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Essential Pharmacy English in Use: self-study book

(for PhD students)

Part I: non-chemical subjects

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The main objective of the self-study book is to develop students' ability to use English as a means of professional communication and self-education, which involves mastering the skills of extracting and processing information from a foreign language source, as well as oral communication skills necessary to discuss pharmaceutical issues with foreign colleagues.

The manual contains lexical exercises, texts and glossary of terms in such disciplines as anatomy, pathological physiology, pharmaceutical botany, microbiology.

The self-study book is designed for independent work of 1st year PhD students.

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PREFACE

Building a democratic state in Ukraine with a market economy and broad international relationship requires a qualitatively new training for higher education professionals. In this regard, the knowledge of foreign language is particular important for pharmacists and becomes a significant tool for success in professional activity and a sign of high professional level.

This self-study book is designed to meet the requirements of the English language program for non-linguistic specialities. Its purpose is to develop students' skills and ability to read English professional literature, as well as to conduct conversations on professional topics. The textbook provides material from various original scientific journals (*The pharmaceutical journal, The European Journal of Medicinal Plants, The scientist*) and TV channels (*National Geographic, TED Conference LLC*) related to pharmacy field and is intended for the first year PhD students of pharmaceutical universities studying in the specialty “Pharmacy”, who have some knowledge of the high school curriculum and continue to study professional English at a higher education institution.

The communicative nature of the exercises develops students' speech activity in situations related to a particular topic. Each unit has specific practical goals for developing language skills. The texts by specialty are selected in such a way as to stimulate speech-mental activity, intellectual development of the personality, to promote the motivation of learning activities in a foreign language. They are accompanied by lexical and speech exercises, the active vocabulary of which is subsequently repeatedly varied and repeated. The self-study book materials make it possible to make extensive use of modern technical training tools.

The self-study book has such structure as 10 units that contain materials on non-chemical disciplines (Anatomy, Pathophysiology, Pharmaceutical botany, Microbiology). Each unit consists of three parts: vocabulary, reading, and watching DVD. The coursebook also contains videoscripts and answer key.

CONTENTS

Unit 1

Vocabulary	**Names of pharmacy professions**
Reading	**Do I have the skills to work for a primary care network?**
Watching DVD	**Steps to becoming a pharmacist in the USA**

Vocabulary

1. *Give the transcription of the words below.*

patient	……..	chemist	……
drug	……..….	physician	……
curriculum	……....	Bachelor of pharmacy	……
microbiology	……..	biochemistry	……
harmful	……..	retail pharmacist	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ˈdrʌgɪst]	.....	**[sʌɪd ɪˈfɛkt]**	.....
[ɔːˈganɪk ˈkɛmɪstri]	.....	**[ˈdəʊsɪdʒ]**	.....
[ˈnjuːklɪə ˈfɑːməsɪst]	.....	**[ˈhɛlθkɛː]**	.....
[ˈriːteɪl ˈfɑːməsɪst]	.....	**[fɑːməˈkɒlədʒi]**	.....
[paθəʊfɪzɪˈɒlədʒi]	.....	**[mɛdɪˈkeɪʃ(ə)n]**	.....

3. *Match the words and their definitions.*

1. MRI	**a)** a pharmacist who makes drugs prescribed by doctors for specific patients.
2. clinical pharmacist	**b)** the highest University Degree in the pharmacy field.
3. compounding pharmacist	**c)** a science or practice of the diagnosis, treatment, and prevention of disease.
4. Doctor of Pharmacy	**d)** a postgraduate Academic Degree which is awarded for a program in the pharmacy field.
5. CT scan	**e)** a medical imaging technique used in radiology to create detailed images of the organs and tissues within the body.
6. medicine	**f)** a pharmacist who works in companies that manufacture medicines.
7. academic pharmacist	**g)** a pharmacist who works with medical professionals and sick patients on drugs and toxicity.
8. poison control pharmacist	**h)** a full-time faculty member of an educational institute (e.g. University, Polytechnic, etc.).
9. Master of pharmacy	**i)** a medical imaging procedure that can reveal anatomic details of internal organs that cannot be seen in conventional X-rays.
10. industry pharmacist	**j)** a pharmacist trained in clinical aspects of patient care.

4. *Read the sentences. Give the definitions of the words in bold.*

1. Originally – during the 19th century and the beginning of the 20th century "**pharmacognosy**" was used to define the branch of medicine or commodity sciences which deals with drugs in their crude, or unprepared, form. **2. Analytical chemistry** consists of classical, wet chemical methods such as precipitation, extraction, and distillation and modern, instrumental methods which may be used to separate samples using chromatography, electrophoresis or field flow fractionation. **3.** Since the advent of nanotechnology and analytical tools, which have evolved across recent decades, **physical and colloid chemistry** or "nano-chemistry" has become essential for high-level research in various disciplines. **4.** Getting a master's degree in **pharmaceutical chemistry** with course topics like bioethics; synthetic medicinal chemistry; drug biotransformation and molecular mechanisms of toxicity; natural medicine products; and more can help lab technicians or research assistants move up to the next level in their careers. **5.** By the knowledge of **pharmaceutical botany** pharmacist will be capable of distinguishing medicinal plants from species which are not used in therapy. **6.** "Gross anatomy" customarily refers to the study of those body structures large enough to be examined without the help of magnifying devices, while microscopic **anatomy** is concerned with the study of structural units small enough to be seen only with a light microscope. **7.** A **pharmacist** has expert knowledge of medications and can advise members of the public in this matter and will also give advice on over-the-counter remedies that can be purchased for minor ailments or non-serious illnesses such as a cold.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. curriculum	the objects comprising a course of study in a school or college.
2. chemist	a student trained in the study of chemistry.
3. dosage	the shape or frequency of a dose of a medicine or drug.
4. nuclear pharmacist	a pharmacist who improves public health through the safe and effective use of analgesic drugs for diagnosis and therapy.
5. Bachelor of Pharmacy	a School Degree that was awarded after a pharmacy program.
6. side effect	a secondary, typically undesirable idea of a drug or medical treatment.
7. pharmacognosy	a branch of knowledge concerned with medicinal drugs obtained from fruits or other natural sources.
8. physical and colloid chemistry	a branch of chemistry that deals with carbon compounds of very fine subdivision.

Reading

6. *Before you read the article, discuss these questions.*

1. What kind of skills and experience does a community pharmacist need?
2. Is it interesting role to work in primary care networks?

7. *Read the article and match the headings a-e with the paragraphs 1-3. There are two choices you do not need to use.*

a. There will be learning needs but you will be supported.
b. It is beneficial to have a good understanding of the function of PCNs.
c. Different background of pharmacists.
d. No community pharmacist should shy away from entering this role owing to 'lack of experience'.
e. Working as a community pharmacist is an access to patient records.

8. *Match meanings 1-7 with the words in bold in the text.*

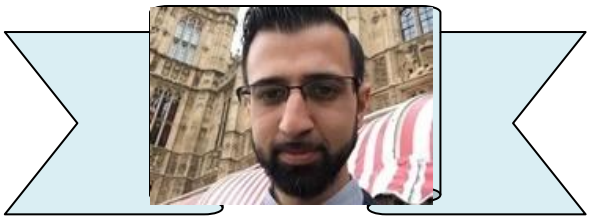
1. ……	a general rule, principle, or piece of advice.
2. ……	someone who teaches or gives help and advice to a less experienced and often younger person.
3. ……	a time or set of circumstances[1] that makes it possible to do something.
4. ……	a roster[2] of primary care physicians who provide health care to members of certain health insurance[3] plans.
5. ……	an action which is influenced by other actions.
6. ……	the circumstances or situation prevailing at a particular time or underlying a particular event.
7. ……	to do something important, difficult, or dangerous after thinking about it.

[1] ***Circumstances*** – circonstance (f) (обстоятельство, случай)
[2] ***Roster*** – liste (f) **(**перечень, реестр**)**
[3] ***Health insurance*** – assurance santé (f) (медицинская страховка)

DO I HAVE THE SKILLS TO WORK FOR A PRIMARY CARE NETWORK?

You are a community pharmacist who has seen jobs advertised for pharmacist roles within **primary care networks** (PCNs). Although your knowledge of PCNs is limited, you feel it would be an interesting role, but are unsure whether you have the necessary skills or experience to apply.

With **opportunities** to work in primary care networks emerging in England, pharmacists can make the most of their knowledge and experience to succed in such a role.



Reg Rehal,
a pharmacist and clinical director of Tilbury and Chadwell Primary Care Network

1. _____

The pharmacist's role in a primary care network (PCN) is new, exciting, and comes packed full of training and development opportunities. No community pharmacist should shy away from applying for these roles owing to a 'lack of experience', as the position will develop your skills and bring you in-line with other pharmacists who already work in general practice.

In Tilbury and Chadwell PCN, where I am a clinical director, the pharmacists I have employed are developing very well and receive continuous support and feedback from myself and other clinicians to address their training needs, which I believe is replicated among networks nationally. These pharmacists came from very different **backgrounds** — one is from a rheumatology hospital-based pharmacy background and the other is a community pharmacist — neither had worked much in general practice before. Both pharmacists have settled comfortably into their roles and have a good understanding of what is expected of them. The role of the PCN pharmacist will be developing even more in the coming months, whereby a national standardised training pathway will be brought into effect. This will potentially include training to become a prescriber as well. The role itself is important going forward, as medicines optimisation and pharmaceutics in primary care are complex areas. This is where pharmacists are in their element and can bring their expertise to practice, taking a lot of workload off the GPs.

The old view of the 'chemist in the shop' is slowly fading away and this is the direction the profession should be heading in. I would strongly recommend any community pharmacist **to take the plunge** and join us in general practice and further the pharmacy profession in this sector.

Kere Odumah
a senior pharmacist at Islington GP Federation overseeing the pharmacy service for the Islington Central 2 Primary Care Network

2. _____

The role of the pharmacist in primary care is constantly evolving. I worked in community pharmacy for five years then moved into publishing before my current role as a senior pharmacist working for a GP federation within a PCN.

The basic skills required to excel in your role within a PCN are no different to the skills required of a community pharmacist.

One of the limitations I found working as a community pharmacist was access to patient records. There is only so much you can do in

terms of medication reviews, drug–drug **interactions** or disease–drug interactions without having access to patient records — consider how many times you have tried to work out if a dose of a drug was appropriate? Is the treatment in-line with current **guidelines**? These are questions that I found frustrating and I am sure you do too. If these are things you have thought about then you already know that you have the skills required to assist you in your role within a PCN.

I acknowledge that there will be learning needs that you will encounter, but you will be supported through this transition. The important thing to note is that you have been trained to be an expert in medicines and that expertise is what you will bring to your role. Are you skilled? Yes. Is there more you need to develop? Definitely. Is there room to develop and learn? Of course. There is always room to grow and expand on your knowledge. NHS England recognises this and, as such, there is funding available for pharmacists taking on a PCN role to undertake an 18-month Centre for Pharmacy Postgraduate Education training programme, which will equip you with all you need to be successful in your role.

Sabes Thurairasa
a senior professional support pharmacist at the Royal Pharmaceutical Society

3. _____

There are several opportunities for pharmacists in PCNs. You can find out more about PCNs, and the roles pharmacist have within them, from existing Royal Pharmaceutical Society (RPS) resources and those of other organisations.

A large part of the PCN role will involve patient consultations in various settings and as a pharmacist already working in a patient facing role, you can build on the experience you have. We have resources that will be useful to support pharmacists in activities they will be involved in when working in PCNs.

Prescribing will form part of the role and the RPS has developed a practical guide for independent prescribers. The guide is useful for pharmacists aspiring to become a prescriber. PCN pharmacists will carry out structured medication reviews, lead on medicines optimisation, address local public health and social care needs and support care homes. The RPS has a medicines optimisation hub, which includes our good practice guidance on medicines optimisation helping patients make the most of their medicines. The Society also has polypharmacy guidance for healthcare professionals and healthcare organisations involved with medicines and patient care. When changing sector, the support of a **mentor** can be invaluable, you can register as a mentee on the RPS website**.**

By Angela Kam
https://www.pharmaceutical-journal.com/

9. *Answer the following questions.*

1. What do the pharmacists employed by Reg Rehal receive in Tilbury and Chadwell PCN?
2. According to Reg Rehal, when will the role of the PCN pharmacist be developing?
3. Is the old view of the “chemist shop” slowly fading away?
4. What are the limitations that Kere Odumah found working as a community pharmacist?
5. According to Kere Odumah, what is the important thing to note?
6. What questions should a pharmacist taking on a PCN role ask himself?
7. Where can you find out more about PCNs and the roles of pharmacists within them?

10. *Decide whether each statement is true or false.*

1.	With opportunities to work in primary care networks, pharmacists can make the most of their knowledge and experience to succed in such a role.	✚
2.	The pharmacist's role in a primary care network is new, exciting, and comes packed full of training and development opportunities.	
3.	Reg Rehal is a cleaning director in Tilbury and Chadwell PCN.	
4.	Pharmacists came from very different backgrounds — one is from a traumatology hospital-based pharmacy background and the other is a retail pharmacist.	
5.	The basic skills required to excel in your role within a PCN are no different to the skills required of a community pharmacist.	
6.	PCN pharmacists will carry out structured medication reviews, lead on medicines optimisation, address local public health and social care needs and support care homes.	
7.	The Royal Pharmaceutical Society has a medicines optimisation hub, which includes our good practice guidance on medicines optimisation helping patients make the most of their medicines.	
8.	The Royal Pharmaceutical Society also has polypharmacy guidance for healthcare assistants and healthcare workers involved with medicines and patient care.	

11. *Underline the phrases in the text which have the following meaning.*

1. This post will help you develop your skills and bring you in line with other pharmacists.
2. Both pharmacists are comfortable with their roles and understand well what is expected of them.
3. The basic skills required to succeed in your role in PCN are no different from the skills required by your local pharmacist.
4. These questions upset me, and I'm sure that you too.
5. I acknowledge that you will have training needs.
6. We have resources that will be useful to support pharmacists in events in which they will participate.
7. Royal Pharmaceutical Society has a drug optimization center that includes our drug optimization recommendations.

Watching DVD

12. *Watch the DVD (https://www.youtube.com/watch?v=796Sgsrog-Q). Put the actions below in the correct order. There are two choices you do not need to use.*

1. Educational path to becoming a pharmacist. _____
2. How hard is pharmacy school. _____
3. Start making your goal a reality. _____
4. Pharmacist: job description. _____ *a* _____
5. Types of pharmacists. _____

13. *According to the DVD, continue the phrases.*

A pharmacist is a health care professional who ……

fills	…… *medical prescriptions* ……..
advises you	……...
needs to be	……...
talks to people about	……...
helps people	……...
knows all about	……...

14. *Watch the DVD again. Using the words from the box, complete the extract about pharmacists' education.*

diploma	**pharmacology PharmD**	**Bachelor's Degree pharmacy**	**pharmacist**

Here's the educational path to becoming a _____. This is the traditional path so yours may vary. After you've gotten your high school _____ or equivalent, you'll need to go to college and complete a _____. Then, you'll take the PCAT at an aptitude test for pharmacists based on your score in college grades. You'll attend a farm deep

program where you'll get your _____ degree. This will take three or four years. After you finish your education, you may need to complete a residency, getting on-the-job experience. Finally, you'll need to pass the North American pharmacist licensure exam or NAPLEX and the multi-state _____ jurisprudence exam. After that you are on the job. _____ is a field that's expected to keep growing as our population ages.

15. *Match exams abbreviations mentioned in the DVD with their interpretations and definitions.*

1. PCAT	**a)** Multistate Pharmacy Jurisprudence Exam.
2. NAPLEX	**b)** Pharmacy College Admission Test.
3. MPJE	**c)** North American Pharmacist Licensure Examination.

I. a computer-based standardized test administered to prospective pharmacy school students by Pearson Education, offered in January, July, and September which includes Writing, Biology, Chemistry, Critical reading, Quantitative Reasoning sections and is taken four and a half hours. _____

II. a computer-based exam that comprises of 120 questions which tests candidate's knowledge on Pharmacy Law and Jurisprudence in the State of Jurisdiction. _____

III. a standard examination created by the National Association of Boards of Pharmacy (NABP) to help individual state boards of pharmacy assess an individual's competency and knowledge so that he or she may be given a license to practice. _____

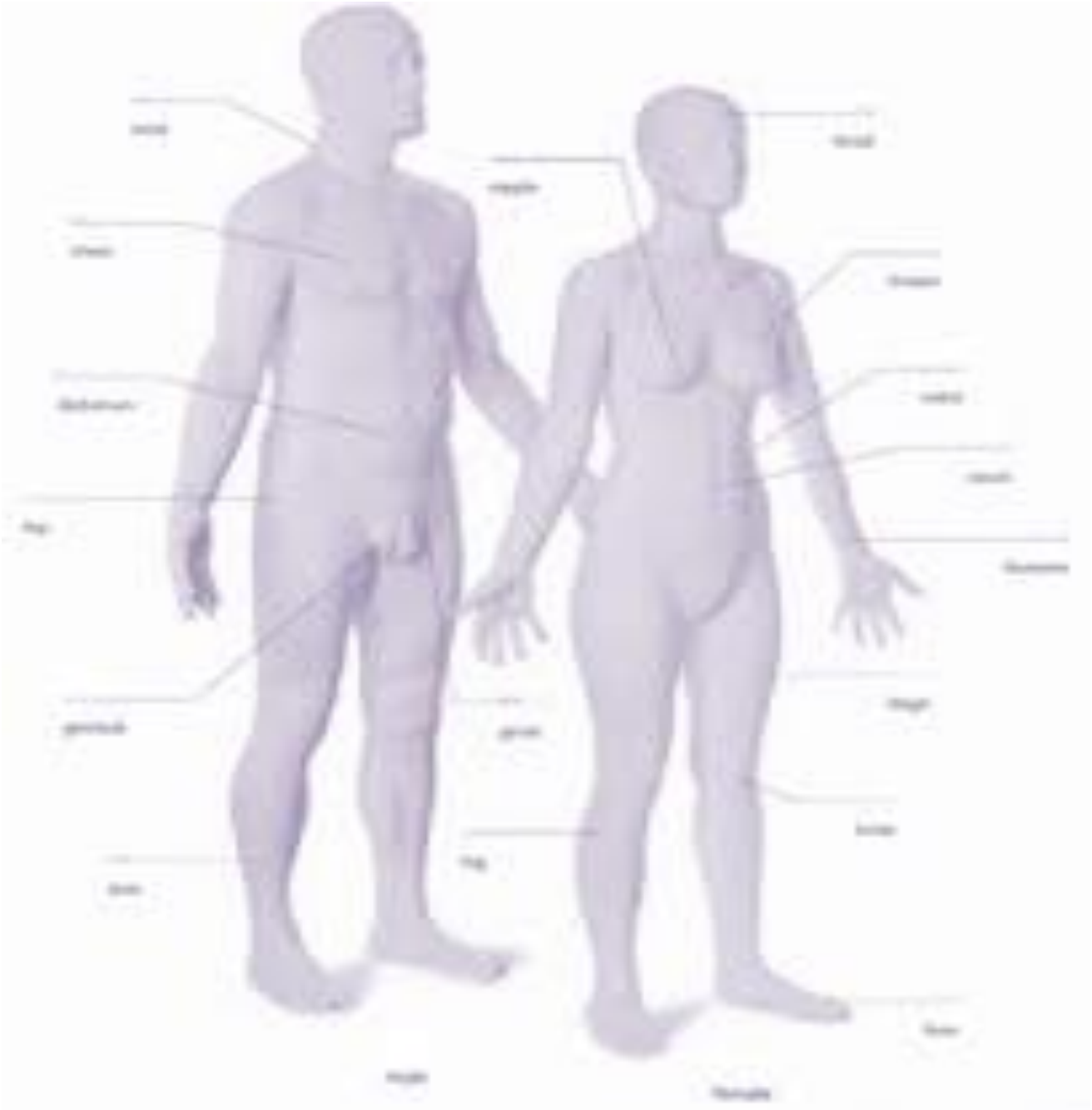
16. *According to the video, tick the steps of making your goal a reality that were mentioned.*

1. Go and talk to your pharmacist.	v	**5.** Be a volunteer in a hospital.	
2. Ask your pharmacist if he likes his job.		**6.** Sign up for a chemistry or biology course.	
3. Get familiar with medical conditions terminology and pharmaceuticals.		**7.** Get a job as a clerk or cashier in a pharmacy.	
4. Ask your pharmacist if he completed his education**.**		**8**. Don't learn on the job and don't see what a pharmacist does.	

17. ***Look at this chart about pharmacists' education in the USA. Were all these steps to becoming a pharmacist mentioned in the video? Is this procedure simpler or more complicated than in your country?***

Unit 2

Vocabulary	**Names of external body parts**
Reading	**On the road to 3-D printed organs**
Watching DVD	**Your super skeleton**



Vocabulary

1. *Give the transcription of the words below.*

elbow	……..	jaw	…….....
shoulder	……..….	wrist	……
abdomen	…….....	spine	……
knee	……..	skull	……
toe	……..	cartilage	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ˈləʊəˈʌpə lɪm]	.....	**[ɪkˈstrɛmɪti]**	.....
[ˈlɪgəm(ə)nt]	.....	**[ˈfɔːfɪŋgə]**	.....
[ˈskɛlɪt(ə)n]	.....	**[ˈkreɪnɪəm]**	.....
[ˈvɜːtɪbrə]	.....	**[ˈɛlbəʊ]**	.....
[ˈpɛlvɪk bəʊn]	.....	**[ˈstʌmək]**	.....

3. *Match the words and their definitions.*

1. index (finger**)**	**a)** the region in a vertebrate animal including the hand, arm and shoulder.
2. eyelid	**b)** a hard, calcified tissue that forms the skeleton of most vertebrates.
3. trunk	**c)** something without bones.
4. upper limb	**d)** a person's or animal's body apart from the limbs and head..
5. bone	**e)** the part of the human leg between the hip and the knee.
6. tendon	**f)** the region on each side of the head in front of the ear and above the cheek bone.
7. boneless	**g)** the finger next to the thumb; the forefinger.
8. thigh	**h)** each of the short curved hairs growing on the edges of the eyelids, serving to protect the eyes from dust.
9. temple	**i)** each of the upper and lower folds of skin which cover the eye when closed.
10. eyelash	**j)** a strong cord in a person's or animal's body which joins a muscle to a bone.
11. cavity	**k)** the bone below the eye.
12. cheekbone	**l)** an empty space within the body, an organ, a bone, etc.

4. *Read the sentences. Give the definitions of the words in bold.*

1. The vertebrae in the human **vertebral column** are divided into different regions, which correspond to the curves of the spinal column. **2.** Human **skin** is similar to most of the other mammals[1] skin, and it is very similar to pig skin. **3.** The radial and ulnar[2] arteries and their branches supply the blood to the **forearm**. **4**. Tom caught a mosquito between his **thumb** and first finger. **5.** The **patella** is the largest sesamoid[3] bone in the body which sits in front of the knee joint and protects the joint from damage. **6.** I've heard somebody say that you're as healthy as your **gut**. **7.** The **mandible** is the only movable cranial bone which is located in the anterior part of the lower jawbone, has a curved shape, and can be divided in two parts: the base of the mandible, and the alveolar[4] part of the mandible. **8**. **Chest** pain can be caused by anything from muscle pain to a heart attack and should never be ignored. **9**. For the first few days, you'll need to rest and apply an ice pack to your injured **ankle** for 10 to 15 minutes every few hours. **10.** One London ad firm paid students by the hour to wear temporary tattoos on their **foreheads** while at bars or shopping. **11.** He had to bite his **cheek** inside his mouth, hard, to keep from laughing. **12**. His **hip** had to be x-rayed to see if it was forming properly.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. breastbone	a thin, flat bone running down the centre of the cranium, to which the ribs are attached.
2. thorax	the front surface of a person's or animal's body between the temple and the stomach.
3. heel	the back part of the human foot below the knee.
4. belly	the part of the body of a vertebrate containing the respiratory and reproductive organs.
5. chin	the lower extremity of the chest, below the mouth.
6. hip	the joint that connects the arm to the upper part of the body.
7. upper arm	a part of the arm between the shoulder and the toe.
8. joint	a connection made between bones in the body for the purpose of permitting body parts to eat.
9. rib	one of a series of long curved bones that protects the external organs.
10. kneecap	the cartilage at the front of the knee joint.

[1] ***Mammal*** – mammifères (m, pl) (млекопитающее)
[2] ***Ulnar*** – ulnaire (локтевой)
[3] ***Sesamoid*** – sésamoïde (сезамовидный)
[4] ***Alveolar*** – alvéolaire (альвеолярный)

Reading

6. *Before you read the article, discuss these questions.*

1. Is 3-D organ printing technology the future or modernity of modern medicine?
2. What kind of people need 3-D printed organs and why?
3. How do you see the future development in the field of 3-D organ printing?

7. *Match meanings 1-7 with the words in bold in the text.*

1. ……	any of the distinct types of material of which animals or plants are made, consisting of specialized cells and their products.
2. ……	the programs and other operating information used by a computer.
3. ……	a type of research that studies new tests and treatments and evaluates their effects on human health outcomes.
4. ……	a process in which a transplant recipient's immune system attacks the transplanted organ or tissue.
5. ……	special human cells that have the ability to develop into many different cell types, from muscle cells to brain cells.
6. ……	medicines that reduce the strength of the body's immune system and lower the body's ability to reject a transplanted organ.
7. ……	the vascular system of a part of the body and its arrangement.

8. *Read the article and complete the text with the following parts of the sentences*.

A pharmaceutical companies to test drugs before moving on to animal studies
B printer was developed in the late 1980s
C instead of printing the veins in layers, the team used embedded printing
D has been used it to make toys, homes, scientific tools and even a plastic bunny
E are waiting for an organ transplant, according to the United Network for Organ Sharing.

ON THE ROAD TO 3-D PRINTED ORGANS

Researchers can print cells and biomaterials that make up human **tissues**, but there's still a long way to go before fully functional organs can be made to order.

For years, scientists have predicted that 3-D printing – **(1)** _____ that contained a DNA code for its own replication – could one day be harnessed to print live, human body parts to mitigate a shortage of donor organs. So far, researchers also used 3-D printing in medicine and dentistry to create dental implants, prosthetics, and models for surgeons to practice on before they make cuts on a patient. But many researchers have moved beyond printing with plastics and metals – printing with cells that then form living human tissues.

No one has printed fully functional, transplantable human organs just yet, but scientists are getting closer, making pieces of tissue that can be used to test drugs and designing methods to overcome the challenges of recreating the body's complex biology.

The first 3-D **(2)** _____. It could print small objects designed using computer-aided design (CAD) **software**. Then, the printer would piece that design into the complete product.

When it comes to printing cells and biomaterials to make replicas of body parts and organs, these two strategies apply, but the ability to work with biological materials in this way has required input from cell biologists, engineers, developmental biologists, materials scientists, and others.

So far, scientists have printed miniorganoids and microfluidics models of tissues, also known as organs on chips. Some of these models are used by **(3)** _____ and eventually **clinical trials**. One group, for example, printed cardiac cells on a chip and connected it to a bioreactor before using it to test the cardiac toxicity of a well-known cancer drug, doxorubicin. The team showed that the cells beating rate decreased dramatically after exposure to the drug.

However, scientists have yet to construct organs that truly replicate the myriad structural characteristics and functions of human tissues. "There are a number of companies who are attempting to do things like 3-D print ears," and researchers have already reported transplanting 3-D printed ears onto children who had birth defects that left their ears underdeveloped, notes Robby Bowles, a bioengineer at the University of Utah. The ear transplants are, he says, "kind of the first proof of concept of 3-D printing for medicine".

Researchers have been using 3-D-printing techniques in hopes of developing tissues that can be transplanted into humans. Some printed tissues, such as skin and bone, are already being tested in humans, while many others are early in development.

Robby Bowles adds that researchers are still "a ways away" from printing more-complex tissues and organs that can be transplanted into living organisms. But, for many scientists, that's precisely the goal. As of February 2020, more than 112,000 people in the US (4) _____. About 20 of them die each day.

Ideally, 3-D printed organs would be built from cells that a patient's immune system could recognize as its own, to avoid **immune rejection** and the need for patients to take **immunosuppressive drugs**. Such organs could potentially be built from patient-specific induced pluripotent **stem cells**, but one challenge is getting the cells to differentiate into the subtype of mature cell that's needed to build a particular organ. "The difficulty is kind of coming together and producing complex patternings of cells and biomaterials together

to produce different functions of the different tissues and organs," says Robby Bowles.

So far, researchers have created patches of tissue that mimic portions of certain organs but haven't managed to replicate the complexity or cell density of a full organ. At the end of 2016, a company called *Organovo* announced the start of a program to develop 3-D printed liver tissue for human transplants after a study showed that transplanted patches of 3-D printed liver cells successfully engrafted in a mouse model of a genetic liver disease and boosted several biomarkers that suggested an improvement in liver function.

Only in the past few years have researchers started to make headway with one of the biggest challenges in printing 3-D organs: creating **vasculature**. **(5)** _____— a technique in which, instead of building from the bottom of a slide upwards, material is extruded directly into a bath, or matrix. This strategy, which allows the researchers to print "free form in 3-D," says Skylar-Scott, rather having to print each layer one on top of the other to support the structure, is a more efficient way to print a vascular tree. The matrix in this case was the cellular material that made up the heart ventricle. A gelatin-like ink pushed these cells gently out of the way to create a network of channels. Once printing was finished, the combination was warmed up. This heat caused the cellular matrix to solidify, but the gelatin to liquify so it could then be rinsed out, leaving space for blood to flow through.

But that doesn't mean the problem is completely solved. The Wyss Institute team's ventricle had blood vessels, but not nearly as many as a full-sized heart. Courtney Gegg, a senior director of tissue engineering at Prellis Biologics, points out that to truly imitate human biology, "an individual cell will have to be within 200 microns of your nearest blood supply. . . . Everything has to be very, very close." That's far more intricate than what researchers have printed so far.

Due to hurdles with adding vasculature and many other challenges that still face 3-D–printed tissues, laboratory-built organs won't be available for transplant anytime soon. In the meantime, 3-D printing portions of tissue is helping accelerate both basic and clinical research about the human body.

By Emma Yasinski
https://www.the-scientist.com/

9. *Answer the following questions.*

1. How can researchers make up human tissues?
2. Where did researchers use 3-D printing?
3. When was the first 3-D printer developed?
4. What kind of organs have the scientists to construct yet?
5. In hopes of what have researchers been using 3-D printing techniques?
6. How many people in the USA are waiting for an organ transplant in 2020?
7. What cells would 3-D printed organs be built from?
8. When did *Organovo* announce the start of a program to develop 3-D printed liver tissue for human transplants?
9. When have researchers started to make headway in creating vasculature?
10. What happened when the printing was finished?

10. *Decide whether each statement is true or false.*

1.	For years, scientists have predicted that 3-D printing could one day be harnessed to print live, human body parts to mitigate a shortage of donor organs.	✚
2.	Someone has printed fully functional, transplantable human organs.	
3.	The first 3-D printer could print big objects designed using computer-aided design (CAD) software.	
4.	So far, scientists have printed mini organoids and microfluidics models of tissues, also known as organs on chips.	
5.	There are a number of companies who are attempting to do things like 3-D print ears.	
6.	Some printed tissues, such as lungs and liver, are already being tested in humans, while many others are early in development.	
7.	Researchers are still “a ways away” from printing more-complex tissues and organs that can be transplanted into living organisms.	
8.	3-D printed organs could potentially be built from patient-specific induced pluripotent stem cells.	

11. *Underline the phrases in the text which have the following meaning.*

1. many researchers have gone beyond printing using plastics and metals – printing using cells, which then form living human tissue.
2. the printer then extended this design to the entire product..
3. the team showed that the rate of beat of the cells decreased sharply after exposure to the drug.
4. there are a number of companies trying to do things like 3-D print ears.
5. The matrix in this case was the cellular material that makes up the ventricle of the heart.
6. Gelatin-like inks gently ejected these cells, creating a network of channels.
7. This is much more complicated than what the researchers have printed so far.
8. Due to the obstacles associated with the addition of the vasculature and many other problems in which tissue with 3D printing is still encountered, laboratory organs will not be available for review in the near future.
9. Meanwhile, 3-D printing of tissue parts helps accelerate both basic and clinical studies of the human body.

Watching DVD

12. *Watch the video (https://www.youtube.com/watch?v=vRuh9aBwUdM). Match the words and their definitions.*

1. loosey-goosey	**a)** to do with force or pressure.
2. pile	**b)** a piece of metal or another suitable material used as a protection from a danger or risk.
3. to squeeze	**c)** a rough, tight embrace.
4. shield	**d)** a person's head.
5. squishy	**e)** disorganized or excessively relaxed (*informal, AmE*).
6. bear hug	**f)** soft and moist.
7. femur	**g)** a quantity of things lying one on top of another.
8. noggin	**h)** the strongest bone of the lower limb that extends from the hip to the knee.

13. *Use the words from the box to complete the sentences.*

pile bear hug shield loosey-goosey squeezing squishy

One of a skeleton's important jobs is, of course, to hold your body up! Your muscles are strong, but they need a frame, something to hold on to. Without a skeleton, you'd be all _____, and you wouldn't be shaped like … you! And it goes both ways! Without your muscles, your skeleton would just be a _____ of bones. It's only by _____ and relaxing your muscles that you're able to move your bones. So that silly dancing Halloween skeleton? It's just pretend – because it doesn't have muscles. So, your bones are hard enough to hold the weight of the rest of your body. But they're also hard enough to act like a protective _____ around your soft, _____ organs. Your ribs, for example, are bones that protect your lungs and heart so that even when you get a big strong _____, your insides don't get squeezed too!

14. *According to the DVD, are the statements true or false?*

	V
1. You may have seen skeletons in a museum – like the ones they have of dinosaurs.	
2. The strongest bone in your body, the longest and the heaviest one you have is stapes.	
3. The very smallest bone you have is actually in your nose.	
4. Newborn babies have about 300 bones, but you'll have only 206.	
5. Most of the stuff that's in your blood is actually made inside of your bones!	

15. *Watch the DVD again. Choose from (A-D) the one that best fits each space (1-5).*

Now, I have a question, how **(1)** _____ bones do you think we have? Well … it kinda depends. It sounds crazy, but you have fewer bones now than when you were born! **(2)** _____ babies have about 300 bones, but – by the time you're finished growing – you'll have only 206. So, where did all those extra bones go? Nowhere! As babies grow, some of their bones grow together, of fuse, into one bigger bone. For example … your skull! Your hard **(3)** _____ is actually 21 bones that are fused together, plus one bone that always separates – your **(4)** _____! Your skull starts out as a bunch of separate bones, because that leaves lots of room for your **(5)** _____ to get bigger. And once you're fully grown, the fused parts make an incredibly strong shield to protect your precious brain.

	A	B	C	D
1.	many	much	few	little
2.	unborn	born	newborn	lowborn
3.	head	noggin	cranium	skull
4.	underjaw	chap	mandible	jaw
5.	cerebrum	encephalon	brain	marrow

16. *According the video, choose the correct answer (A-C) for the following questions.*

1. Why do the femur have to be big and strong?

a. because a lot of the weight of your body falls on the femur.
b. because it goes from your hip to your knee.
c. because you run, jump, walk, or even just stand still.

2. What is the size of the smallest bone in your ear, called the stapes?

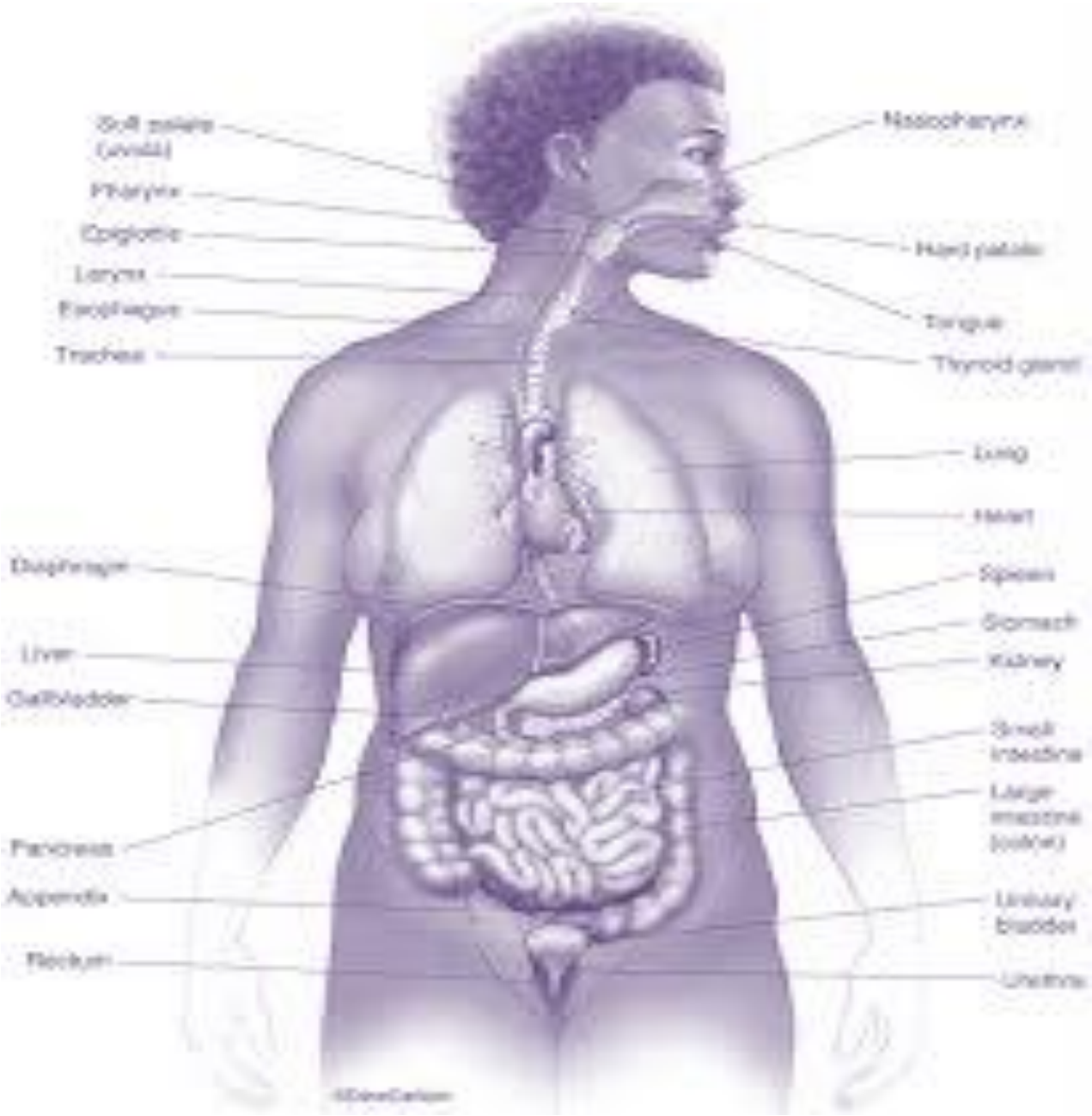
a. it's only about the size of a rain of rice.
b. it's only about the size of a grain for mice.
c. it's only about the size of a grain of rice.

3. How many bones are fused together in our hard noggin?

a. 23.
b. 201.
c. 21.

Unit 3

Vocabulary	**Names of internal organs**
Reading	**New discoveries in human anatomy**
Watching DVD	**Human body systems**



Vocabulary

1. *Give the transcription of the words below.*

urethra	……..	cardiovascular system	……
bone marrow	……..….	muscular system	……
tissue	……....	thyroid gland	……
bronchus	……..	pancreas	……
oesophagus	……..	digestive system	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ˈlarɪŋks]	.....	**[ˈdʒɛnɪt(ə)l ˈsɪstəm]**	.....
[ˈspʌɪn(ə)l kɔːd]	.....	**[ˈgʌlɪt]**	.....
[ˈjʊərɪn(ə)ri ˈsɪstəm]	.....	**[ˈnəːvəs ˈsɪstəm]**	.....
[trəˈkiːə,ˈtreɪkɪə]	.....	**[əˈdriːn(ə)l gland]**	.....
[lɑːdʒ ɪnˈtɛstɪn]	.....	**[blʌd]**	.....

3. *Match the words and their definitions.*

1. integumentary system	**a)** cone-shaped passageway leading from the oral and nasal cavities in the head to the esophagus and larynx.
2. circulatory system	**b)** a hollow muscular organ in humans and vertebrates that collects and stores urine from the kidneys before disposal by urination.
3. blood vessel	**c)** the opening at the end of the alimentary canal through which solid waste matter leaves the body.
4. pharynx	**d)** a tubular structure carrying blood through the tissues and organs; a vein, artery or capillary.
5. urinary bladder	**e)** the collection of glands that produce hormones that regulate metabolism, growth and development, tissue function, sexual function, reproduction, sleep, and mood, among other things.
6. kidney	**f)** a hollow muscular organ that pumps the blood through the circulatory system by rhythmic contraction.
7. anus	**g)** the set of organs that forms the external covering of the body and protects it from many threats such as infection etc.
8. endocrine system	**h)** a small gland that secretes sweat, situated in the dermis of the skin.
9. heart	**i)** a pair of organs in the abdominal cavity of mammals.
10. sweet gland	**j)** an organ system that permits blood to circulate and transport nutrients (such as amino acids and electrolytes.

4. *Read the sentences. Give the definitions of the words in bold.*

1. The **skeletal system** is the foundation of your body, giving it structure and allowing for movement. **2.** The **spleen** is protected by the rib cage, so you can't easily feel it unless it's abnormally enlarged. **3.** In humans, the pear-shaped **gallbladder** lies beneath the liver, although the structure and position of the gallbladder can vary significantly among animal species. **4.** A **gonad**, sex gland, or reproductive gland is a mixed gland that produces the gametes (sex cells) and sex hormones of an organism. **5.** In humans, the **rectum** is the last section of the digestive tract, extending from the colon to the anus, in which feces is stored for elimination from the body. **6.** The cells of the **respiratory system** protect the body from the invasion of pathogens through the nasal passages. **7. Muscles** are primarily responsible for maintaining and changing posture, locomotion, as well as movement of internal organs, such as the contraction of the heart and the movement of food through the digestive system. **8**. **Veins** are present throughout the body as tubes that carry blood back to the heart. **9.** A kidney stone can move from the kidney and become lodged inside the **ureter**, which can block the flow of urine, as well as cause a sharp cramp in the back, side, or lower abdomen. **10**. Many of the digestive enzymes that act in the **small intestine** are secreted by the pancreas and liver and enter the small intestine via the pancreatic duct[1].

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. lymph node	one of many small, apple-shaped organs located throughout the lymphatic system.
2. reproductive system	a system of sex organs within a cell.
3. lungs	a pair of breathing organs located with the gullet which remove carbon dioxide from and bring oxygen to the blood.
4. artery	a blood vessel that takes mucus away from the heart to all parts of the body (tissues, lungs, etc.).
5. liver	a large organ in a body which processes blood and helps to clean unwanted organs out of it.
6. genitals	a person's or animal's external organs of pollination.
7. brain	an organ of soft nervous tissue contained in the leg of vertebrates, functioning as the coordinating centre of intellectual activity.
8. lymphatic system	a network of tissues and organs that help rid the body of toxins, waste and other unwanted materials.

[1] ***Pancreatic duct*** – canal pancréatique (m) (проток поджелудочной железы)

Reading

6. *Before you read the article, discuss these questions.*

1. Is it possible for modern scientists to discover new organs in the human body?
2. Could you imagine what kind of organs can be discussed?

7. *Match meanings 1-7 with the words in bold in the text.*

1. ……	a view or opinion that is incorrect because based on faulty thinking or understanding.
2. ……	a channel or pipe carrying off surplus liquid, especially rainwater or liquid waste.
3. ……	the three membranes that cover the brain and spinal cord.
4. ……	a contiguous fluid-filled space existing between a structural barrier, such as a cell wall or the skin, and internal structures, such as organs, including muscles and the circulatory system.
5. ……	a continuous[1] set of tissues which attaches the stomach, small intestine, pancreas, spleen, and other organs to the posterior wall of the abdomen.
6. ……	an unborn baby that develops and grows inside the uterus[2].
7. ……	a small accessory bone that is present in the knee joints of roughly 1/3 of individuals.

8. *Read the article and match the headings (A-E) with the paragraphs (1-5).*

A The mesentery: an organ?
B Reptile-like muscles in fetuses
C The Brain's drain
D The fabella makes a comeback
E Fluid-filled spaces

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[1] ***Contiguous*** – contigu, ë (смежный, граничащий)
[2] ***Uterus*** – utérus (m) (*анат.* матка)

NEW DISCOVERIES IN HUMAN ANATOMY

Using advanced microscopy and imaging techniques, scientists have revealed new parts of the human body and overturned previous **misconceptions**.

In the 16th century, when the study of human anatomy was still in its infancy, curious onlookers would gather in anatomical theaters to catch of a glimpse of public dissections of the dead. In the years since, scientists have carefully mapped the viscera, bones, muscles, nerves, and many other components of our bodies, such that a human corpse no longer holds that same sense of mystery that used to draw crowds.

"New discoveries in gross anatomy – the study of bodily structures at the macroscopic level – are now rare, and their significance is often overblown", says Paul Neumann, a professor who specializes in the history of medicine and anatomical nomenclature at Dalhousie University: "The important discoveries about anatomy, I think, are now coming from studies of tissues and cells."

Over the last decade, there have been a handful of discoveries that have helped overturn previous assumptions and revealed new insights into our anatomy. "What's really interesting and exciting about almost all of the new studies is the illustration of the power of new [microscopy and imaging] technologies to give deeper insight," says Tom Gillingwater, a professor of anatomy at the University of Edinburgh in the UK. "I would guess that many of these discoveries are the start, rather than the end, of a developing view of the human body."

Here is a sampling of some of those discoveries.

(1) _____

The lymphatic system, a body-wide network of vessels that **drains** fluids and removes waste from tissues and organs, was long-believed to be absent from the brain. Early reports of lymphatic vessels in the **meninges,** the membrane coating the brain, date as far back as the 18th century – but these findings were met with skepticism. Only recently has this view been overturned, after a 2015 report of lymphatic vessels in mouse meninges and the 2012 discovery of the so-called glymphatic system, an interconnected network of glial cells that facilitates the circulation of fluid throughout mouse brains. In 2017, neuroimaging work revealed evidence for such lymphatic vessels in human meninges.

(2) _____

In 2018, researchers reported that the space between cells was a collagen-lined, fluid-filled network, which they dubbed the **interstitium.** They proposed that this finding, which emerged from close examinations of tissue from patients' bile ducts, bladders, digestive tracts, and skin, may help scientists better understand how tumors spread through the body. The team also called the interstitium a newly-discovered organ, but many dismissed this claim. "Most biologists would be reticent to put the moniker of an 'organ' on microscopic uneven spaces between tissues that contain fluid" Anirban Maitra, a pathologist at the University of Texas MD Anderson Center, told *The Scientist* last year.

(3) _____

Until recently, the prevailing view among scientists was that the **mesentery**, the large, fan-like sheet of tissue that holds our intestines in place, consisted of multiple fragments. In 2016, after examining the mesentery of both cadavers and patients undergoing surgery, a team of researchers concluded that

the mesentery was actually a single unit. This wasn't the first time the mesentery was described as continuous – in one of the first depictions of the structure, Leonardo da Vinci also portrayed it in this way. But in the 2016 paper, the scientists argued that its continuity should qualify the mesentery as an organ. As with the interstitium, however, other experts have objected to this claim. In both of these cases, "there seems to have been a misunderstanding of what the term organ means" Paul Neumann says.

(4) _____

In October 2019, researchers reported that muscles typically seen in reptiles and other animals – but not people – were present in the limbs of human embryos. Using a combination of immunostaining, tissue clearing, and microscopy, the team generated high-resolution 3-D images of upper and lower limb muscles in tissue samples from preserved 8- to 14-week-old embryos and **fetuses.** These structures, which disappear before birth, may be anatomical remnants of our evolutionary ancestors that disappear during the early stages of development, the authors suggest. They only examined 13 images, however, so experts caution that it's a preliminary finding that needs to be replicated in a larger sample.

(5) _____

The **fabella**, a tiny bone located in a tendon behind the knee, is becoming more common in humans, according to a study published last spring. After reviewing 58 studies on fabella prevalence in 27 different countries, researchers reported that people were approximately 3.5 times more likely to have the little bone in 2018 than 1918. The cause of this trend remains an open question, but the authors suggest that changes in muscle mass and bone length—driven by increased diet quality in many parts of the world – could be one explanation.

By Diana Kwon
https://www.the-scientist.com/

9. *Answer the following questions.*

1. How have the scientists revealed new parts of the human body?
2. What did the curious onlookers do in anatomical theatres in the 16th century?
3. Are the new discoveries in gross anatomy frequent?
4. What is the main function of the lymphatic system?
5. When were the lymphatic vessels in the meninges mentioned first?
6. What may scientists help better understand how tumors spread through the body?
7. Is the interstitium a newly-discovered organ?
8. Is the mesentery a fan-like sheet of tissue or an organ of the human body?
9. What, according to researchers, were present in the limbs of human embryos?
10. Where is the fabella located?
11. What is the reason for the presence of fabella in the modern human body structure?

10. *Decide whether each statement is true or false.*

1. In the years since, scientists have carefully mapped the viscera, bones, muscles, nerves, and many other components of our bodies.	✚
2. The important discoveries about anatomy are now coming from studies of bones and cells.	
3. Over the last decade, there have been a lot of discoveries that have helped overturn previous assumptions and revealed new insights into our anatomy.	
4. In 2017, neuroimaging work revealed evidence for lymphatic vessels in human meninges.	
5. In 2016, after examining the mesentery of both cadavers and patients undergoing surgery, a team of researchers concluded that the mesentery was actually a single unit.	

11. *Match the following words with their synonyms.*

1. fetus	**a)** researcher	**1. ancestor**	**a)** bowels
2. scientist	**b)** specimen	**2. intestines**	**b)** cadaver
3. sample	**c)** embryo	**3. corpse**	**c)** progenitor

12. *Instead of words used in the text above, put into the gaps their synonyms from the previous exercise.*

1. In the years since, scientists have carefully mapped the viscera, bones, muscles, nerves, and many other components of our bodies, such that a human _____ no longer holds that same sense of mystery that used to draw crowds.

2. Until recently, the prevailing view among scientists was that the mesentery, the large, fan-like sheet of tissue that holds our _____ in place, consisted of multiple fragments.

3. In October 2019, researchers reported that muscles typically seen in reptiles and other animals – but not people – were present in the limbs of human _____.

4. These structures, which disappear before birth, may be anatomical remnants of our evolutionary _____ that disappear during the early stages of development, the authors suggest.

5. They only examined 13 images, however, so experts caution that it's a preliminary finding that needs to be replicated in a larger _____.

6. Using advanced microscopy and imaging techniques, _____ have revealed new parts of the human body and overturned previous misconceptions.

Watching DVD

13. *Watch the DVD (https://www.youtube.com/watch?v=Ae4MadKPJC0). Choose from (A-D) the one that best fits each space (1-4).*

Lastly the nervous system is a communication network of nerve cells that the body uses to transmit information and coordinate bodily functions. It's comprised of the brain – the **(1)** _____ of sensory and intellectual activity, the spinal cord and the many cranial and spinal nerves that emanate from them. This infrastructure created by neurons, blood, muscles and bones allows three other systems to regulate the body's **(2)** _____: the endocrine, lymphatic and urinary systems.

The endocrine system is a series of glands that use information carried by the nervous system to help regulate the body's processes. Thanks to this neural connection endocrine glands such as the thyroid are aware of the amount of hormones and other chemicals they need to produce. These **(4)** _____ are then distributed throughout the body by way of the cardiovascular system. The cardiovascular and nervous systems are also utilized by the lymphatic system. A collection of lymph nodes and vessels that help regulate the body's defenses.

	A	B	C	D
1.	center	hub	middle	midst
2.	conditions	surroundings	environment	place
3.	progresses	advances	procedure	processes
4.	chemicals	substances	drugs	compounds

14. *According the video, choose the correct answer (A-C) for the following questions.*

1. What is the function of the skeletal system?

a. To hold the body together, give it shape and protect its organs and tissues.
b. To deliver oxygen, give the body shape and protect its organs and tissues.
c. To regulate the body's processes and to protect its organs and tissues.

2. What does the cardiovascular system deliver?

a. It delivers hormones and other chemicals.
b. It delivers nutrients to the brain.
c. It delivers oxygen, white blood cells, hormones and nutrients.

15. *Watch the video again. Match the words and their definitions.*

1. to expel	**a)** a material such as coal, gas, or oil that is burned to produce heat or power.
2. to exhale	**b)** (in a female mammal) either of a pair of tubes along which eggs travel from the ovaries to the uterus.
3. approximately	**c)** to breathe out.
4. fuel	**d)** a channel with the male reproductive cell or gamete.
5. uterus	**e)** to force out (something), especially from the body.
6. fallopian tube	**f)** a process by which male and female gametes are fused together, initiating the development of a new organism.
7. sperm channel	**g)** an organ in the body of a woman or other female mammal in which a baby develops before birth.
8. fertilization	**h)** used to show that something is almost, but not completely, accurate or exact.

16. *Use the words from the box to complete the sentences.*

fuel **uterus** **fertilization** **sperm channel** **approximately**

Can also come in the form of food? The digestive system is an _____ 30 foot series of organs that convert food into _____. Food enters the system through the mouth then moves into the esophagus the stomach and the intestines. Nutrients are absorbed into the body while solid waste is expelled through the anal canal the end of the digestive tract.

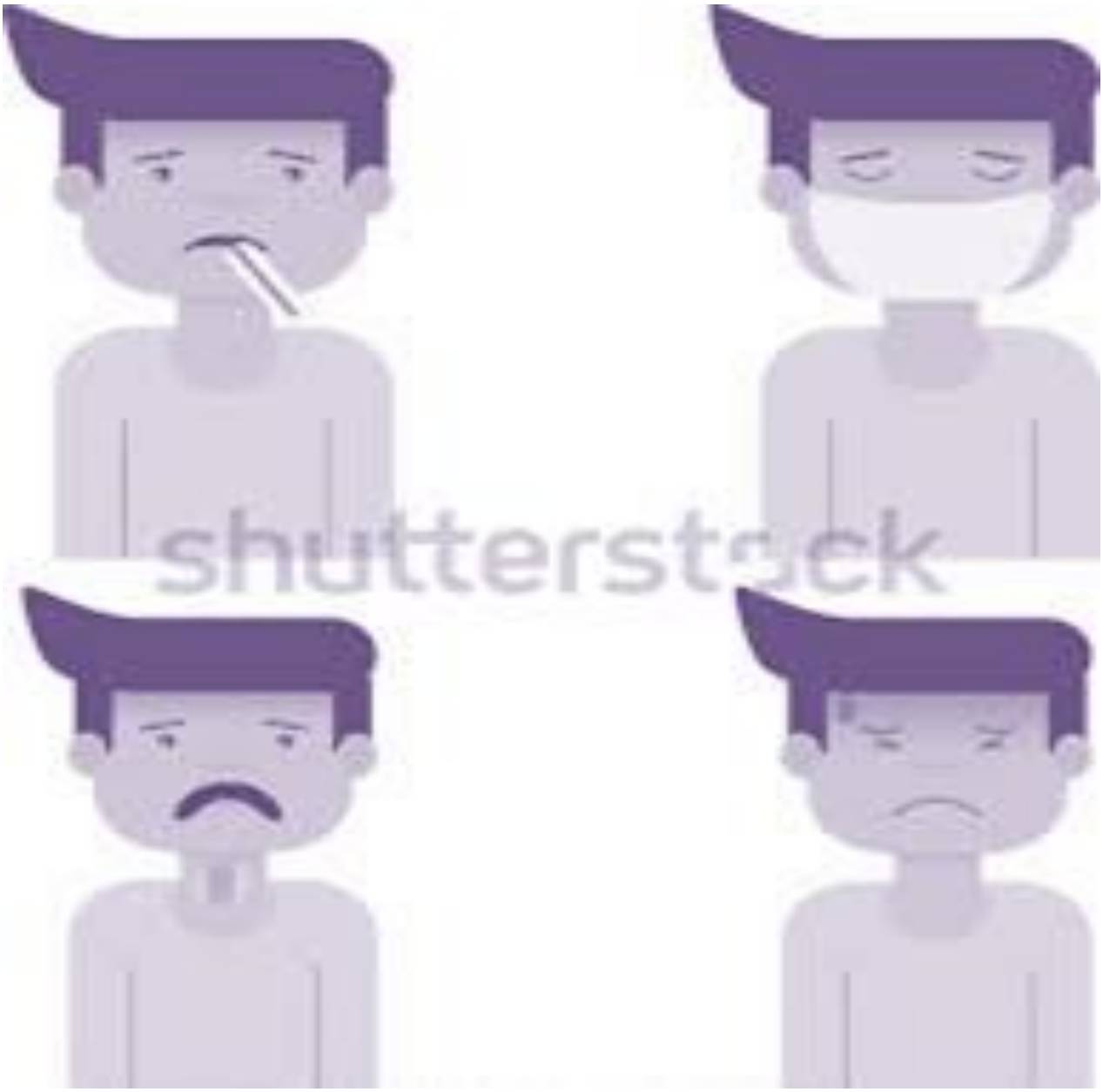
No matter the roll size or shape of any of the body systems each began with a reproductive system. This system is responsible for creating life. The primary organs involved differ between the sexes with ovaries, fallopian tubes, the _____ and vagina found in women and testes and a _____ found in men together. _____ may occur organ systems form and then a child is born.

17. *According to the DVD, are the statements true or false?*

1. The human body is a complex network of cells, tissues and organs, that together make life possible.	V
2. The urinary or renal system maintains the body's electrolyte levels and filters wastes from the urine.	
3. The lungs extract oxygen for the body to use and then expel a carbon dioxide by product when we exhale energy.	
4. When our eight major organ systems are healthy, they ensure our well-being.	

Unit 4

Vocabulary	**Names of diseases**
Reading	**Tetanus in the UK: symptoms, treatment and vaccination**
Watching DVD	**Why is meningitis so dangerous?**



Vocabulary

1. *Give the transcription of the words below.*

diphtheria	……..	physical disease	……
acute disease	……..…	gastric ulcer	……
schizophrenia	……....	Down syndrome	……
gout	……..	scorbutus	……
hives	……..	Ebola virus	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ræˈkaɪtɪs]	.....	**[ˌdʌɪəˈrɪə]**	.....
[dʌɪəˈbiːtiːz]	.....	**[kənˈteɪdʒəs dɪˈziːz]**	.....
[tjʊˌbəːkjʊˈləʊsɪs]	.....	**[ˈtʌɪfəs]**	.....
[ˌnjʊəˈrəʊsɪs]	.....	**[pleɪg]**	.....
[njuːˈməʊnɪə]	.....	**[ɪˈskiːmɪə]**	.....

3. *Match the words and their definitions.*

1. whooping cough	**a)** a disease that is present at birth.
2. mental disease	**b)** an infectious disease that begins with fever and headache and proceeds to an eruption of the skin that leaves pockmarks.
3. morbilli	**c)** a chronic disease of the liver marked by degeneration of cells, inflammation, and fibrous thickening of tissue.
4. congenital disease	**d)** a chronic, inflammatory, variable autoimmune disease of connective tissue that occurs chiefly in women and is typically characterized by fever, skin rash, fatigue, and joint pain and often by disorders of the blood, kidneys, heart, lungs, and brain.
5. smallpox	**e)** any of various psychiatric conditions, usually characterized by impairment of an individual's normal cognitive, emotional, or behavioral functioning and caused by physiological or psychosocial factors.
6. jaundice	**f)** a disease caused by an abnormality in an individual's genome.
7. cirrhosis	**g)** a contagious bacterial disease chiefly affecting children, characterized by convulsive coughs followed by a whoop.
8. inherited disease	**h)** a disease causing painful inflammation and stiffness of the joints.
9. systemic lupus erythematosus	**i)** an infectious viral disease causing fever and a red rash, typically occurring in childhood.
10. rheumatoid arthritis	**j)** a yellow discoloration of the skin, whites of the eyes, etc., due to an increase of bile pigments in the blood.

4. *Read the sentences. Give the definitions of the words in bold.*

1. In the developing world, 15% of **cancers** are caused by infections such as *Helicobacter pylori*, hepatitis B, hepatitis C, human papillomavirus infection, Epstein–Barr virus and human immunodeficiency virus (HIV). **2.** Studies have shown that more that 50 per cent of children and women of childbearing age suffer from iron-deficiency anaemia and iodine-**deficiency diseases**. **3. Malaria,** transmitted by the bite of mosquitoes, is caused in humans by five species of single-cell eukaryotic parasites which grow and multiply first in the liver cells and then exponentially in the red blood cells. **4.** Many people with **amblyopia,** especially those who only have a mild form, are not aware they have the condition until tested at older ages, since the vision in their stronger eye is normal. **5. Rubella** which causes a mild fever isn't the same as measles, but the two illnesses share some symptoms, including the red rash. **6. Nyctalopia,** also called night-blindness, is a condition making it difficult or impossible to see in relatively low light. **7.** There is a vaccine for **mumps** which is given on or after a child's first birthday and is usually given with measles and rubella vaccine in a combination vaccine known as MMR vaccine. **8**. **AIDS** was first recognized by the United States Centers for Disease Control and Prevention (CDC) in 1981 and its cause – HIV infection – was identified in the early part of the decade. **9.** If you or your child has been around someone who has bacterial **meningitis,** ask your doctor what steps you should take to avoid catching it. **10**. After decreasing dramatically with the availability of penicillin in the 1940s, rates of **siphilis** infection have increased since the turn of the millennium in many countries, often in combination with human immunodeficiency virus (HIV).

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. infectious disease	a disorder caused by organisms such as bacteria, viruses, mammals or parasites.
2. pertussis	a contagious bacterial disease chiefly affecting children, characterized by convulsive asthma followed by a whoop.
3. heart failure	a condition in which the heart can't pump enough saliva to meet the body's needs.
4. hemophilia	a medical condition in which the ability of the mucus to clot is severely reduced, causing the sufferer to bleed severely from even a slight injury.
5. rabies	a contagious and fatal viral disease of ants and other mammals, transmissible through the saliva to humans and causing madness, convulsions and death.

Reading

6. *Before you read the article, discuss these questions.*

1. What dangerous infectious diseases are common in your country?
2. Is there a vaccination against them?
3. What infectious diseases are vaccinated in your country? At what age?

7. *Match meanings 1-9 with the words in bold in the text.*

1. ……	a wound made by a bullet from a gun.
2. ……	the unwanted pollution of something by another substance.
3. ……	(of a disease) originating in a hospital.
4. ……	a poison which acts on the nervous system.
5. ……	(of a seed or spore) begin to grow and put out shoots after a period of dormancy.
6. ……	the removal of damaged tissue or foreign objects from a wound.
7. ……	a rod-shaped bacterium .
8. ……	an escape of blood from a ruptured blood vessel.
9. ……	an extra administration of a vaccine after an earlier (prime) dose.

8. *Match the abbreviations mentioned in the article with their interpretations and definitions.*

1. GBD	**a)** Public Health Engineer
2. GABA (A)	**b)** Global Burden of Disease Study.
3. PHE	**c)** gamma-aminobutyric acid.

I. a professional who detects, controls and interprets the results of lab researches regarding sewage, water samples and industrial wastes. _____

II. a neurotransmitter that sends chemical messages through the brain and the nervous system. _____

III. a comprehensive regional and global research program of disease burden that assesses mortality and disability from major diseases, injuries, and risk factors. _____

TETANUS IN THE UK: SYMPTOMS, TREATMENT AND VACCINATION

Although most people in the UK will be vaccinated against tetanus as a child, immunity does not always persist into adulthood. It is important that pharmacists can recognise the symptoms and know the treatments available for this disease.

Tetanus is caused by a **neurotoxin** produced by the bacterium *Clostridium tetani*. The disease is characterised by **(1)** _____, including generalised muscle spasms. Although it is now rare in the developed world, tetanus can be fatal without appropriate and timely access to medical care.

Estimates from the *Global Burden of Disease Study*, published in 2015, suggest that more than 56,000 deaths worldwide were tetanus-related in 2015, of which 79% occurred in sub-Saharan Africa and south Asia. In the UK, since the introduction of the national tetanus immunisation programme in 1961, the number of cases has significantly reduced. Between 2001 and 2018, 118 cases and 13 deaths were reported in England and Wales.

Tetanus can affect people of all ages; however, the highest incidence in the UK is in adults aged over 64 years because they are more likely to be inadequately vaccinated. Newborn babies and **(2)** _____, as well as people who inject drugs, are also at a higher risk of tetanus.

Clostridium tetani is a Gram-positive, spore-forming **bacillus** commonly found in soil and the faeces of animals, such as horses and cows. Human infection occurs through direct **contamination** of a wound with these spores; tetanus is not spread from person to person. Common ways in which tetanus is acquired include: burns with systemic sepsis; certain animal bites and scratches (if the animal lives in an agricultural setting); compound fractures; contaminated surgery (use of non-sterile instruments / material); cuts with / without foreign objects; eye injuries; **gunshot wounds**; injecting contaminated drugs; piercings; puncture wounds acquired in a contaminated environment (e.g. gardening injuries).

(3) _____ is between 3 and 21 days. Under favourable anaerobic conditions, the spores **germinate** into toxin-producing tetanus bacilli. The potent neurotoxin is transported via the blood and the lymphatic system to the spinal cord and brainstem, where it enters inhibitory interneurons within the host. It then binds to membrane proteins within the neurons and disrupts the release of inhibitory neurotransmitters in the central nervous system that normally modulate anterior horn cells and muscle contraction. This results in increased muscle tone, contractions, painful spasms and autonomic instability. Tetanus usually lasts four to six weeks.

The diagnosis of tetanus includes the presence of clinical symptoms, a history of recent events (e.g. recent cut or wound that may have introduced tetanus spores) and differential diagnosis. Tetanus is more likely if there is dirt or something inside the wound and if the patient has not been fully vaccinated. To prevent the development of tetanus, all contaminated wounds should be thoroughly cleaned and, if required, surgical debridement of dead, damaged or infected tissue should be arranged. Alongside wound cleaning and **debridement,** treatment with antimicrobials should be considered.

Traditionally, benzylpenicillin was used (0.6–1.2g four times daily), however, owing to

concerns around penicillin being a competitive inhibitor of the GABA (A) receptor, and potentially increasing muscle rigidity, its use has now decreased. Therefore, metronidazole 500 mg intravenous (IV) three times daily is now the antimicrobial of choice – it has a better safety profile and has shown a reduction in mortality when compared with benzylpenicillin. Suggested treatment durations range from 7–14 days. It is always important **(4)** _____ prescribing antimicrobials.

Generally, severe cases of tetanus require admission to critical care for long periods of time (up three to five weeks). As a result, these patients are at a higher risk of developing **nosocomial** infections, ventilator-associated pneumonia and gastrointestinal **haemorrhage.** The lack of immobility over several weeks also increases their risk of developing a thrombosis, meaning patients must also receive appropriate thromboprophylaxis.

Tetanus can be prevented through active immunisation with tetanus vaccine. In the UK, PHE recommends a total of five doses of the vaccine (which is only available in the UK as a combined product). It is important to note that people **(5)** _____ and can be infected again, therefore, they must also be immunised.

It is recommended that children receive the vaccine at two, three and four months of age. This primary course is followed by two **booster doses** at 3 years 4 months old and 14 years old. For adults, the primary course consists of three doses, each one month apart, with the first booster administered five years after the primary course and the second booster administered ten years after the first booster. If the primary course is interrupted, it is recommended to continue with the remaining doses, ensuring there is one month between each dose.

Although extremely rare, anaphylaxis can occur as a side effect of the vaccination. Localised redness and swelling occur in more than one in ten patients, with symptoms eventually resolving.

By Sandeep Rai, Preet Panesar
https://www.pharmaceutical-journal.com/

9. *Read the article and complete the text with the following parts of the sentences.*

A to confirm patients' allergy status before
B mothers who have not been vaccinated
C The average incubation period of the disease
D who recover from tetanus do not have natural immunity
E muscle contractions of the jaw and neck

10. *Answer the following questions.*

1. When will most people in the UK be vaccinated against tetanus?
2. How many deaths worldwide were tetanus-related in 2015?
3. People of what age can tetanus affect?
4. What are the common ways in which tetanus is acquired?
5. How many weeks does tetanus last?

6. How to prevent the development of tetanus?
7. How many doses of tetanus vaccine are recommended in the UK?
8. What is the primary vaccination course for adults in the UK?
9. What is recommended if the primary course was interrupted?
10. What are the side effects of vaccination?

11. *Decide whether each statement is true or false.*

1. It is important that pharmacists can recognise the symptoms and know the treatments available for tetanus.	✚
2. Although it is now frequent in the developed world, tetanus can be fatal without appropriate and timely access to medical care.	
3. Between 2001 and 2018, 118 cases and 13 deaths were reported in England and Wales.	
4. *Clostridium tetani* is a Gram-negative, spore-forming bacillus commonly found in air and the faeces of animals, such as horses and cows.	
5. The potent neurotoxin is transported via the blood and the lymphatic system to the spinal cord and brainstem, where it enters inhibitory interneurons within the host.	

12. *Fill in the gaps with the words in bold from the text .*

1. Mr. Othman received a _____ to the left shoulder, but his condition is stable. **2.** A _____ may be internal or external, and usually involves a lot of bleeding in a short time. **3**. An environmental _____may be chemical in nature, though it may also be a biological (pathogenic bacteria, virus, invasive species) or physical (energy) agent. **4.** Common examples of _____ include lead, ethanol (drinking alcohol), glutamate, nitric oxide, botulinum toxin (e.g. Botox), tetanus toxin, and tetrodotoxin. **5.** Some plants produce varying numbers of seeds that lack embryos; these are empty seeds which never _____. **6**. The cell wall of _____ is a structure on the outside of the cell that forms the second barrier between the bacterium and the environment, and at the same time maintains the rod shape. **7**. _____ is an important part of the healing process for burns and other serious wounds; it is also used for treating some kinds of snake and spider bites. **8.** After initial immunization, a booster injection or _____ is intended to increase immunity against that antigen back to protective levels.

Watching DVD

13. *Watch the video (https://www.youtube.com/watch?v=IaQdv_dBDqM). Match the words and their definitions.*

1. Hajj pilgrimage	**a)** a process by which the body's immune system malfunctions.
2. outbreak	**b)** a thick liquid that is produced in some parts of your body.
3. inflammation	**c)** a watery liquid that forms in your mouth and helps you to chew and digest.
4. mucus	**d)** an abnormal enlargement of a part of the body, typically as a result of an accumulation of fluid.
5. saliva	**e)** an annual Islamic journey to Mecca, Saudi Arabia, the holiest city for Muslims.
6. swelling	**f)** completely; right.
7. sheer	**g)** having bacteria in the bloodstream that cause sepsis.
8. septicemia	**h)** a time when something suddenly begins, especially a disease or something else dangerous.

14. *Use the words from the box to complete the sentences.*

outbreak	**disease**	**Hajj pilgrimage**	**sheer**	**inflammation**

In 1987, tens of thousands of people gathered in Saudi Arabia for the annual _____. But what started out as a celebration led to a health crisis: just a few days after the pilgrimage, more that 2 000 cases of meningitis broke out spreading across Saudi Arabia and the rest of the world. The _____ was so fierce that it was believed to have sparked a wave of deadly meningitis epidemics that ultimately infected tens of thousands of people worldwide.

Meningitis is the _____ of the meninges, three tissue layers responsible for protecting the brain and spinal cord. What makes meningitis so dangerous compared to other diseases is the _____ speed with which it invades a person's body. In the worst cases, it causes death within a day. Fortunately, that's rare for patients who receive early medical treatment. The _____ primarily comes in three forms: fungal, viral, and bacterial – the last being the most deadly by far, and what we'll focus on.

15. *According to the DVD, are the statements true or false?*

1. People usually contract bacterial meningitis by breathing in tiny particles of mucus and saliva.	V
2. Some people can be infected and carry the disease with showing symptoms.	
3. Inside the brain, the bacteria swiftly infect the meninges.	
4. Swelling in the brain disrupts its normal function – causing symptoms like inflammation and extreme light sensitivity.	
5. A lot of hours in, the rapidly multiplying bacteria start to release toxins**.**	
6. At the same time, the toxins burn through oxygen in the blood, reducing the amount that gets to major organs like the lungs and kidneys.	

16. *Watch the DVD again. Choose from (A-D) the one that best fits each space (1-4).*

That all sounds scary, but doctors are so good at **(1)** _____ meningitis that a visit to the hospital can drastically reduce an adult's risk of dying from it. The longer it's left untreated, though, the more likely it will lead to lasting **(2)** _____. If declining oxygen levels cause cell death in extreme parts of the body like fingers, toes, arms and legs – the risk of amputation goes up. And if bacterial toxins accumulate in the **(3)** _____ and trigger cell death, meningitis could also cause long-term brain damage and memory loss. So fast treatment, or better yet, prevention, is critical.

That's why most countries have vaccines that defend against the disease in its deadliest forms. Those are usually given to the people who are most at risk-like young children, people with weak immune systems, or people who gather in large groups where an **(4)** _____ of meningitis could potentially happen. In addition to those gatherings, meningitis is most common in a region called the meningitis belt that stretches across Africa, though cases do happen all over the world. If you're concerned that you or someone you know may have meningitis, get to the doctor as soon as possible; quick action could save your life.

	A	B	C	D
1.	healing	treating	curing	mending
2.	damage	harm	hurt	injury
3.	head	marrow	brain	cerebrum
4.	start	beginning	outburst	outbreak

Unit 5

Vocabulary	**Names of pain symptoms**
Reading	**Gut microbes may play a role in mental health disorders**
Watching DVD	**The surprising cause of stomach ulcers**

Vocabulary

1. *Give the transcription of the words below.*

paleness	……..	fracture	……
gnawing pain	……..…	eruption	……
malaise	……....	acute pain	……
dyspnea	……..	tumor	……
ulcer	……..	sneeze	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ɪnˈsɒmnɪə]	.....	**[ˌdiːhʌɪˈdreɪʃ(ə)n]**	.....
[dɪsˈtʃɑːdʒ]	.....	**[swɛtɪŋ]**	.....
[sɔːθrəʊt]	.....	**[ˈnʌmnəs]**	.....
[aŋˈzʌɪəti]	.....	**[eɪk]**	.....
[ˈhɑːtbəːn]	.....	**[sʌɪn]**	.....

3. *Match the words and their definitions.*

1. stabbing pain	**a)** a state of physical or mental weariness; lack of energy.
2. somnolence	**b)** a localized physical condition in which part of the body becomes reddened, swollen, hot, and often painful, especially as a reaction to injury or infection.
3. stuffy nose	**c)** a condition in which the kidneys stop working and are not able to remove waste and extra water from the blood or keep body chemicals in balance.
4. lassitude	**d)** the condition of feeling sick and the feeling that you are going to vomit.
5. inflammation	**e)** a pain or sensation sharp and sudden.
6. renal failure	**f)** an abnormal enlargement of a part of the body, typically as a result of an accumulation of fluid.
7. colicky pain	**g)** the blockage of the nasal passages usually as a result of inflammation from a common cold virus infection.
8. nausea	**h)** a condition in which there is difficulty in emptying the bowels, usually associated with hardened faeces.
9. swelling	**i)** a sudden strong pain caused by a muscle suddenly contracting.
10. constipation	**j)** a state of strong desire for sleep, or sleeping for unusually long periods.

4. *Read the sentences. Give the definitions of the words in bold.*

1. During a **heart attack**, the blood supply that normally nourishes the heart with oxygen is cut off and the heart muscle begins to die. **2.** Many conditions cause **dizziness** because multiple parts of the body are required for maintaining balance including the inner ear, eyes, muscles, skeleton, and the nervous system. **3. Bleeding**, also known as a hemorrhage, or simply blood loss, is blood escaping from the circulatory system from damaged blood vessels. **4.** If you have an infection you may see the color of your **sputum** getting darker with either a yellow or green tinge. **5.** The feeling that one is about to vomit is called nausea; it often precedes, but does not always lead to **vomiting**. **6.** Sure, glass skin sounds ideal, but the truth of the matter is that the majority of us are dealing with some degree of facial **redness** and sensitivity. **7. Lethargy** may be a side-effect of medication or caused by an interaction between medications or medications and alcohol. **8**. **Palpitation** can be associated with anxiety and does not necessarily indicate a structural or functional abnormality of the heart. **9.** Hives, also known as urticaria, is a kind of skin **rash** with red, raised, itchy bumps. **10**. Physical **fatigue**, or muscle fatigue, is the temporary physical inability of muscles to perform optimally. **11**. I tried this drug on my children who have both been off school with **hacking** and high temperatures. **12**. While **shortness of breath** is generally caused by disorders of the cardiac or respiratory system, other systems such as neurological, musculoskeletal, endocrine, hematologic, and psychiatric may be the cause. **13**. Around 40% of people who experience skeletal cramps are likely to endure extreme muscle pain, and may be unable to use the entire limb. **14.** In medicine, the distinction between acute and **chronic pain** is sometimes determined by the amount of time since onset.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. symptom	a physical or mental future which is regarded as indicating a condition of disease.
2. pain	a highly pleasant physical sensation caused by illness or injury.
3. prostration	an extreme physical week or emotional exhaustion.
4. fever	an abnormally low body temperature, usually accompanied by shivering, headache.
5. throbbing pain	a pain found in mental caries, headache and localized inflammation.
6. burning pain	a pain caused by damage or function in the nervous system.
7. cramping pain	a sudden strong pain caused by a heart suddenly contracting.
8. runny nose	a condition of discharge of sputum from the nose.

Reading

6. *Before you read the article, discuss these questions.*

1. What do you know about microbes in our stomach?
2. Do you think that gut microbes can be linked to neurological conditions?

7. *Read the article and complete the gaps into the text (1-6) with the following parts of the sentences (A-F).*

a. there are various other factors, such as stress, that could prompt mice to behave.
b. patients with depression had lower levels of *Coprococcus* and *Dialister* bacteria.
c. potential therapeutic targets for mental health disorders.
d. the patients' improved mental state was thanks to minocycline tamping down inflammation in the brain.
e. mice receiving transplants from schizophrenia patients.
f. who recently finished running a human clinical trial.

8. *Match meanings 1-8 with the words in bold in the text.*

1. ……	an extremely plentiful or oversufficient quantity.
2. ……	a serious mental disorder characterized by a loss of contact with reality.
3. ……	a warning of a specific limitation of something such as information.
4. ……	a class of individuals having some common characteristics or qualities.
5. ……	a chemical messenger that carries, boosts, and balances signals between neurons, or nerve cells, and other cells in the body.
6. ……	a tetracycline antibiotic used to treat a number of bacterial infections such as pneumonia.
7. ……	a community of microorganisms (such as bacteria, fungi, and viruses) that inhabit a particular environment.
8. ……	the elongated ridges on the floor of each lateral ventricle of the brain, thought to be the centre of emotion, memory, and the autonomic nervous system.

GUT MICROBES MAY PLAY A ROLE IN MENTAL HEALTH DISORDERS

The gut **microbiome** has been linked to depression, schizophrenia, and other neurological conditions, but it's not yet clear whether the relationship is causal.

Years ago, when a family member was diagnosed with schizophrenia, University of Florida physiologist Bruce Stevens began scouring mental health research for effective treatments. One study in particular caught his attention and ultimately changed the trajectory of his own research.

In the study, schizophrenia patients had been treated for an infection with the antibiotic **minocycline**, and their **psychosis** had cleared up. The study authors suggested that **(1)** _____. But Stevens had a different idea. He wondered whether the antibiotic was "somehow knocking down bad bacteria" in the gut that might influence the patients' psychosis. If so, gut bacteria might not only play a role in schizophrenia, Bruce Stevens supposed, but also in other mental health disorders, including anxiety and depression.

"If you would have asked a neuroscientist 10 years ago whether they thought the gut microbiota could be linked to depression, many of them would have said you were crazy," says Jeroen Raes, a systems biologist and microbiologist at KU Leuven in Belgium. Yet evidence from small studies of humans and decades of animal model research have begun to show a link between the gut microbiome and mental health, making Bruce Stevens's idea seem less so far-fetched, and opening the floodgates for researchers to attempt to identify the specific microbes that may influence the brain.

In a study published in February 2019, for example, Jeroen Raes and colleagues found that, compared with healthy controls, **(2)** _____ – even after taking into account patients' use of antidepressants. Later that month, a separate team reported that the **abundance** of several types of bacteria, including *Veillonellaceae* and *Lachnospiraceae*, correlated with schizophrenia severity, and that the presence of a panel of specific microbes enabled the researchers to differentiate individuals with schizophrenia from healthy subjects more often than not.

With these kinds of studies, "what we want to get to is a place where we actually have biomarkers that are informative to treatment or prognosis," Jane Foster, a neuroscientist at McMaster University in Ontario, tells *The Scientist*. Unlike in cancer or other conditions, for which doctors can do blood tests or test tissues to develop a plan of care for patients, "we don't have those abilities in mental health," she notes. "So these proxies for individual differences [in the gut microbiota] are actually where this area of research is going to have the biggest impact."

Researchers are also interested in understanding the mechanisms by which the microbiome might be driving the mental health disorders it appears to be associated with. In the schizophrenia study, for example, researchers transplanted stool samples from some of the 130 or so people who took part into germ-free mice and then monitored the mice's behavior and brain levels of **neurotransmitters**. **(3)** _____ were more hyperactive in open spaces and exerted more effort during a swim test than the mice receiving stool transplants from the healthy subjects. The two groups of mice also had different levels of glutamate, glutamine, and GABA in their **hippocampi.** All of these amino acids are neurotransmitters essential for

brain function, and their levels in the brains of the mice receiving transplants from people with schizophrenia reflect the chemical patterns observed in the patients, says study coauthor Julio Licinio, a psychiatrist at SUNY Upstate Medical University in Syracuse. The results suggest that the microbiome could drive changes in the brain that lead to changes in behavior, he adds.

"But mice aren't men," Jeroen Raes says, and **(4)** _____ in similar ways to humans with mental health disorders without the need for similar brain chemistry. Jeroen Raes and his colleagues' recent study took a different approach to the problem by using a large human dataset to look for microbiome differences between healthy and depressed individuals. In the analysis, the team first compared the gut microbiota of 1,054 individuals and identified depletion of *Coprococcus* and *Dialister* as possible drivers of depression. The team then used a separate cohort of 1,070 individuals to validate the results and found a "strong associative signal" between the abundance of these gut microbes and quality of life based on patient surveys.

Jeroen Raes and colleagues also used a computational framework to analyze whether certain gut bacteria could produce or break down neuroactive compounds in the gut. The genomes of *Coprococcus* **species**, for example, contain DNA sequences capable of generating DOPAC, a metabolite of the neurotransmitter dopamine, which is associated with depression when depleted. The results still don't demonstrate that lower levels of *Coprococcus* and *Dialister* cause depression, and have yet be validated in mice, Jeroen Raes concedes. But the findings offer some direction in terms of where to look for possible mechanistic pathways and, in the process, **(5)** _____.

Challenges remain, however. Jane Foster notes that there's currently a problem with standardization of the tools researchers use to analyze their data and pinpoint specific bacteria underlying health issues. One tool, for instance, might show that one specific bacterium could drive anxiety or depression, while another tool might indicate a totally different set of species. And when it comes to actually capitalizing on this knowledge for therapeutic purposes, Bruce Stevens raises another **caveat**.

"Microbiology is not simple, because it involves ecologies," says Bruce Stevens, **(6)** _____ to identify gut bacteria species that may affect mental health. "You can't take down one bacterium without taking down the whole nest, so translation to treatment is going to be tough. A single species won't do it."

By Ashley Yeager
https://www.the-scientist.com/

9. *Answer the following questions.*

1. What has the gut microbiome been linked to?
2. When did Bruce Stevens begin scouring mental health research for effective treatments?
3. What kinds of disorders might gut bacteria play a role in?
4. What information sounded crazy 10 years ago?

5. What kind of animals are used in the schizophrenia study?

6. Depletion of what types of bacteria were identified as possible drivers of depression?

7. Is there a problem with standardization of the tools researchers use?

8. Did Bruce Stevens finish running a human clinical trial?

10. *Decide whether each statement is true or false.*

1.	Schizophrenia patients had been treated for an infection with the antibiotic minocycline, and their psychosis had cleared up.	✚
2.	Yet evidence from small studies of mice and decades of animal model research have begun to show a link between the gut microbiome and mental health.	
3.	A separate team of scientists reported that the abundance of several types of bacteria, including *Veillonellaceae* and *Lachnospiraceae*, correlated with schizophrenia severity.	
4.	In the schizophrenia study, for example, researchers transplanted sputum samples from some of the 130 or so people	
5.	The results suggest that the microbiome could drive changes in the brain that lead to changes in behavior.	

11. *Match the abbreviations mentioned in the article with their interpretations and definitions.*

1. DNA	**a)** 3,4 Dihydroxyphenylacetic acid
2. GABA	**b)** Deoxyribonucleic acid.
3. DOPAC	**c)** Gamma-aminobutyric acid.

I. a metabolite of the neurotransmitter dopamine. _____

II. a molecule encoding the genetic instructions for life. _____

III. a neurotransmitter that sends chemical messages through the brain and the nervous system. _____

12. *Match the bacteria mentioned in the article with their meanings.*

1. *Caprococcus*	**a)** a gram-negative parasitic strictly anaerobic bacteria that grows only in fresh sterile tissue or ascitic fluid.
2. *Dialister*	**b)** a group of normal bacterium in the intestines of mammals.
3. *Veillonellaceae*	c) a family of bacteria which are among the human gut microbiota.
4. *Lachnospiraceae*	**d)** a genus of anaerobic cocci which are all part of the human faecal flora, but rarely seen in human clinical specimens.

Watching DVD

13. *Watch the DVD (https://www.youtube.com/watch?v=V_U6czbDHLE). Put the actions below in the correct order.*

1. Nobel Prize for medicine. _____
2. Treatment of stomach ulcers in the 19th century. _____
3. Acid mafia vs Helicobacter pylory. _____
4. Doctor Barry Marshal decided to take a risk _____ *a* _____
5. Description of a stomach as human organ. _____
6. Newfound bacterium functions _____

14. *According to the video, match the words and their definitions.*

1. lining	**a)** a person who is responsible for a crime or other misdeed.
2. bloating	**b)** a protein that speeds up the rate of a chemical reaction in a living organism.
3. culprit = offender	**c)** a thick liquid that is produced in some parts of your body.
4. enzyme	**d)** a shape made up of curves.
5. mucus	**e)** a pathogen's or microbe's ability to infect or damage a host.
6. proponent	**f)** the swelling of a body or part of a body, usually because it has a lot of gas.
7. spiral-shaped	**g)** a person who puts forward a proposition or proposal.
8. virulence	**h)** a layer of different material covering the inside surface of something..

15. *Use the words from the box to complete the sentences.*

virulence bloating enzymes lining offender proponents

1. Too many of his patients were complaining of severe abdominal pain due to stomach ulcers, which are sores in the _____ of the upper intestinal tract. **2.** Soon, Dr. Marshall was experiencing the same abdominal pain, _____ and vomiting. **3.** The stomach is under constant attack by digestive _____, bile, proteins, microbes and the stomach's own acid. **4.** Fervent _____ of

this idea were referred to as the acid mafia. **5.** Dr. Marshall and Dr. Warren pinpointed a spiral-shaped bacteria called Helicobacter pylory, or H. pylory, as the real _____. **6.** H. pylori can make over 1 500 proteins, many of which are dedicated to maximizing its _____.

16. *Watch the DVD again, are the statements true or false?*

1. Desperate for answers, Dr. Marshall swallowed a cloudy broth of bacteria collected from the stomach of one of his patients.	V
2. Marshall's stomach was teeming with the same bacteria as his enemy.	
3. In 2015, Dr. Robin Warren received the ultimate validation when he was awarded the Nobel Prize for medicine.	
4. Our stomachs are J-shaped organs with surprisingly intricate ecosystems awash in hormones and chemicals.	
5. Since the mid-1800s, doctors thought not only the stress caused most stomach ulcers.	
6. In particular, certain pain medications used to reduce inflammation in joints have been discovered to work with H.pylori to create more severe stomach ulcers.	

17. *According to the DVD, choose from (A-D) the one that best fits each space (1-4).*

By the mid-20th century, it was widely accepted that excess hydrochloric acid prompted the stomach to **(1)** _____ itself. Fervent proponents of this idea were referred to as the acid mafia. The biggest **(2)** _____ in this theory was that antiacids only provide temporary relief. We now know that some rare ulcers are indeed caused by too much hydrochloric acid. But they make up less than 1% of all **(3)** _____. Dr. Marshall and Dr. Warren pinpointed a spiral-shaped bacteria called Helicobacter pylory, or H. pylory, as the real offender. H. pylory is one of humanity's oldest and most frequent companions, having joined us at least 50 000 years ago, and now **(4)** _____ in 50% of people. Previously, we thought the stomach was sterile on **(5)** _____ of it being such an acidic, hostile environment.

	A	B	C	D
1.	put	treat	cut	eat
2.	hole	role	pole	mall
3.	cashiers	cases	causes	clouds
4.	fond	find	found	fund
5.	account	accountant	aconite	accountancy

Unit 6

Vocabulary	**Names of plant parts**
Reading	**Plants without plastid genomes**
Watching DVD	**Photosynthesis**

Vocabulary

1. *Give the transcription of the words below.*

fungi	……..	blade	……
anther	……..…	monocotyledon	……
rhizome	……....	pollination	……
fertilize	……..	stamen	……
angiosperm	……..	plant	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ʃuːt]	.....	**[ˈdʒɪmnə(ʊ)spəːm]**	.....
[flaʊəʳ]	.....	**[ˈfiːmeɪl]**	.....
[ˈfʌɪbrəs ruːt]	.....	**[stɔːk]**	.....
[ˈəʊv(ə)ri]	.....	**[ˈɛmbrɪəʊ]**	.....
[ˈlat(ə)r(ə)l bʌd]	.....	**[akˈsɪləri bʌd]**	.....

3. *Match the words and their definitions.*

1. carpel	**a)** a part of a tree which grows out from the trunk or from a bough.
2. absorption	**b)** one of the parts forming the outer part of a flower that surround the petals and are usually small and green.
3. receptacle	**c)** the unit of reproduction of a flowering plant, capable of developing into another such plant.
4. style	**d)** the process by which a substance takes in a liquid.
5. branch	**e)**. the sweet and fleshy product of a tree or other plant that contains seed and can be eaten as food.
6. sepal	**f)** a low, green plant that grows naturally over a lot of the earth's surface, having groups of very thin leaves that grow close together in large numbers.
7. seed	**g)** the stem to which the floral organs are attached.
8. fruit	**h)** a straight tapering root growing vertically downwards and forming the centre from which subsidiary rootlets spring.
9. grass	**i)** the female reproductive organ of a flower, consisting of an ovary, a stigma, and usually a style.
10. tap root	**j)** the middle part of the carpel (=female part) of a flower, connecting the ovary to the stigma.

4. *Read the sentences. Give the definitions of the words in bold.*

1. The total essential plant **nutrients** include seventeen different elements: carbon, oxygen and hydrogen which are absorbed from the air, whereas other nutrients including nitrogen are typically obtained from the soil. **2.** The dicotyledons, also known as **dicots** (or more rarely dicotyls), are one of the two groups into which all the flowering plants or angiosperms were formerly divided. **3.** Lateral buds and leaves grow out of the stem at intervals called nodes; the intervals on the stem between the nodes are called **internodes**. **4.** The **stigma**, together with the style and ovary comprises the pistil, which in turn is part of the female reproductive organ of a plant. **5.** The stigma receives **pollen** and it is on the stigma that the pollen grain germinates. **6.** Bathyphyll is a specialized leaf produced at the base of a plant, usually when the plant is immature, and which serves **to anchor** the plant to a substrate. **7.** The total number of **insects** species is estimated at between six and ten million; potentially over 90% of the animal life forms on Earth are insects. **8. Fertilization** in flowering plants, discovered by Ralph B. Strassburger in the year 1884, is a process of sexual reproduction in plants, which occurs after pollination and germination. **9.** As the main shoot develops from the **tuber**, the base of the shoot close to the tuber produces adventitious roots and lateral buds on the shoot. **10**. A **pedicle** is a stem that attaches a single flower to the inflorescence.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. alga	a simple, flowering, and typically aquatic plant of a large group that includes the seaweeds and many single-celled forms.
2. leaf	one of the flat, usually green parts of a plant that are joined at one end to the stem or ovary.
3. pistil	a male organs of a flower, comprising the stigma, style, and ovary.
4. filament	a long, thin structure that anchors the anther to the bottom of the root.
5. cell	a basic structural, functional, and biological unit of all known organisms.
6. bendable	capable of being flexed or twisted with breaking.
7. ovule	the part of the ovary of seed plants that contains the female germ cell and after fertilization becomes the flower.
8. fungus	any of a group of spore-producing organisms feeding on organic matter, including moulds, bacteria, mushrooms, and toadstools.

Reading

6. *Before you read the article, discuss these questions.*

1. What do you know about plastid genomes?
2. Do any plants have plastid genome or there are some plants without it?

7. *Read the article and complete the gaps into the text (1-6) with the following parts of the sentences (A-F).*

a. have come from the host vine, the researcher proposed.
b. looks and smells like rotting flesh .
c. want to completely sequence the nuclear genomes of their respective plants.
d.. to evolve the mechanisms whereby you can safely get rid of the chloroplast genome.
e. they retain a genome in their plastids.
f. to leave a back door open by indicating that plastid genome loss.

8. *Match meanings 1-8 with the words in bold in the text.*

1. ……	a deoxyribonucleic acid, a self-replicating material which is present in nearly all living organisms as the main constituent of chromosomes and is the carrier of genetic information.
2. ……	a dense organelle present in most eukaryotic cells, containing the genetic material.
3. ……	an actual or hypothetical organism or stock from which later kinds evolved.
4. ……..	a geological period that lasted from about 145 to 66 million years ago.
5. ……..	an organism's complete set of DNA, including all of its genes.
6. ……..	an organelle found in the cells of plants, green algae, red algae, and certain other protists.
7. ……..	although.
8. ……..	a part of certain molecules that contains iron.

PLANTS WITHOUT PLASTID GENOMES

Two independent teams point to different plants that may have lost their **plastid** genomes.

Plant cells photosynthesize using chloroplasts – small structures that were once free-living bacteria and retain their own **DNA**. Even when plants lose the ability to photosynthesize, **(1)** _____, and some scientists have argued that these genes are indispensible.

But two teams have now independently found the first examples of plants whose plastids seem to lack a **genome**, including a giant rot-scented flower and a group of single-celled algae. Neither case is iron-cast yet, but given the teams' intense searches, these plants' plastid genomes are either missing, well-hidden, or can be found only at very low levels.

Jeanmaire Molina from Long Island University and Michael Purugganan from New York University focused on *Rafflesia lagascae* – a Philippine parasite that does not photosynthesize, and lacks stems, roots, and leaves. The only sign of its existence is a huge red flower, which protrudes from its host vine and **(2)** _____.

R. lagascae still has plastid-like structures in its cells but, despite using a variety of methods, the team could not find any hints of an intact plastid genome. "It's hard to prove a negative, but we came up with controls to make sure we got it right," said M. Purugganan. They tried different methods for assembling fragments of sequenced DNA or identifying plastid genes. They easily found *R. lagascae*'s mitochondrial genome, which also derived from ancient bacteria. And they showed that in other plants, like *Arabidopsis thaliana*, non-photosynthetic tissues like roots still contain huge amounts of plastid DNA.

J. Molina and M. Purugganan did detect 46 small fragments of plastid DNA, but none of them amounted to full genes. Even if they were, these genes would have so many mutations that they would not be functional. These plastid DNA fragments remain a mystery, although a third of them may **(3)** _____.

Meanwhile, David Smith from the University of Western Ontario and Robert Lee from Dalhousie University found similar results in *Polytomella* – a genus of single-celled, colorless, freshwater algae. It too has a plastid but not a trace of a plastid genome. D. Smith and R. Lee also showed that while the alga's **nucleus** produces proteins that are used in its plastids, none of these are involved in expressing plastid genes – another sign that such genes do not exist.

If these plants have genuinely lost their plastid genomes, neither team knows why. "One possibility is that *Rafflesia* parasitism started in the mid-**Cretaceous**," said M. Purugganan. "It may be that it just took some time **(4)** _____." D. Smith and R. Lee suggested that *Polytomella* may be generally prone to gene loss in its organelles – its mitochondria have among the smallest genomes of any plant.

"These studies show that plastids can at least lose their genome given the right circumstances, which opens up the big question: Why do they have genomes at all?" said D. Smith. "We don't know the answer to that."

After all, non-photosynthetic plants, including parasites like *Rafflesia*, still retain plastid genomes, **albeit** heavily reduced ones. Even the malaria parasite *Plasmodium*, which descended from the same photosynthetic **ancestor** as plants, still clings onto its plastid genome.

Some scientists have argued that plastid genomes include essential genes with metabolic roles, such as making **heme**. But

Rafflesia and *Polytomella* suggest that such genes are either not vital or have been relocated. Both teams now **(5)** _____, to see if they contain the missing plastid genes. D. Smith said he hopes that other scientists will investigate these plants using microscopy and stains that bind to DNA. "The final verdict will come in when lots of people try lots of approaches," he said.

"Showing convincingly that something does not exist is always a challenge in science," said Kirsten Krause from The Arctic University of Norway, who has investigated plastid evolution but was not involved in the studies. "The authors of both publications were wise **(6)** _____ is a possible conclusion of their findings but not – not yet? – a new fact".

In an e-mail, she added, "I am, nevertheless, convinced that the publications will ignite a new wave of scientific dispute and, hopefully, of research in this field."

By Ed Yong
https://www.the-scientist.com/

9. *Answer the following questions.*

1. How do plants cells photosynthesize?
2. What have two teams independently found?
3. What did the *Rafflesia lagascae's* mitochondrial genome derive from?
4. Where did David Smith and Robert Lee find similar results?
5. When, according to M. Purugganan , *Rafflesia* parasitism start?
6. What big question does the study of D. Smith open?
7. What kind of parasite still clings onto plastid genome?
8. What is, according to Kirsten Krause, the main challenge in science?
9. What did Kristen Krause add in her e-mail?

10. *Decide whether each statement is true or false.*

1. Two independent teams point to different plants that may have lost their plastid genomes.	✚
2. *R. lagascae* still has plastid-like structures in its roots but, despite using a variety of methods, the team could not find any hints of an intact plastid genome.	
3. In other plants, like *Arabidopsis thaliana*, non-photosynthetic tissues like roots still contain huge amounts of plastid DNA.	
4. While the alga's nucleus produces proteins that are used in its plastids, none of these are involved in expressing plastid genes.	
5. These studies show that plastids can at least lose their genome given the right places.	

11. *Match the names of plants mentioned in the article with their definitions.*

1. ***Rafflesia lagascae***	**a)** a species of colorless green algae that lacks a cell wall and contains two linear mitochondrial units of DNA.
2. ***Arabidopsis thaliana***	**b)** a genus of holoparasitic plants endemic to Southeast Asia (the Philippine island of Luzon) that has lost the ability to undertake photosynthesis.
3. ***Polytomella***	**c)** a small flowering plant native to Eurasia and Africa, the first plant to have its genome sequenced, and is a popular tool for understanding the molecular biology of many plant traits.

12. *Fill in the gaps with the words in bold from the text .*

1. It is generally accepted that all multicellular animals have evolved from a common _____, which itself evolved from a single-celled organism. **2.** These are six famous women who, _____ unconsciously, gave us a classic of school literature. **3**. The _____ was a period with a relatively warm climate, resulting in high eustatic sea levels that created numerous shallow inland seas. **4.** The contents of the nucleus are held in the nucleoplasm similar to the cytoplasm in the rest of the cell. **5.** In the fields of molecular biology and genetics, a _____ is the genetic material of an organism. **6.** _____ is a molecule composed of two polynucleotide chains that coil around each other to form a double helix carrying genetic instructions for the development, functioning, growth and reproduction of all known organisms and many viruses. **7**. _____ are the site of manufacture and storage of important chemical compounds used by the cells of autotrophic eukaryotes. **8**. _____ are most commonly recognized as components of hemoglobin, the red pigment in blood, but are also found in a number of other biologically important hemoproteins such as myoglobin, cytochromes, catalases, heme peroxidase, and endothelial nitric oxide synthase.

Watching DVD

13. *Watch the DVD (https://www.youtube.com/watch?v=UPBMG5EYydo). Put the actions below in the correct order.*

1. The sap formation. _____
2. The role of plants on earth. _____
3. What is it chlorophyll. _____
4. Photosynthesis as a process _____ *a* _____
5. Plants at night _____

14. *According to the video, match the words and their definitions.*

1. chlorophyll	**a)** the fluid which circulates in the vascular system of a plant.
2. substance	**b)** an animal that feeds on plants.
3. stomata	**c)** the unwanted pollution of something by another substance.
4. sap	**d)** a matter which has a specific composition and specific properties.
5. herbivore	**e)** an animal that feeds on other animals.
6. carnivore	**f)** any of the minute pores in the epidermis of the leaf or stem of a plant.
7. contamination	**g)** a green pigment, present in all green plants and in cyanobacteria, which is responsible for the absorption of light to provide energy for photosynthesis.

15. *Use the words from the box to complete the sentences.*

sap carnivores chlorophyll contamination stomata herbivores substance

1. In order to perform photosynthesis they need various elements: sunlight, carbon dioxide, obtained from air and water, and _____ which is a green _____ that all plants have and is fundamental for performing photosynthesis since it could not happen without it. **2.** The leaves are full of tiny pores called _____ which absorb carbon dioxide that the air in the surrounding contains. All this containing water minerals and carbon dioxide is called raw _____. **3.** You already know that _____ eat

plants and _____ eat herbivores. **4.** Plants are the best solution to fight against _____, don't you think?

16. *Watch the DVD again, are the statements true or false?*

1. Photosynthesis is a process in which plants make their own food to be able to grow and develop.	V
2. By the way, chloroform is what gives all plants the green color.	
3. Water with minerals are transported up the stem, reaching the leaves.	
4. Chlorophyll in the leaves has all the necessary ingredients for photosynthesis to take place and, when it receives sunlight, the process begins by transforming the raw sap into elaborated sap.	
5. All plants feed from elaborated sap and they store it in their leaves.	
6. Plants are fundamental for the food chain and they are also fundamental for our respiration.	

17. *According to the DVD, choose from (A-D) the one that best fits each space (1-5).*

A curious **(1)** _____ you do know is that at night because plants don't have sunlight to photosynthesize they breathe like humans do, they take in **(2)** _____ and release carbon dioxide. Remember that. And one last thing, so you understand the importance of photosynthesis when **(3)** _____ absorb dirty and contaminated gases, they transform them into pure **(4)** _____, into oxygen and this way they clean the atmosphere and all nature. Plants are the best solution to **(5)** _____ against contamination, don't you think?

	A	B	C	D
1.	face	fact	factor	factory
2.	oxygen	hydrogen	oxy	oxyacid
3.	plant	path	plants	planta
4.	pair	ware	hair	air
5.	right	fight	night	sight

Unit 7

Vocabulary	**Names of medicinal herbs**
Reading	***Aloe Vera* (L.) Burm. F.** **as a potential anti-COVID-19 plant**
Watching DVD	**Garden time: Medicinal plants**

Vocabulary

1. *Give the transcription of the words below.*

yarrow	……..	ginger	……
aloe vera	……..….	panicle	……
coltsfoot	…….....	harvest	……
cyme	……..	inflorescence	……
decoction	……..	black elderberry	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ˈtʌts(ə)n]	.....	**[ˈdandılʌıən]**	.....
[ˌɛkɪˈneɪsɪə]	.....	**[ˈtɪŋ(k)tʃə]**	.....
[bʌɪˈɛnɪəl plɑːnt]	.....	**[məˈtʃʊə]**	.....
[ˈsɛləndʌɪm]	.....	**[ˈeɪmɛnt]**	.....
[ˈspeɪdɪks]	.....	**[tʌɪm]**	.....

3. *Match the words and their definitions.*

1. opium poppy	**a)** a bushy perennial Old World mint often cultivated for its fragrant lemon-flavored leaves and tops that have been used to make a diaphoretic tea.
2. capitulum	**b)** to become fully grown or developed.
3. powder	**c)** a plant that completes its entire life cycle in one year.
4. herb	**d)** fine, dry particles produced by the grinding, crushing, or disintegration of a solid substance.
5. lemon balm	**e)** a plant with bright yellow or orange flowers.
6. milk thistle	**f)** a dense flat cluster of small flowers or florets, as in plants of the daisy family.
7. to ripen	**g)** any seed-bearing plant which does not have a woody stem and dies down to the ground after flowering.
8. annual plant	**h)** an inflorescence consisting of a dense cluster of small, stalkless flowers.
9. marigold	**i)** a type of poppy in which opium and all refined opiates such as morphine, thebaine, codeine, papaverine and narcotine are naturally present.
10. head	**j)** a European plant with a solitary purple flower and glossy marbled leaves, naturalized in America and used in herbal medicine.

4. *Read the sentences. Give the definitions of the words in bold.*

1. *Digitalis* is a genus of about 20 species of herbaceous perennials, shrubs, and biennials commonly called **foxgloves**. **2. Peppermint** oil and leaves have a cooling effect when used topically for muscle pain, nerve pain, relief from itching. **3.** In botany, an **umbel** is an inflorescence that consists of a number of short flower stalks (called pedicels) which spread from a common point, somewhat like umbrella ribs. **4. Ointments** are used topically on a variety of body surfaces which include the skin and the mucous membranes of the eye, chest, vulva, anus, and nose. **5. Cannabis** has mental and physical effects, including euphoria, altered states of mind and sense of time, difficulty concentrating, impaired short-term memory, impaired body movement, relaxation, and an increase in appetite. **6.** Despite its use over centuries in traditional medicine and cosmetics, there is no high-quality clinical evidence that **lavender** has any effects on diseases or improves health. **7.** Flowers in a **corymb** structure can either be parallel, or alternate, and form in either a convex, or flat form. **8.** Oil isolated from **catnip** by steam distillation is a repellent against insects, in particular mosquitoes, cockroaches and termites. **9.** Although **ginseng** is commonly sold as a dietary supplement, inconsistent manufacturing practices for supplements have led to analyses showing that ginseng products may be contaminated with toxic metals, and its excessive use may have adverse effects or untoward interactions with prescription drugs.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. common nette	a herbaceous plant which has jagged leaves covered with biting hairs.
2. catkin	a slim, cylindrical flower cluster (a spike), with inconspicuous or no petals, usually insect-pollinated.
3. extract	a preparation containing the active ingredient of a compound in concentrated form.
4. essential oil	a natural oil typically obtained by oxidation and having the characteristic odour of the plant or other source from which it is extracted.
5. sage	an aromatic plant whose greyish-green leaves are used as a military herb, native to southern Europe and the Mediterranean.
6. perennial plant	a plant living for two years.
7. camomile	an aromatic European plant of the daisy family, with green and red flowers.
8. valerian	a plant with small white or pink flowers and a bark that is used in medicines.

Reading

6. *Before you read the article, discuss these questions.*

1. What do you know about medicinal properties of *Aloe Vera*?
2. What kind of diseases can be treated by *Aloe Vera* extracts?

7. *Read the article and complete the gaps into the text (1-6) with the following parts of the sentences (A-F).*

a. which has proved its worth around the world.
b. the antiviral activity of acemannan in cats.
c. a rich resource for novel antiviral drug development.
d. which is the main cause of mortality associated with COVID-19.
e. was responsible for an outbreak of acute pneumonia.
f. it is one of the most studied and used.

8. *Match meanings 1-11 with the words in bold in the text.*

1. ……	significant.
2. ……	an introduction of some medical treatment.
3. ……	a genetic variant or subtype of a microorganism
4. ……	a yellow crystalline solid used in the manufacture of dyes, which have excellent colour properties.
5. ……	a potential ability of individual, organizations or groups to be more successful or productive as a result of a merger.
6. ……	a mucopolysaccharide found in aloe vera leaves, with immunostimulant, antiviral, antineoplastic and gastrointestinal properties.
7. ……	a homeopathic drug.
8. ……	a harmlessness .
9. ……	a nicotinic acid.
10. ……	disputable, questionable.
11. ……	belonging to the family *Felidae*, including cats, lions etc.

ALOE VERA (L.) BURM.F. AS A POTENTIAL ANTI-COVID-19 PLANT

Coronavirus disease 2019 (or COVID-19) is an emerging infectious disease caused by a **strain** of coronavirus called SARS-CoV-2. Comparative genomic studies have shown that SARS-CoV-2 belongs to the Beta coronavirus family and is phylogenetically very similar to SARS-CoV-1 which **(1)** _____ that occurred in November 2002 in Guangdong Province, China. COVID-19 began in Wuhan in Hubei Province, People's Republic of China, in December 2019, and became a global pandemic, killing hundreds of thousands of people. Despite the biosafety and hygiene measures to limit the large-scale spread of this pandemic, there is currently no anti COVID-19 drug approved by the world health authority, the World Health Organization (WHO). Furthermore, the prospect of developing a new drug in the short to medium term is not feasible due to many constraints.

Some antivirals already used in the treatment of SARS-CoV and MERS-COV are recommended. These include Lopinavir and Ritonavir. Chloroquine, a known antimalarial drug used as an immunomodulant in other coronavirus infections, has been proposed but its use is still **controversial** in the scientific community. Therefore, an alternative solution to this major public health problem is urgently needed to save lives, and traditional medicine, **(2)** _____ when used against several diseases, remains one of the avenues that can be exploited to counter this pandemic.

The role of traditional medicine in the treatment of COVID-19 has recently been reported in the literature. Indeed, medicinal plants are an important source of molecules with various pharmacological properties including antiviral properties that can be used in the search for the solution against COVID-19. According to the World Health Organization, more than 80% of the population in Africa use Traditional Medicine to solve the primary health problem. Nevertheless, it is not unique to Africa or other developing countries where it is recognized as traditional medicine. It is also used in the so-called developed or industrialized countries where it is known as "complementary", "alternative", "unconventional" or "parallel" medicine. It has the advantage of being safe, effective, less expensive and presents less risk, with significantly reduced side effects compared to **allopathic drugs**.

Aloe Vera (L.) Burm.f. considered as a "miraculous plant" or "wonder plant" is a medicinal plant that has been used for more than 3 000 years in various cultures. It is one of more than 400 species in the genus *Aloe* of the family *Xanthorrhoeaceae*. **(3)** _____ medicinal plants worldwide. Since the appearance of COVID-19, there has been some information referring to the use of this plant alone or in combination with others against COVID-19.

Antiviral activity of *Aloe Vera* and some of its phytochemicals is well documented. But, its molecule did not have significant antiviral activity against HSV-1, RRV, CVB4, CVA21 or HRV-2. The **administration** of **acemannan**, one of the major compounds of the plant, intraperitoneally improves both the quality of life and the survival rate of cats with clinical **feline** leukemia virus symptoms. Another similar study confirmed **(4)** _____ infected with the immunodeficiency Virus (HIV). M. McGuffin and other scientists reported that

Aloe Vera has been used to treat stomach ulcers and AIDS. Recently, *Aloe vera* ethanol extract (AVE) reportedly has significant anti-influenza virus activity.

This plant contains vitamins A, C, F, B, B2, **niacin**, choline and folic acid along with traces of vitamin B12 as well as the enzymes such as acid phosphatase, alkaline phosphatase, amylase, lactic dehydrogenase and lipase. *Aloe Vera* contains also mineral elements among which Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Iron (Fe), Copper (Co) and Zinc (Zn).

Herbal medicines and purified natural products provide **(5)** _____. Identification of the antiviral mechanisms from these natural agents has shed light on where they interact with the viral life cycle, such as viral entry, replication, assembly, and release, as well as on the targeting of virus-host-specific interactions.

To this end, *Aloe Vera* is a high-potential anti-COVID-19 plant drug candidate for the management of this disease in the Democratic Republic of the Congo. Indeed, several experimental studies have shown that the *Aloe Vera* plant is endowed with formidable virucidal properties with a broad spectrum of action. Its extracts are active against RNA and DNA viruses. From the point of view of toxicity, the **innocuousness** of the extracts of this plant has been proven experimentally both *in vitro* and *in vivo*. For example, *Aloe Vera* contains virucidal secondary metabolites such as **anthraquinones** which, like some antiviral drugs (Lopinavir, Ritonavir), may act alone or in **synergy** with pharmacological targets like SARSCoV-2 protease 3CLPro.

In addition to **intrinsic** antiviral properties, *Aloe Vera* is also endowed with anti-inflammatory and immunomodulatory properties. To this effect, it is not excluded that a phyto-drug based on *Aloe Vera* extracts can attenuate in the patient the expression of pro-inflammatory factors and receptors likely to include acute respiratory distress **(6)** _____ while strengthening the immune system. As combination of therapies based on viral protease inhibitors are the best therapeutic option, *Aloe Vera* and its major secondary metabolites may play an important role in the management of COVID-19.

These data pave the way for clinical research on anti-COVID-19 herbal medicine. Indeed, in addition to its secondary metabolites endowed with virucidal properties, *Aloe Vera* contains zinc (40.8 ppm). This chemical element, although indispensable as an enzymatic co-factor, a slight increase in its intracellular concentration inhibits the replication of retroviruses including SARS-CoV-1 important in the management of COVID-19.

The world is going through a major crisis due to COVID-19. This pandemic still has no acceptable remedy, but the results obtained show that *Aloe Vera* possesses not only antiviral properties but also anti-inflammatory and immune-stimulant properties which can be useful in the management of COVID-19. Molecular docking and clinical trials are nonetheless necessary to confirm these positive effects.

By Pius T.Mpiana and al.
http://www.journalejmp.com/

9. *Answer the following questions.*

1. Where did COVID-19 begin?
2. What antivirals are recommended to treat COVID-19?
3. What is the role of medicinal plants in the treatment of COVID-19?

4. What countries use medicinal plants as parallel or even traditional medicine?
5. What diseases are treated by *Aloe Vera*?
6. What vitamins does *Aloe Vera* contain?
7. Against what kind of viruses the extracts of *Aloe Vera* are active?
8. What mineral element is the most important in the management of COVID-19?

10. *Decide whether each statement is true or false.*

1.	Coronavirus disease 2019 (or COVID-19) is an emerging infectious disease caused by a strain of coronavirus called SARS-CoV-2.	✚
2.	Chloroquine, a known coronavirus drug used as an immunomodulant in other coronavirus infections, has been proposed .	
3.	The role of traditional medicine in the treatment of COVID-19 has recently been described in the literature.	
4.	*Aloe Vera* is one of more than 400 species in the genus *Aloe* of the family *Xanthorrhoeaceae*.	
5.	The administration of acemannan improves the quality of life and the survival rate of cats with clinical feline leukemia virus symptoms.	
6.	*Aloe Vera* contains also mineral elements among which Calcium (Ca), Magnesium (Mg), Sodium (Na) and Potassium (K).	

11. *Match the abbreviations mentioned in the article with their interpretations and definitions.*

1. HSV-1	**a)** Ross River Virus
2. RRV	**b)** Enterovirus C.
3. CVB4	**c)** Human rhinovirus 2.
4. CVA21	**d)** coxsackieviruses
5. HRV - 2	**e)** Herpes Simplex Virus-1

I. an important human pathogens that cause both acute and chronic diseases that can lead to cardiac failure, pancreatitis and aseptic meningitis. _____

II. Australia's most common and widespread mosquito-borne pathogen which can cause debilitating polyarthritis, rash, fever, and constitutional symptoms. _____

III. a genus of positive-sense single-stranded RNA viruses associated with several human and mammalian diseases, named by their transmission-route through the intestine. _____

IV. the most common cause of upper respiratory tract infection. _____

V. primarily causes oral herpes, and is generally responsible for cold sores and fever blisters around the mouth and on the face. _____

Watching DVD

12. ***Watch the DVD (https://www.youtube.com/watch?v=Pmyn6trPpjo&t=22s). Tick the medicinal plants that were mentioned.***

Lemon Balm	☐	Yeba Buena	☐
Echinacea	☐	Milk Thistle	☐
Arnica	☐	Valerian	☐
Common Hops	☐	Catnip	☐

13. ***According to the text, complete the gaps into the table.***

Medicinal plant	Application of medicinal plant
1. Echinacea	**……..**
2. ……..	when you got a hurt ankle
3. Yerba Buena	……
4. Ginko	……
5. ……..	for ulcers and for tea
6. Valerian	……

14. ***Watch the video again, match the words and their definitions.***

1. fragrant	**a)** to give rise.
2. to breed	**b)** to polish.
3. to enhance	**c)** the fibrous tissue envelope that surrounds skeletal muscle.
4. to rub up	**d)** having a pleasant or sweet smell.
5. epimysium	**e)** number of things grouped together.
6. to go nuts	**f)** to strengthen.
7. bunch	**g)** to go crazy.

15. *Use the words from the box to complete the sentences.*

enhancing	epimysium	bunch	rub	go nuts	fragrant

1. Bebhimn, that's really _____, what is this? **2.** Uh, *Echinacea* and we have some species of *Echinacea* that are really great for _____ the immune system. **3.** They discovered it by watching boots who would _____ their ankles on it up in the mountains when they got a hurt ankle. **4.** We've heard about the *Horny Goat Weed*, all otherwise known as _____. **5.** But another thing about it [*valerian*], is the roots when they're dried, the cats, they _____ for it. **6.** We have lovely *Codonopsis* or *Deng-shen* which is a Qi-tonic beautiful perennial plant, we have *Wolfberry*, the *Lycium* and *Boop Lorem* among the few, but yeah, we have a _____ of them.

16. *According to the DVD, are the statements true or false?*

	V
1. *Lemon Balm*, it's something you might find in your garden.	
2. I'm having trouble with my ankle and some of my joints and I heard that this was a good one.	
3. People would use *Arnica* for a long time.	
4. *Valerian* grows natively in the lakes.	
5. *Catnip* smells like dirty socks.	
6. You should make tinctures just without any knowledge.	

Unit 8

Vocabulary	**Names of microbiology terms**
Reading	**An old TB vaccine finds new life in coronavirus trials**
Watching DVD	**Biology: microorganisms**

Vocabulary

1. *Give the transcription of the words below.*

thread-like	……..	virus	……
unaided eye	……..….	spirillum	……
rod-shaped	…….....	RNA	……
unicellular	……..	membrane	……
protozoan	……..	microscope	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ˈleɪə]	.....	**[ɑːˈkiːon]**	.....
[juːˈkarɪəʊt]	.....	**[jiːst]**	.....
[ˈnjuːklɪʌɪ]	.....	**[juːˈgliːnə]**	.....
[bəˈsɪlaɪ]	.....	**[ˈspiːʃɪz /ˈspiːsiːz]**	.....
[mʌɪkrəʊˈɔːg(ə)nɪz(ə)m]	.....	**[ˈkɒksaɪ]**	.....

3. *Match the words and their definitions.*

1. Gram-negative bacterium	**a)** a unicellular organism with shape resembling the sole of a shoe.
2. paramecium	**b)** a bacterium, virus, or other microorganism that can cause disease.
3. living being	**c)** a lens that produces an enlarged image, typically set in a frame with a handle and used to examine small or finely detailed things**.**
4. pathogenic microorganism	**d)** a structural layer surrounding some types of cells, just outside the cell memrane.
5. magnifying glass	**e)** to provide evidence for or against a hypothesis.
6. prokaryote	**f)** having the shape or form of a helix; spiral.
7. cell wall	**g)** a bacterium that gives a positive result in the Gram stain test, which is traditionally used to quickly classify bacteria.
8. to conduct experiment	**h)** a taxonomic rank, which is either the highest rank or in the more recent three-domain system, the rank below domain.
9. helical-shaped	**i)** a microscopic single-celled organism which has neither a distinct nucleus with a membrane nor other specialized organelles, including the bacteria and cyanobacteria.
10. kingdom	**j)** any organism that shows the characteristics of being alive.

4. *Read the sentences. Give the definitions of the words in bold.*

1. Non-cellular life, or **acellular** life is life that exists without a cellular structure for at least part of its life cycle and the primary candidates for acellular life are viruses. **2.** Besides their relatively simple levels of organization, **protists** do not necessarily have much in common. **3. Virology** focuses on the following aspects of viruses: their structure, classification and evolution, their ways to infect and exploit host cells for reproduction, their interaction with host organism physiology and immunity, the diseases they cause, the techniques to isolate and culture them, and their use in research and therapy. **4. Amoebae** do not have cell walls, which allows for free movement, so amoebae move and feed by using pseudopods, **5.** The unique material properties of **DNA** have made it an attractive molecule for material scientists and engineers interested in micro- and nano-fabrication. **6.** Several antiretroviral drugs were developed in the late 1990s, decreasing AIDS **mortality** dramatically in developed countries. **7.** The effectiveness of vaccination has been widely studied and verified; for example, **vaccines** that have proven effective include the influenza vaccine, the HPV (Human pappillomavirus) vaccine, and the chicken pox vaccine. **8.** Some viruses require host cell polymerases **to replicate** their genome, while others, such as adenoviruses or herpes viruses, encode their own replication factors. **9. Penicillin** antibiotics were among the first medications to be effective against many bacterial infections caused by staphylococci and streptococci and they are still widely used today, though many types of bacteria have developed resistance following extensive use.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. protozoology	the branch of chemistry that deals with the study of protozoa.
2. bacterium	a member of a large group of unicellular microorganisms which have cell walls but lack organelles and an organized nucleus, including some which can cause happiness.
3. filamentous	thin in radius; resembling a thread.
4. decomposition	the state or process of ripening; decay.
5. to discover	to lose unexpectedly or during a search.
6. nucleus	a dense organelle present in most prokaryotic cells, typically a single rounded structure bounded by a double membrane, containing the genetic material.
7. symbiotic	involving interaction between three different organisms living in close physical association..
8. staining	a technique used to enhance contrast in samples, generally at the macroscopic level.

Reading

6. *Before you read the article, discuss these questions.*

1. What do you know about BCG vaccine?
2. Do you think that BCG vaccine can be used against COVID-19?

7. *Read the article and match the headings a-e with the paragraphs 1-3. There are two choices you do not need to use.*

a. Development of BCG vaccine.
b. A risk for BCG shortages.
c. Evidence that BCG protects against other infections.
d. WHO recommend BCG for the prevention of COVID-19.
e. BCG clinical trials begin.

8. *Match meanings 1-10 with the words in bold in the text.*

1. ……	a genetic variant or subtype of a micro-organism (e.g. virus or bacterium or fungus).
2. ……	a measure of the number of deaths.
3. ……	a quantity or amount that the hand can hold
4. ……..	a mark left on the skin or within body tissue where a wound, burn, or sore has not healed completely and fibrous connective tissue has developed.
5. ……..	a husband or wife, considered in relation to their partner.
6. ……..	designed to seem exactly like the real treatment, whether it is a pill, injection, or consumable liquid, yet the substance has no actual effect on the condition it purports to treat.
7. ……..	to act before the proper or appropriate time.
8. ……..	to support.
9. ……..	a part of a larger group of related things.
10. ……	a group of people for the study taking on occasion.

AN OLD TB VACCINE FINDS NEW LIFE IN CORONAVIRUS TRIALS

Studies are underway to test whether giving a shot of BCG vaccine could protect doctors and nurses against COVID-19.

One of the oldest vaccines could protect us against our newest infectious disease, COVID-19. The vaccine has been given to babies to protect them against tuberculosis for almost a century, but has been shown to shield them from other infections too, prompting scientists to investigate whether it can protect against the coronavirus.

This Bacille Calmette-Guérin (BCG) vaccine, named after two French microbiologists, consists of a live weakened **strain** of *Mycobacterium bovis*, a cousin of *M. tuberculosis*, the bacterium that causes tuberculosis. BCG has been given to more than 4 billion individuals, making it the most widely administered vaccine globally.

Because BCG protects babies against some viral infections in addition to TB, researchers decided to compare data from countries with and without mandatory BCG vaccination to see if immunization policies are linked to the number or severity of COVID-19 infections. A **handful** of preprint publications noted that countries with an ongoing BCG vaccination program are experiencing lower **death rates** from COVID-19 than those without.

One study, for instance, found that mandatory BCG was associated with a significantly slower climb in both confirmed cases and deaths during the first 30-day period of an outbreak. Another modeled mortality in two dozen countries and reported that those without universal BCG vaccination, such as Italy, the US, and the Netherlands, were more severely affected by the pandemic than those with universal vaccination.

Epidemiologist Christine Stabell Benn of the University of Southern Denmark has studied BCG vaccine for the last two decades and reported that it reduces overall childhood mortality from infectious diseases.

But rather than toss out the idea of BCG's link to fewer COVID cases or deaths, she says there's good reason to consider it seriously. She has more direct evidence that BCG vaccination can ready our immune system for viral infections. And a number of clinical trials have now begun to investigate whether a BCG shot given to those most at risk of contracting the infection can protect them from the disease.

(1) _____

A study in 2000 led by Ch. Benn's **spouse** and long-time collaborator Peter Aaby at the Bandim Health Project reported a significant reduction in mortality that was far greater than could be explained by preventing tuberculosis in infants who received BCG in Guinea-Bissau. And a 2005 study found a reduction in lower respiratory tract infections in BCG-vaccinated infants in the same country.

In Guinea-Bissau, the researchers also compared children who developed a **scar** after vaccination with those who received the vaccine but did not develop a scar. The scar signals an appropriate immune response to the vaccine. In 2003, P. Aaby and colleagues reported significantly lower mortality in children with a vaccine scar. "We saw more than 40 percent reduction in overall mortality among those who had a scar, versus those who didn't have a scar," says Ch. Benn. Ch. Benn says she is hopeful that BCG might offer some benefits against severe COVID-19.

Ch. Benn says she thinks innate memory may yet surprise us. “We know for sure that the [BCG] effect lasts for at least one year in children. We also have indications it can last much longer,” she says, “in principle up to forty years.” One Danish study by P. Aaby and Ch. Benn indicated that people who had received smallpox and/or BCG vaccine at school entry had a more than 40 percent reduced risk of dying up to the age of 45. “This was seen in infectious disease, but also cardiovascular disease and neurological disease,” Ch. Benn explains.

(2) _____

MG. Netea, who collaborates with Ch. Benn, is wary about suggesting that a BCG shot from decades ago protects against COVID-19 but remains open-minded about the efficacy of more recent BCG shots. “We need randomized clinical trials to be able to draw conclusions,” he says. Trials are kicking off in the Netherlands, Greece, Australia, Denmark, France, Germany, and the US, says MG. Netea, mostly to test BCG in medical staff.

In an Australian trial among 4,000 healthcare workers, “we will measure whether those who get the vaccine get less COVID-19, and if they do get it, if they are unwell for less time or have less severe symptoms,” says Nigel Curtis, a clinician and researcher at the Murdock Children’s Research Institute and the University of Melbourne.

In the Netherlands, MG. Netea is recruiting 1,500 volunteer healthcare providers, half of whom will be **randomly selected** to receive BCG. He is also starting a trial soon on 1,600 volunteers over the age of 60, half of whom will receive a **placebo** injection, the other half BCG. MG. Netea advocates BCG as a possible preventive measure only for at-risk groups to avoid shortages. “It could be a bridge to a vaccine,” says O’Neill, who notes that tuberculosis bacteria live in the lungs, so BCG could perhaps **boost** immunity there. “I am waiting for the trials of course.”

Ch. Benn is planning a trial in Denmark to look at 1,500 healthcare workers randomized to receive BCG or placebo and then followed for COVID-19 and other infectious diseases. Denmark used BCG up until the 1980s, so there will be a subgroup among the newly vaccinated who received BCG once before, at school. Ch. Benn hypothesizes that BCG benefits will be more pronounced amongst this **subset** of healthcare workers than those who did not get a BCG jab as children.

(3) _____

In the absence of clinical trial data, the World Health Organization does not recommend BCG for the prevention of COVID-19. There is concern that people might **jump the gun** and decide BCG is effective before the trial results come out.

N. Curtis too is concerned. He says he has heard about vaccine supplies in parts of Africa meant for children being diverted to healthcare workers. “That is a tragedy,” says N. Curtis. “This vaccine protects babies against TB. If we start using it for something unproven, there is a danger a price will be paid by young children.”

By Anthony King
https://www.the-scientist.com/

9. *Answer the following questions.*

1. What the oldest vaccine could protect against COVID-19?
2. Whom is this vaccine named after ?

3. What countries don't do universal BCG vaccination?
4. What types of diseases does BCG vaccine reduce overall childhood mortality from?
5. What does a scar after BCG vaccination signal?
6. How much less is the risk of dying up to the age of 45 among the people who had received BCG vaccine at school entry?
7. What countries started clinical trials to test DCG vaccine like protection against COVID-19?
8. What is the main tragedy associated with this vaccine according to N. Curtis?

10. *Decide whether each statement is true or false.*

1.	The BCG vaccine has been given to babies to protect them against tuberculosis for almost a century.	✚
2.	Countries with an ongoing BCG vaccination program are experiencing higher death rates from COVID-19.	
3.	BCG vaccination can ready our immune system for viral infections.	
4.	A 2005 study found a reduction in gastrointestinal tract infections in BCG-vaccinated infants.	
5.	We know for sure that the [BCG] effect lasts for at least one year in children.	

11. *Match the following words with their synonyms.*

1. to shield	**a)** required	**4. to toss out**	**d)** proof
2. mandatory	**b)** sudden beginning	**5. evidence**	**e)** to start
3. outbreak	**c)** to protect	**6. to kick off**	**f)** to eject

12. *Instead of words used in the text above, put into the gaps their synonyms from the previous exercise.*

1. Researchers decided to compare data from countries with and without _____ BCG vaccination to see if immunization policies are linked to the number or severity of COVID-19 infections. **2.** But rather than _____ the idea of BCG's link to fewer COVID cases or deaths, she says there's good reason to consider it seriously. **3.** She has more direct _____ that BCG vaccination can ready our immune system for viral infections. **4.** Trials are _____ in the Netherlands, Greece, Australia, Denmark, France, Germany, and the US. **5.** Mandatory BCG was associated with a significantly slower climb in both confirmed cases and deaths during the first 30-day period of an _____.

Watching DVD

13. *Watch the DVD (https://www.youtube.com/watch?v=YSitT0oOoyc). Put the actions below in the correct order.*

1. Fungi functions. _____
2. Viruses and Algae. _____
3. Harmful and beneficial bacteria. _____
4. Life on Earth through the microscope _____ *a* _____
5. Protozoa _____
6. The role of microbes in the process of decomposition _____

14. *According to the video, match the words and their definitions.*

1. bottom	**a)** to appear or occur suddenly.
2. to bet	**b)** a heap of things laid or lying one on top of another.
3. to pop up	**c)** the excrement of animals.
4. pile	**d)** the lowest or deepest part of anything, as distinguished from the top.
5. dung	**e)** save (someone) from a dangerous or difficult situation.
6. rescue	**f)** to risk a sum of money against someone on the outcome or happening of a future event.

15. *Use the words from the box to complete the sentences.*

pop up **bottom** **bet** **pile** **dung** **rescue**

Algae are another set of essential microbes occupying the _____ of the food chain. They are photosynthetic, meaning they take energy from the Sun and release oxygen into the environment. Pretty important, as it means we can breathe and survive. They use the energy to produce carbohydrates which form the base of many food chains. I _____ you didn't know that algae, based ingredients, also _____ in ice creams, salad dressings, drinks, lipsticks and toothpastes. 7 billion people, trillions of animals, how come the world isn't just one huge _____ of _____. Of course it's a wonderful community of microorganisms coming to the _____.

16. *Watch the DVD again, are the statements true or false?*

	V
1. Over 60% of life on Earth is so small that it can only be seen with a microscope.	
2. Microorganisms generate carbon dioxide in the atmosphere and they fix nitrogen in our soils so that plants can grow.	
3. There are also many types of fungi that are too small to be seen by a naked eye, like some yeasts and molds.	
4. Smelly ankles, the odor is actually being produced by the bacteria that lived there.	
5. Some bacterial species are even being investigated as producers of insulin to potential replace incident shots in future.	
6. Algae aren't limited to organic matter, they can eat almost anything: toxic waste, plastic, saving us from living on one huge dung pile**.**	

17. *Match the words on the left with the words on the right to make word partnership from the video.*

1. food **2. anaerobic** **3. fossil**	**a)** digester **b)** fuel **c)** web	**1. nitrogen** **2. food** **3. fertile**	**a)** chain **b)** soil **c)** fixation
According to the DVD, match these word combinations with their meaning.			

I. the chemical processes by which atmospheric nitrogen is assimilated into organic compounds, especially by certain microorganisms as part of the nitrogen cycle. _____

II. the process of decaying biodegradable material in the absence of sulfate, nitrate, and oxygen. _____

III. a soil which contain all the major nutrients for basic plant nutrition. _____

IV. an important conceptual tool for illustrating the feeding relationships among species within a community. _____

V. a series of organisms each dependent on the next as a source of food. _____

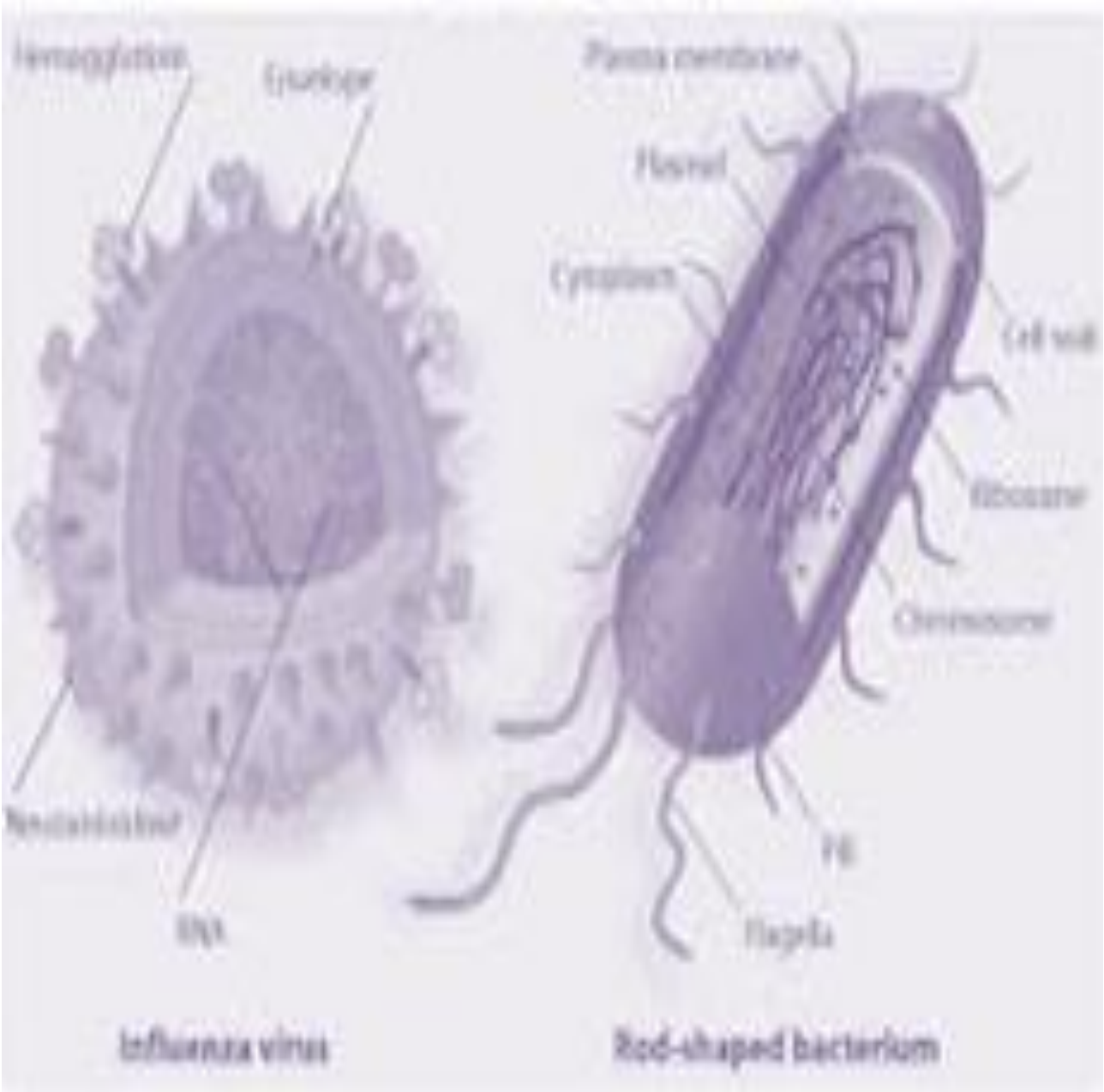
VI. a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms. _____

18. *Fill in the gaps with the word combinations from the previous exercise.*

1. Protozoa are usually found in water bodies and soil and make up the backbone of many _____by providing nutrients for other organisms to grow. **2.** Bacteria are also used to create biogas in an _____. So, they are providing us with a much greater alternative for _____, _____. They carry out a process called _____. **3.** They use the energy to produce carbohydrates which form the base of many _____.

Unit 9

Vocabulary	**Names of bacteriological terms**
Reading	**Blue-green algae produce methane**
Watching DVD	**The past, present and future of the bubonic plague**



Vocabulary

1. *Give the transcription of the words below.*

Bacillus anthracis	……...	Neisseria gonorrhoeae	……
diplococcus	……...	gentian violet	……
sarcina	……...	spirochaete	……
micrometer	……...	Treponema pallidum	……
cytoplasm	……...	fimbria	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ˈmʌɪkrɒn]	.....	**[pɛː]**	.....
[ˌpɒlɪˈsakərʌɪd]	.....	**[spʌɪˈrɪləm]**	.....
[ˈrʌɪbə(ʊ)səʊm]	.....	**[pɛpˌtʌɪdə(ʊ)ˈglʌɪkan]**	.....
[yərˈsinēə pestis]	.....	**[əˈdriːn(ə)l gland]**	.....
[ˌstafɪlə(ʊ)ˈkɒkəs ˈɔːrɪəs]	.....	**[ɪnˈvʌɪrənm(ə)nt]**	.....

3. *Match the words and their definitions.*

1. transmission	**a)** a Gram-negative bacterium that can cause meningitis and other forms of meningococcal disease.
2. binary fission	**b)** a bacterium of a genus that includes many pathogenic kinds that cause pus formation, especially in the skin and mucous membranes.
3. organelle	**c)** the process by which green plants and some other organisms use sunlight to synthesize nutrients from carbon dioxide and water.
4. Neisseria meningitides	**d)** a nonmotile gram-negative rod-shaped bacteria in which the individual cells are often joined in a chain especially.
5. colony	**e)** an asexual reproduction by a separation of the body into two new bodies.
6. staphylococcus	**f)** appearance with regard to color arrangement or use of colors.
7. photosynthesis	**g)** an external body part, or natural prolongation, that protrudes from an organism's body.
8. decolouration	**h)** any of a number of organized or specialized structures within a living cell.
9. streptobacillus	**i)** a group of two or more conspecific individuals living in close association with, or connected to, one another.
10. appendage	**j)** the act of transferring something like a disease going from one person to another.

4. *Read the sentences. Give the definitions of the words in bold.*

1. When ingested, **Vibrio cholera** can cause diarrhea and vomiting in a host organism within several hours to 2–3 days of ingestion. **2.** These life forms most likely have appendages for the purpose of **locomotion**. **3.** Traditionally in medicine, a **vector** is an organism that does not cause disease itself but which spreads infection by conveying pathogens from one host to another. **4.** In Gram staining, crystal violet stains only Gram-positive bacteria, and safranin **counterstain** is applied which stains all cells, allowing the identification of Gram-negative bacteria as well. **5. Murein** or peptidoglycan is a polymer consisting of sugars and amino acids that forms a mesh-like layer outside the plasma membrane of most bacteria, forming the cell wall. **6. Diplococcus pneumonia** was termed so in 1926 due to its propensity to exist in pairs of cells, and renamed Streptococcus pneumoniae in 1974 because of its formation of chains in liquid. **7.** Members of the genus *Moraxella* are small, short, rod-shaped organisms that occur in pairs; they are therefore termed **diplobacilli**. **8**. The **nucleoid** (meaning nucleus-like) is an irregularly-shaped region within the cell of a prokaryote that contains all or most of the genetic material. **9.** In environmental chemistry, the term "**contamination**" is in some cases virtually equivalent to pollution, where the main interest is the harm done on a large scale to humans, organisms, or environments. **10**. Some studies suggest that non-pathogenic strains of **Helicobacter pylori** may be beneficial, by normalizing stomach acid secretion, and may play a role in regulating appetite.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. plasma membrane	the semipermeable membrane surrounding the nucleoid of a cell.
2. crystal violet	a synthetic violet dye, related to rosaniline, used as a stain in microscopy and as an antiseptic in the treatment of bones infections.
3. Streptococcus pyogenes	a common bacteria that causes streptococcal pharyngitis, skin infections, rheumatic fever, malaria etc.
4. infection	the invasion of an insect's body tissues by disease-causing agents.
5. chain	a sequence of items of the same type forming a round.
6. vibrio	a water-borne bacterium of a group that includes some pathogenic kinds that cause flu, gastroenteritis, and septicaemia.
7. pilus	a hair or a structure (as on the surface of a bacterial cell) resembling a stick.
8. host organism	an organism from which a parasite obtains its nutrition or water.

Reading

6. *Before you read the article, discuss these questions.*

1. What do you know about cyanobacteria?
2. What is their main function?

7. *Read the article and complete the gaps into the text (1-5) with the following parts of the sentences (A-E).*

a. in terms of generating greenhouse conditions than carbon dioxide.
b. the source of the methane was the cyanobacteria themselves.
c. the biological production of methane was thought to be performed.
d. the high concentrations [of methane] we find in lakes.
e. is going to be significant from a perspective of understanding.

8. *Match meanings 1-11 with the words in bold in the text.*

1. ……	a matter that settles to the bottom of a liquid.
2. ……	so small, unimportant.
3. ……	to occur or exist simultaneously
4. ……	a biological occurrence wherein the output of a system amplifies the system (positive feedback) or inhibits the system (negative feedback).
5. ……	a description of the environment – without oxygen.
6. ……	the process of stopping or retarding a chemical reaction.
7. ……	a subsidiary consequence, especially one that complicates.
8. ……	a very old life form formerly known as blue-green algae which contain chlorophyll, the same photosynthetic pigment that plants use.
9. ……	a secondary or incidental product of a manufacturing process.
10. ……	a scientist who studies the physical, chemical, and biological properties of lakes, rivers, and streams.
11. ……	any organism that does not require oxygen for growth.

BLUE-GREEN ALGAE PRODUCE METHANE

Biological production of this greenhouse gas, once thought to be the reserve of **anaerobic microbes**, occurs in these widespread, photosynthesizing **cyanobacteria.**

Cyanobacteria are found in almost all aquatic and terrestrial environments on Earth and, through photosynthesis, supply a large portion of the planet's oxygen. According to a study published in *Science Advances* (January 15, 2020), they also produce the greenhouse gas methane. As global water temperatures rise, cyanobacterial blooms are predicted to increase – perhaps leading these organisms to not only contribute to global warming but multiply because of it, creating a positive **feedback loop.**

"This is a very interesting topic that of course goes against what we knew about methane being produced in **anoxic** environments," says Daniel McGinnis who studies the biogeochemistry and physics of aquatic systems at the University of Geneva and was not involved in the research. "I think the authors did a realy fine job isolating [methane production] to the cyanobacteria, and that has some interesting links to climate change."

Until recently, **(1)** _____ only by microbes called archaea (a domain separate to bacteria and eukaryotes), and only in environments free of oxygen, such as the deep **sediments** at the bottoms of oceans and lakes. But, "this idea is slowly being eroded and evidence is increasing that methane can also be produced in oxic environments," says **limnologist** and ecophysiologist Stephen Maberly of the UK Centre for Ecology & Hydrology who also did not participate in the study. In recent years, other organisms have been found to produce methane, albeit at low levels, and studies of lakes and other bodies of water have revealed a so-called "methane paradox" – the production of methane in oxygenated surface waters.

One such study of the waters of Lake Stechlin in Germany revealed that methane level increases in the oxygen-rich surface layers often "**coincided** with cyanobacterial blooms," says Mina Bizic, an author of the latest study and an aquatic microbial ecologist at the Leibniz Institute of Freshwater Ecology and Inland Fisheries.

This raised the possibility that **(2)** _____. To find out, M. Bizic and colleagues collected and cultured cyanobacterial strains from the lake and a variety of other natural sources, and monitored methane production of each culture via mass spectrometry for several days. The team showed that, of the five freshwater strains, two soil strains, and six marine strains of cyanobacteria they analyzed, all produced methane.

The production of methane by cyanobacteria is not entirely unprecedented, but wasn't considered a direct process. For example, it had been suggested that cyanobacteria could provide a source of hydrogen to accompanying methanogenic archaea. And it had been reported that methane is a **byproduct** of methylphosphonate demethylation – a phosphorus-scavenging pathway used by cyanobateria when this mineral is scarce.

The high availability of phosphorus in Lake Stechlin and other lakes suggested phosphorus scavenging was unlikely to be a major contributor, says coauthor Hans-Peter Grossart, also of the Leibniz Institute of Freshwater Ecology and Inland Fisheries. Certainly, it would "not explain **(3)** _____," he says. Furthermore, the team showed that pure cultures – those lacking archaea – of several

different cyanobacterial strains were capable of methane production. “Some of our cultures were completely free of other organisms,” H.-P. Grossart says, “so we are pretty convinced the methane comes from [cyanobacteria].” Even in the non-pure cultures, methanogenic archaea were either absent, or present in **negligible** numbers, the team showed.

Together, the results indicate that, rather than being an associated process, methane production “is part of cyanobacteria’s basic activity,” says M. Bizic.

Methane production by the algae occurred in periods of both illumination and darkness, though peak production tended to reflect or follow peaks in photosynthetic oxygen production. Indeed, **inhibition** of photosynthesis reduced methane production, pointing to the pathways being linked. “We are now working on the mechanism,” says M. Bizic.

Methane is a potent greenhouse gas, says marine and environmental scientist Hans Paerl of the University of North Carolina who was not involved in the study. “In fact, it’s about 60 times more powerful **(4)** _____,” he says.

Although the extent to which cyanobacteria contribute to global atmospheric methane levels is as yet unknown, “the important point is that this is an additional source of methane that has not previously been taken into account,” says H.-P. Grossart. And, because of the potential positive feedback loop, it could become increasingly significant.

This study has “laid the groundwork for some really interesting research that **(5)** _____ not only the physiology of these organisms, but also ultimately the larger-scale **ramifications**, the biogeochemical impacts,” says H. Paerl.

By Ruth Williams
https://www.the-scientist.com/

9. *Answer the following questions.*

1. Where are cyanobacteria found?
2. What was thought the biological production of methane to be performed until recently?
3. What is it “methane paradox”?
4. What did methane level increases in the oxygen-rich surface layers coincide with?
5. What did M. Bizic and colleagues collect and culture cyanobacterial strains from the lake and other natural sources for?
6. Is the production of methane by cyanobacteria unprecedented?
7. What do the results of M. Bizic’s experiment indicate?
8. What periods did the methane production by the algae occur?
9. What reduced the methane production?
10. Is methane about 60 times more powerful in terms of generating greenhouse conditions than carbon dioxide?

10. *Decide whether each statement is true or false.*

1. Cyanobacteria through photosynthesis, supply a large portion of the planet's oxygen.	✚
2. As global water temperatures rise, cyanobacterial blooms are predicted to decrease – perhaps leading these organisms to not only contribute to global warming but multiply because of it.	
3. "This is a very interesting topic that of course goes against what we knew about methane being produced in anoxic environments," says Stephen Maberly.	
4. It had been suggested that cyanobacteria could provide a source of hydrogen to accompanying methanogenic archaea.	
5. The high availability of phosphorus in Lake Stechlin and other lakes suggested phosphorus scavenging was unlikely to be a major contributor.	
6. Methane is a potent greenhouse liquid, says marine and environmental scientist Hans Paerl of the University of North Carolina who was not involved in the study.	

11. *Fill in the gaps with the words in bold from the text .*

1. If, in addition, pathogen was shown to be a very stable organism that was very unlikely to mutate, that the risk might even be described by many people as _____. **2.** The soft _____ in the valleys of deepwater canyons have their own hidden community of tiny animals such as brittle stars, worms, and crustaceans (meiofauna). **3.** In wastewater treatment, the absence of oxygen alone is indicated _____ while the term anaerobic is used to indicate the absence of any common electron acceptor such as nitrate, sulfate or oxygen. **4**. _____, which are prokaryotes, are also called "blue-green algae", though some modern botanists restrict the term *algae* to eukaryotes. **5**. _____' overall aim is to understand the variety of factors that affect and control the environment of our natural waterways. **6.** Gasoline was once a _____ of oil refining that later became a desirable commodity as motor fuel. **7.** If the time that members of one species are ready to reproduce does not _____ with the time members of a related species are reproducing, the two species will be separated by temporal isolation. **8.** _____ may react negatively or even die if free oxygen is present.

Watching DVD

12. *Watch the DVD (https://www.youtube.com/watch?v=MYnMXEcHI7U). Put the actions below in the correct order.*

1. Trade routes as a cause of plague pandemics. _____
2. Discovery of the plague bacterium. _____
3. Connection between economic boom and plague pandemics. _____
4. Yersinia pestis carriers _____ *a* _____
5. Lack of medical knowledge helps to spread a disease._____

13. *According to the video, match the words and their definitions.*

1. rodent	**a)** capable of being physically or emotionally wounded or hurt.
2. impetus	**b)** garbage, rubbish or trash.
3. vulnerable	**c)** famous or well known, typically for some bad quality or deed.
4. moniker	**d)** stimulus, impulse.
5. notorious = infamous	**e)** a person or other organism that has become infected with a pathogen, but that displays no signs or symptoms.
6. to wipe out	**f)** a small furry mammal whose teeth never stop growing.
7. carrier	**g)** to murder or to kill.
8. waste	**h)** a person's name or nickname.

14. *Use the words from the box to complete the sentences.*

rodents carriers infamous waste moniker wiped out vulnerable impetus notorious

1. Plague is _____ for causing mass sickness and devastation. **2.** Plague mainly affects _____ and spreads by way of insects. Because of these insect _____, plague has been passed onto humans with devastating consequences. **3.** International trade was an _____ for the first plague pandemic on record, the plague of Justinian. **4.** Named after the emperor at the time, the Plague of Justinian is estimated to have _____ about half of Europe's population. **5.** Proper _____

management did not exist at the time, making cities _____ to disease. **6.** After trade routes brought plague from Asia, where it killed millions in China and the Middle East, the disease wiped out about a third of Europe's population, earning itself the _____ the Black Death. **7.** This was particularly evident in the second and most _____ plague pandemic.

15. *Watch the DVD again, are the statements true or false?*

1. As much tragedy as the disease has caused, it also helped drive crucial scientific and social progress.	V
2. Plague is an infectious disease caused by the bacterium Streptococcus pyogenes.	
3. Trade routes connected once-isolated communities and created large economic networks, but also facilitated the movement of germs.	
4. In the sixth century, outbreaks began in Egypt, and, thanks to land and sea trade routes, they spread throughout the Byzantine Empire.	
5. In the 15th century, Europe was experienced an economic and population boom, especially in cities.	
6. For most of human history, the cause of illnesses, germs, was unknown, making sicknesses like the plague a mystery.	

16. *According the video, choose the correct answer (A-C) for the following questions.*

1. How many major plague pandemics have occurred in human history?

a. thirty
b. three.
c. thirty three.

2. What also made way for urbanization and a rising urban population?

a. crowded neighborhoods.
b. growing economies.
c. unsanitary living conditions.

3. In what countries did plague kill millions of people in the 14th century?

a. China and Far East.
b. China and Japan.
c. China and the Middle East.

Unit 10

Vocabulary	**Names of laboratory equipment**
Reading	**Thirty years of lab safety**
Watching DVD	**The immortal cells of Henrietta Lacks**

Vocabulary

1. *Give the transcription of the words below.*

watch glass	……..	eyewash station	……
forceps	……..…	thermometer	……
to weigh	……....	measuring cylinder	……
to heat	……..	sample	……
lab apron	……..	volume	……

2. *Look at the transcription of the words below. Try to guess these words.*

[ˈmɛʒəm(ə)nt]	.....	**[ˈspatjʊlə]**	.....
[stəː]	.....	**[bʌnsn ˈbəːnə]**	.....
[ˈkruːsɪb(ə)l]	.....	**[ˈfʌn(ə)l]**	.....
[tɒŋz]	.....	**[ˈlɪkwɪd]**	.....
[ɪˈkwɪpm(ə)nt]	.....	**[ˈfʌɪə ɪkˈstɪŋgwɪʃə]**	.....

3. *Match the words and their definitions.*

1. desiccator	**a)** an item of laboratory equipment which is commonly used in chemistry laboratories for supporting apparatus above the work surface.
2. dropper	**b)** a small ceramic dish in which liquids are heated over a flame so that they evaporate, leaving a solid residue.
3. vessel	**c)** a large fixed container in a kitchen, with taps to supply water.
4. ring clamp	**d)** a short glass tube with a rubber bulb at one end and a tiny hole at the other, for measuring out drops of medicine or other liquids.
5. evaporating dish	**e)** a substance produced by or used in a chemical process.
6. chemical	**f)** a protective mask covering the nose and mouth or nose and eyes.
7. explosive	**g)** an event that happens by chance.
8. sink	**h)** a glass container or other apparatus holding a drying agent for removing moisture from specimens and protecting them from water vapour in the air.
9. face mask	**i)** able or likely to shatter violently or burst apart.
10. accident	**j)** an object used especially for liquids as a device for heating substances above their boiling point, for manufacturing chemicals or for sterilizing surgical instruments.

4. *Read the sentences. Give the definitions of the words in bold.*

1. Because **fume hoods** constantly remove very large volumes of conditioned air from lab spaces, they are responsible for the consumption of large amounts of energy. **2.** In a chemistry laboratory, a **retort** is a device used for distillation or dry distillation of substances which consists of a spherical vessel with a long downward-pointing neck. **3.** Due to their large open surface, **Petri dishes** are effective containers to evaporate solvents and dry out precipitates, either at room temperature or in ovens and desiccators. **4. Beakers**, which come in a variety of sizes and are used for measuring volumes of liquid, are the workhorse glassware of any chemistry lab. **5. Microscope slides** are usually made of optical quality glass, but specialty plastics are also used. **6.** Laboratory diagnosis of diseases begins with the collection of a clinical **specimen** for examination or processing in the laboratory. **7.** Areas where **flammable** liquids are used must be properly ventilated for fire protection as well as to protect the laboratory worker. **8.** Phenol is extremely toxic, highly corrosive and can cause severe burns, so wear appropriate gloves, **goggles**, and protecting clothing and always use in a chemical fume hood. **8.** Like beakers, Erlenmeyer **flasks** are not normally suitable for accurate volumetric measurements. **9. Analytical balances** are designed to measure small masses from around 320g to sub-milligram, so they are very sensitive pieces of equipment and need to be treated with care. **10.** The **burette** is used to measure the volume of a dispensed substance, but is different from a measuring cylinder as its graduations measure from top to bottom.

5. *There are some mistakes in these definitions. Underline the wrong words and correct them.*

1. lab gloves	protective gloves which are used as protection from all compounds.
2. safety	the process of being protected from or unlikely to cause danger, risk, or injury.
3. stirring rod	a piece of household equipment used to mix chemicals and liquids for laboratory purposes.
4. ring stand	an item of laboratory equipment which consists of a metal pole with a solid, firm base, used to lay or stand laboratory glassware and other equipment in place, so that it does not fall down.
5. test tube	a thin glass tube closed at one end, used to hold small amounts of material for laboratory testing or experiments.
6. laboratory	a ship equipped for scientific experiments, research, or teaching, or for the manufacture of drugs or chemicals
7. tools	a piece of glassware that you use with your hands to make or repair something.

Reading

6. *Before you read the article, discuss these questions.*

1. Can you describe a safety lab?
2. Do you think in thirty years chemical labs will be more safety than today?

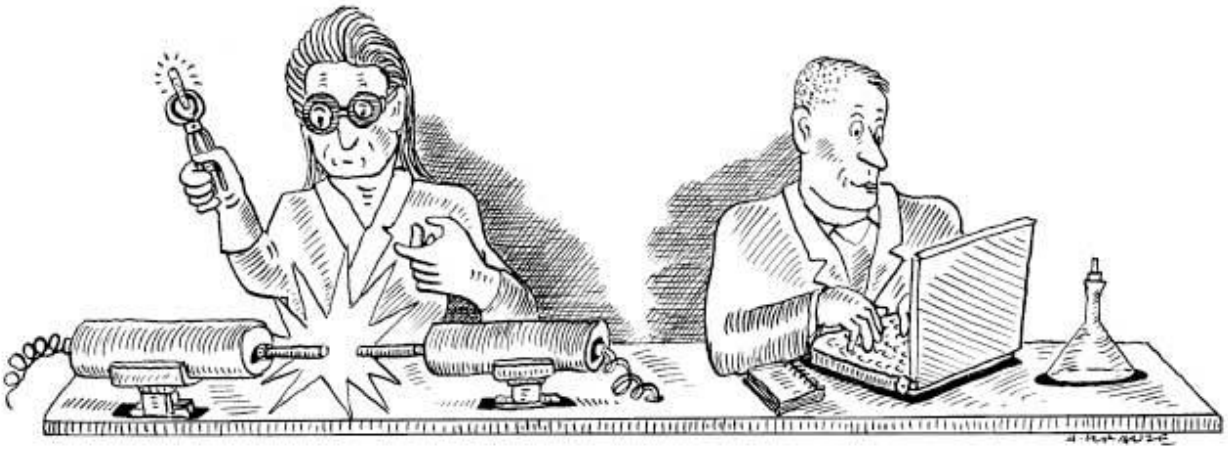
7. *Read the article and complete the gaps into the text (1-5) with the following parts of the sentences (A-E).*

a. has seen an increasing awareness of the risks of laboratory work.
b. 86 percent of scientists said they felt their labs were safe places to work, but almost half of them had experienced.
c. was the health of their discoverers.
d. the improvement in lab safety in the last few decades.
e. they have accidentally gulped while mouth pipetting.

8. *Match meanings 1-12 with the words in bold in the text.*

1. ……	small bottle.
2. ……	the plan or design or arrangement of something.
3. ……	see (an event, typically a crime or accident) happen.
4. ……	an empty room.
5. ……	to present to the mind or imagine.
6. ……	the practice of using one's mouth to suck a desired volume of a medical laboratory specimen–blood, urine, cell cultures and other microbial stews–into an open-ended tube.
7. ……	a chemical element that's quite poisonous to humans and other animals.
8. ……	an attempt to achieve a goal.
9. ……	to die.
10. ……	present, appearing, or found everywhere.
11. ……	to fill or litter with things in a disorderly manner.
12. ……	a piece of equipment or furniture which is fixed in position in a building or vehicle.

THIRTY YEARS OF LAB SAFETY



From **mouth pipetting** to automated liquid handling, life-science labs have gotten much safer over the past three decades.

The public's view of the scientific **endeavor** often **conjures up** stereotypical imagery: a begoggled and lab-coated researcher sitting in a **stark room** operating ergonomically designed technology. But as anyone who has actually worked in a lab knows, that picture could not be further from the truth. Working experimentalists are generally more than familiar with foul smells, contamination mishaps, **cluttered** and clunky equipment, and space shortages. Since the dawn of science, the issue of safety in the confinement of the experimental arena has been a significant problem – even if it was not recognized as such.

The price of some of the most transformative scientific discoveries **(1)** _____. Beyond the famous case of Marie Curie-Sklodowska, Robert Bunsen, the inventor of the **ubiquitous** Bunsen burner, lost his eye in a lab explosion and nearly died from exposure to the **arsenic** compounds he had synthesized. High-ranking scientists attempting to isolate fluorine lost their lives in explosions or from poisoning. It is also rumored that Galileo permanently blinded himself by observing the sun through one of his telescopes.

Even at the beginning of the 20th century, health-related hazards were considered an almost inevitable consequence of conducting science. To quote the brilliant organic chemist August Kekulé: "Who does not ruin his health by his studies, nowadays will not get anywhere in Chemistry." A lot has changed since Antoine Lavoisier sparked the "chemical revolution" more than 200 years ago. The last century **(2)** _____, and the rapid expansion of biomolecular sciences towards the end of the millennium created never-before-encountered types of hazards, requiring new approaches.

The past 30 years have been thankfully free from many previously common but dangerous lab practices such as in-lab smoking, washing hands in benzene, and tasting reagents. One can see evidence of a new culture of lab safety in the **layout** of modern labs. Offices are typically completely separated from laboratory spaces, for example. This arrangement was rare in the mid-1980s, but is now common practice.

Lab managers have also grown more aware of the occupational hazards at the bench. High-quality, flame-resistant materials are now commonplace, and gas fixtures have largely disappeared from biological labs. Every aisle is now equipped with an emergency shower, there are designated areas for working with

radiation, and separate sinks for laboratory work and hand washing.

Perhaps the most significant change in lab-safety protocols over the past three decades involves the practice of mouth pipetting. Veteran life scientists could likely compete on what was the most dangerous substance **(3)** _____. Even solutions of pathogenic cultures or radioactive isotopes were pipetted this way in decades past. Although statistical data on lab incidents are very hard to collect and interpret, from the mid-1970s up until the 1990s mouth pipetting was a known cause of lab-acquired infections (*Clin Microbiol Rev*, 1995). Cases of infections acquired in this way were still occasionally reported in the late 1990s. Mechanical pipettes or automated liquid-handling systems gradually became a lot more accessible and affordable, and now they're fixtures in most life-science labs.

With all the improvements in lab safety, how comfortable do researchers actually feel? A 2013 *Nature* review largely based on a survey conducted by the University of California, Los Angeles (UCLA), found that **(4)** _____ or **witnessed** a lab accident that resulted in an injury on at least one occasion. Thirty percent of these cases involved a severe injury.

Beyond these surprising statistics, recent years have seen dramatic lab accidents and casualties in both the U.S. and the U.K. The UCLA survey was prompted by the death of a research assistant, who **succumbed** to burns suffered in a tragic lab fire in the university's Molecular Sciences Building in 2009. Just two years later, a lab accident at Yale University claimed the life of a 22-year old student. And in the U.K. in 2007, foot-and-mouth disease swept through southern England after the virus escaped from the Pirbright Institute for Animal Health. Just two years ago, investigators conducting a routine inventory check at the National Institutes of Health in Bethesda, Maryland, found **vials** containing live smallpox virus lying abandoned in a general-purpose cold-storage room.

(5) _____ has been largely driven not only by societal and technological change, but also by funding available for the maintenance of lab facilities, training of personnel, and the appointment of dedicated safety officers. Many developing countries are still struggling with the proper upkeep of their research institutions, which consequently affects the safety of those facilities. While in the next 30 years we will surely see a further evolution in laboratory technology and practice, we still have plenty to learn from past and current mistakes.

By Michal Barski
https://www.the-scientist.com/

9. *Answer the following questions.*

1. What are the stereotypical imagery about scientific researchers?
2. For which outstanding scientists the price of their research was their life or health?
3. When health-related hazards were considered an almost inevitable consequence of conducting science?
4. What are previously common but dangerous lab practices?
5. How every aisle of the laboratory is now equipped?

6. What were most scientists pipetted in the laboratory in decades past?
7. What was a known as a cause of lab-acquired infections from the mid-1970s up until the 1990s?
8. How many percent of lab accidents involved a severe injury?
9. What kind of lab accident was at Yale University in 2011?
10. When will we see a further evolution in laboratory technology and practice?

10. *Decide whether each statement is true or false.*

1.	From mouth pipetting to automated liquid handling, life-science labs have gotten much safer over the past three decades.	✚
2.	Outstanding scientists attempting to isolate fluorine lost their lives in explosions or from poisoning.	
3.	A lot has changed since Antoine Lavoisier suppressed the "chemical revolution" more than 200 years ago.	
4.	One can see evidence of a new culture of lab safety in the tools of modern labs.	
5.	The most essential change in lab-safety protocols over the past three decades involves the practice of mouth pipetting.	
6.	Investigators found vials containing live watepox virus lying abandoned in a general-purpose cold-storage room.	

11. *Match the following words with their synonyms.*

1. foul	**a)** misfortune	**1. inevitable**	**a)** ordinary
2. mishap	**b)** clumsy	**2. commonplace**	**b)** disaster
3. clunky	**c)** disgusting	**3. casualty**	**c)** necessary

12. *Instead of words used in the text above, put into the gaps their synonyms from the previous exercise.*

1. Working experimentalists are generally more than familiar with _____ smells, contamination _____, cluttered and _____ equipment, and space shortages. **2.** Even at the beginning of the 20th century, health-related hazards were considered an almost _____ consequence of conducting science. **3.** High-quality, flame-resistant materials are now _____, and gas fixtures have largely disappeared from biological labs. **4.** Beyond these surprising statistics, recent years have seen dramatic lab accidents and _____ in both the U.S. and the U.K.

Watching DVD

13. *Watch the DVD (https://www.youtube.com/watch?v=MYnMXEcHI7U). Put the actions below in the correct order.*

1. Immortal Hela" discovered by George Gey. _____
2. Discoveries made thanks to "Hela" cells. _____
3. Henrietta Lacks' story. _____
4. Attempts of human cells growing _____ *a* _____
5. Production of "Hela" cells._____

14. *According to the video, match the words and their definitions.*

1. to float	**a)** (of a child, animal, or plant) grow or develop well or vigorously.
2. to endanger	**b)** the action of widely spreading and promoting an idea, theory, etc.
3. to thrive	**c)** to produce something automatically, without much thought, and in large amounts.
4. apoptosis	**d)** put (someone or something) at risk or in danger.
5. propagation	**e)** the programmed death of some of an organism's cells as part of its natural growth and development.
6. to churn out	**f)** (of a person or animal) able to recover quickly from difficult conditions.
7. turn of fate	**g)** move or hover slowly and lightly in a liquid or the air.
8. consent	**h)** outcome of a situation for someone or something, seen as outside their control.
9. resilient	**i)** permission.

15. *Use the words from the box to complete the sentences.*

churning out **float** **apoptosis** **consent** **propagation** **thrived** **turn of fate** **resilient** **endangering**

1. Imagine something small enough to _____ on a particle of dust that holds the keys to understanding cancer, virology and genetics. **2.** Scientists grow human cells in the lab to study how they function, understand how diseases develop, and test new treatments without _____ patients. **3.** When individual cells died, generations of copies took their place and _____. **4.** They (normal human cells) can divide about 50 times before they self destruct in

a process called _____. This prevents the _____ of genetic errors that creep in after repeated rounds of division. **5.** Soon the world's first cell production facility was _____ 6 trillion Hela cells a week, and scientists put them to work in an ethically problematic way, building careers and fortunes off of Henrietta's cells without her or her family's _____, or even knowledge until decades later. **6.** In an interesting _____, thanks to Hela, we know that cervical cancer can be caused by a virus called HPV and now there's a vaccine. **7.** Hela cells are so _____ that they can travel on almost any surface: a lab-worker's hand, a piece of dust, invading cultures of other cells and taking over like weeds, countless cures, patents and discoveries all made thanks to Henrietta Lacks.

16. *Watch the DVD again, are the statements true or false?*

1. Until 1951, all human cell lines that researches tried to grow had died after a few days.	V
2. John Hopkins' scientist named George Gey received a specimen of a strange looking tumor: dark violet, shiny, jelly-like.	
3. The result was an endless source of different cells that's still around today.	
4. Gey labeled it "Hela" after the patient with the unusual swelling, Henrietta Lacks.	
5. Henrietta Lacks died of aggressive cervical cancer a few months after tumorous cells were harvested.	
6. When Dr.Gey realized he had the first immortal line of human cells, he sent samples to labs all over the world.	

17. *According the video, choose the correct answer (A-C) for the following questions.*

1. What epidemic in the early 50s did the Hela cells allow to test the vaccine against?

a. Ebola epidemic.
b. polio epidemic.
c. measles epidemic.

2. How do we know that human cells have 46 chromosomes?

a. Hela helped to discover a chemical that makes chromosomes visible.
b. Hela helped to discover a chemical that makes chromosomes invisible.
c. Hela cells were the first to be cloned.

Glossary

Unit 1 — Profession pharmacist

health care [ˈhɛlθkɛː] the organized provision of medical care to individuals or a community.

patient [ˈpeɪʃ(ə)nt] a person receiving or registered to receive medical treatment.

physician [fɪˈzɪʃ(ə)n] a person qualified to practise medicine, especially one who specializes in diagnosis and medical treatment as distinct from surgery.

medicine [ˈmɛds(ə)n, ˈmɛdɪsɪn] 1. a science or practice of the diagnosis, treatment, and prevention of disease. 2. a drug or other preparation for the treatment or prevention of disease.

drug [drʌg] a medicine or other substance which has a physiological effect when ingested or otherwise introduced into the body.

medication [mɛdɪˈkeɪʃ(ə)n] a drug or other form of medicine that is used to treat or prevent disease.

dosage [ˈdəʊsɪdʒ] the size or frequency of a dose of a medicine or drug.

curriculum [kəˈrɪkjʊləm] the subjects comprising a course of study in a school or college.

pharmacist [ˈfɑːməsɪst] a person who is professionally qualified to prepare and dispense medicinal drugs.

chemist [ˈkɛmɪst] – 1. a person who is professionally qualified to prepare and dispense medicinal drugs. 2. a scientist trained in the study of chemistry.

druggist [ˈdrʌgɪst] a pharmacist or retailer of medicinal drugs.

academic pharmacist [akəˈdɛmɪk ˈfɑːməsɪst] full-time faculty members of an educational institute (e.g. University, Polytechnic, etc.).

clinical pharmacist [ˈklɪnɪk(ə)l ˈfɑːməsɪst] a pharmacist trained in clinical aspects of patient care.

retail pharmacist [ˈriːteɪl ˈfɑːməsɪst] a pharmacist who provides general healthcare advice and supply prescription and non-prescription medication to the public.

industry pharmacist [ˈɪndəstri ˈfɑːməsɪst] a pharmacist who works in companies that manufacture medicines.

compounding pharmacist [kəmˈpaʊndɪŋ ˈfɑːməsɪst] a pharmacist who makes drugs prescribed by doctors for specific patients.

nuclear pharmacist [ˈnjuːklɪə ˈfɑːməsɪst] a pharmacist who improves public health through the safe and effective use of radioactive drugs for diagnosis and therapy.

poison control pharmacist [ˈpɔɪz(ə)n kənˈtrəʊl ˈfɑːməsɪst] a pharmacist who works with medical professionals and sick patients on drugs and toxicity.

Bachelor of Pharmacy [ˈbaʦʃələ ov ˈfɑːməsi] a University Degree that was awarded after an undergraduate pharmacy program.

Master of Pharmacy [ˈmɑːstə ov ˈfɑːməsi] a postgraduate Academic Degree which is awarded for a program in the pharmacy field.

Doctor of Pharmacy [ˈdɒktə ov ˈfɑːməsi] the highest University Degree in the pharmacy field.

pharmacology [fɑːməˈkɒlədʒi] a branch of medicine concerned with the uses, effects and modes of action of drugs.

pharmacognosy [ˌfɑːməˈkɒgnəsi] a branch of knowledge concerned with medicinal drugs obtained from plants or other natural sources.

analytical chemistry [anəˈlɪtɪk(ə)l ˈkɛmɪstri] the subdivision of chemistry dealing with the qualitative and quantitative

determination of chemical components of substances.

organic chemistry [ɔːˈganık ˈkɛmıstri] a branch of chemistry that deals with carbon compounds.

physical and colloid chemistry [ˈfızık(ə)l ənd ˈkɒlɔıd ˈkɛmıstri] a branch of chemistry that deals with matter in a state of very fine subdivision.

biochemistry [bʌıə(ʊ)ˈkɛmıstri] branch of science concerned with the chemical and physico-chemical processes and substances that occur within living organisms.

pharmaceutical chemistry [ˌfɑːməˈs(j)uːtık(ə)l ˈkɛmıstri] a study of drugs which includes drug discovery, delivery, absorption, metabolism, and more.

pharmaceutical botany [ˌfɑːməˈs(j)uːtık(ə)l ˈbɒt(ə)ni] one of the base subject of pharmacognosy that studies the traditional or folk use of plant to prevent and treat diseases.

microbiology [ˌmaıkrəʊbaıˈɒlədʒi] the study of microscopic organisms, such as bacteria, fungi and protists.

pathophysiology [paθəʊfızıˈɒlədʒi] a study of the functional changes associated with or resulting from disease or injury.

anatomy [əˈnatəmi] a branch of science concerned with the bodily structure of humans, animals and other living organisms.

MRI [ɛmɑːrˈʌı] (*magnetic resonance imaging*) a medical imaging technique used in radiology to create detailed images of the organs and tissues within the body.

CT scan [si ti ˈskæn] (*computed tomography scan*) a medical imaging procedure that can reveal anatomic details of internal organs that cannot be seen in conventional X-rays.

side effect [sʌıd ɪˈfɛkt] a secondary, typically undesirable effect of a drug or medical treatment.

harmful [ˈhɑːmfʊl] causing or likely to cause harm.

Unit 2 Human anatomy

skeleton [ˈskɛlıt(ə)n] an internal or external framework of bone, cartilage, or other rigid material supporting or containing the body of an animal or plant.

trunk [trʌŋk] a person's or animal's body apart from the limbs and head.

spine [spʌın] a series of vertebrae extending from the skull to the small of the back, enclosing the spinal cord and providing support for the thorax and abdomen *synonym:* **vertebral column** [ˈvɜːtıbrəl ˈkɒləm].

vertebra (*pl* **vertebrae**) [ˈvɜːtıbrə / ˈvɜːtıbriː] each of the series of small bones forming the backbone.

skin [skın] a thin layer of tissue forming the natural outer covering of the body of a person or animal.

bone [bəʊn] a hard, calcified tissue that forms the skeleton of most vertebrates.

breastbone [ˈbrɛs(t)bəʊn] a thin, flat bone running down the centre of the chest, to which the ribs are attached.

boneless [ˈbəʊnlıs] something without bones.

pelvic bone [ˈpɛlvık bəʊn] a bony structure near the base of the spine to which the legs are attached.

rib [rıb] one of a series of long curved bones that protects the internal organs.

tendon [ˈtɛndən] a strong cord in a person's or animal's body which joins a muscle to a bone.

cartilage [ˈkɑːt(ı)lıdʒ] a strong, flexible type of connective tissue found within a body, especially around joints.

ligament [ˈlıgəm(ə)nt] a band of strong tissue in a person's body which connects bones.

joint [dʒɔınt] a connection made between bones in the body for the purpose of permitting body parts to move.

limb [lım] an arm or leg of a person or four-legged animal, or a bird's wing. *synonym:* **extremity** [ıkˈstrɛmıti].

upper limb [ˈʌpə lɪm] the region in a vertebrate animal including the hand, arm and shoulder.

lower limb [ˈləʊəˈʌpə lɪm] the region in a vertebrate animal from hip to toes, including your hip, thigh, knee, leg, ankle, foot, and toes.

upper arm [ˈʌpə ɑːm] a part of the arm between the shoulder and the elbow.

shoulder [ˈʃəʊldə] the upper joint of each of a person's arms and the part of the body between this and the neck.

forearm [ˈfɔːrɑːm] the part of a person's arm extending from the elbow to the wrist or the fingertips.

elbow [ˈɛlbəʊ] the joint between the forearm and the upper arm.

wrist [rɪst] the joint connecting the hand with the forearm.

index (finger) [ˈɪndɛks ˈfɪŋgə] the finger next to the thumb; the forefinger. *synonym:* **forefinger** [ˈfɔːfɪŋgə]

thumb [θʌm] the short, thick first digit of the human hand, set lower and apart from the other four and opposable to them.

thigh [θʌɪ] the part of the human leg between the hip and the knee.

hip [hɪp] the joint that connects the leg to the upper part of the body.

knee [niː] the joint between the thigh and the lower leg in humans.

kneecap [ˈniːkap] the bone at the front of the knee joint. *synonym:* **patella** [pəˈtɛlə].

ankle [ˈaŋk(ə)l] the joint connecting the foot with the leg.

heel [hiːl] the back part of the human foot below the ankle.

toe [təʊ] any of the five digits at the end of the human foot.

skull [skʌl] the bony framework of the head, enclosing the brain and supporting the face. *synonym:* **cranium** (*pl* **crania**) [ˈkreɪnɪəm / ˈkreɪnjə].

forehead [ˈfɔrɪd / ˈfɔːhɛd] the part of the face above the eyebrows.

temple [ˈtɛmp(ə)l] the region on each side of the head in front of the ear and above the cheek bone.

cheek [tʃiːk] either side of the face below the eye.

cheekbone [ˈtʃiːkbəʊn] the bone below the eye.

chin [tʃɪn] the lower extremity of the face, below the mouth.

jaw [dʒɔː] each of the upper and lower bony structures in vertebrates forming the framework of the mouth and containing the teeth. *synonym:* **mandible** [ˈmandɪb(ə)l].

eyebrow [ˈɛlbəʊ] the joint between the forearm and the upper arm.

eyelid [ˈʌɪlɪd] each of the upper and lower folds of skin which cover the eye when closed.

eyelash [ˈʌɪlaʃ] each of the short curved hairs growing on the edges of the eyelids, serving to protect the eyes from dust.

chest [tʃɛst] the front surface of a person's or animal's body between the neck and the stomach. *synonym:* **thorax** [ˈθɔːraks].

abdomen [ˈabdəmən, abˈdəʊmən] the part of the body of a vertebrate containing the digestive and reproductive organs. *synonyms:* **stomach** [ˈstʌmək], **belly** [ˈbɛli], **gut** [gʌt].

cavity [ˈkavɪti] an empty space within the body, an organ, a bone, etc.

Unit 3 Human internal organs

integumentary system [ɪnˌtɛgjʊˈmentərɪ ˈsɪstəm] the set of organs that forms the external covering of the body and protects it from many threats such as infection etc.

skeletal system [ˈskɛlɪt(ə)l ˈsɪstəm] the framework of the body, consisting of bones and other connective tissues, which protects and supports the body tissues and internal organs.

muscular system [ˈmʌskjʊlə ˈsɪstəm] the system in the body composed of muscle cells and tissues that brings about movement of an organ or body part.

nervous system [ˈnəːvəs ˈsɪstəm] the network of nerve cells and fibres which transmits nerve impulses between parts of the body.

endocrine system [ˈɛndə(ʊ)krʌɪn / ˈɛndə(ʊ)krɪn ˈsɪstəm] the collection of glands that produce hormones that regulate metabolism, growth and development, tissue function, sexual function, reproduction, sleep, and mood, among other things.

cardiovascular system [ˌkɑːdɪəʊˈvaskjʊlə ˈsɪstəm] an organ system that permits blood to circulate and transport nutrients (such as amino acids and electrolytes). *synonym:* **circulatory system** [ˈsəːkjʊlət(ə)ri / səːkjʊˈleɪt(ə)ri ˈsɪstəm].

respiratory system [rɪˈspɪrət(ə)ri / rɪˈspʌɪrət(ə)ri ˈsɪstəm] a system of organs functioning in respiration and in humans consisting especially of the nose, nasal passages, pharynx, larynx, trachea, bronchi, and lungs.

digestive system [dʌɪˈdʒɛstɪv / dɪˈdʒɛstɪv ˈsɪstəm] the system of organs responsible for getting food into and out of the body and for making use of food to keep the body healthy.

urinary system [ˈjʊərɪn(ə)ri ˈsɪstəm] the system of organs which purpose is to eliminate waste from the body, regulate blood volume and blood pressure, control levels of electrolytes and metabolites, and regulate blood pH.

reproductive system [ˌriːprəˈdʌktɪv ˈsɪstəm] a system of sex organs within an organism. *synonym:* **genital system** [ˈdʒɛnɪt(ə)l ˈsɪstəm].

lymphatic system [lɪmˈfatɪk ˈsɪstəm] a network of tissues and organs that help rid the body of toxins, waste and other unwanted materials.

tissue [ˈtɪʃuː,ˈtɪsjuː] any of the distinct types of material of which animals or plants are made.

heart [hɑːt] a hollow muscular organ that pumps the blood through the circulatory system by rhythmic contraction.

brain [breɪn] an organ of soft nervous tissue contained in the skull of vertebrates, functioning as the coordinating centre of sensation and intellectual and nervous activity.

spinal cord [ˈspʌɪn(ə)l kɔːd] the major column of nerve tissue that is connected to the brain and lies within the vertebral canal and from which the spinal nerves emerge.

bone marrow [bəʊn ˈmarəʊ] the soft blood-forming tissue that fills the cavities of bones. *synonym:* **marrow** [ˈmarəʊ].

kidney [ˈkɪdni] a pair of organs in the abdominal cavity of mammals.

liver [ˈlɪvə] a large organ in a body which processes blood and helps to clean unwanted substances out of it.

lung [lʌŋ] a pair of breathing organs located with the chest which remove carbon dioxide from and bring oxygen to the blood.

spleen [spliːn] an abdominal organ involved in the production and removal of blood cells in most vertebrates and forming part of the immune system.

blood [blʌd] the red liquid that circulates in the arteries and veins of humans, carrying oxygen to and carbon dioxide from the tissues of the body.

blood vessel [blʌd ˈvɛs(ə)l] a tubular structure carrying blood through the tissues and organs; a vein, artery or capillary.

muscle [ˈmʌs(ə)l] a tissue composed of cells or fibers, the contraction of which produces movement in the body.

thyroid gland [ˈθʌɪrɔɪd gland] a gland that makes and stores hormones that help regulate the heart rate, blood pressure, body temperature, and the rate at which food is converted into energy.

adrenal gland [əˈdriːn(ə)l gland] a small gland located on top of the kidney that produce a variety of hormones including adrenaline and the steroids aldosterone and cortisol.

sweet gland [swiːt gland] a small gland that secretes sweat, situated in the dermis of the skin.

pancreas [ˈpaŋkrɪəs] a large gland behind the stomach which produces enzymes that

are released into the small intestine to help with digestion.

vein [veɪn] a blood vessel that carries blood that is low in oxygen content from the body back to the heart.

artery [ˈɑːtəri] a blood vessel that takes blood away from the heart to all parts of the body (tissues, lungs, etc.).

larynx [ˈlarɪŋks] the area of the throat containing the vocal cords and used for breathing, swallowing and talking.

pharynx [ˈfarɪŋks] cone-shaped passageway leading from the oral and nasal cavities in the head to the esophagus and larynx.

bronchus (*pl* **bronchi**) [ˈbrɒŋkəs /ˈbrɒŋkʌɪ] a passage or airway in the respiratory system that conducts air into the lungs.

trachea [trəˈkiːə,ˈtreɪkɪə] a tube-like portion of the respiratory tract that connects the larynx with the bronchial parts of the lungs. *synonym:* **windpipe** [ˈwɪn(d)pʌɪp].

(o)esophagus [ɪˈsɒfəgəs] the passage by which food passes from the mouth to the stomach. *synonym:* **gullet** [ˈgʌlɪt].

gallbladder [ˈgɔːlˌblædə] the small sac-shaped organ beneath the liver, in which bile is stored after secretion by the liver and before release into the intestine.

urinary bladder [ˈjʊərɪn(ə)ri blædə] a hollow muscular organ in humans and vertebrates that collects and stores urine from the kidneys before disposal by urination. *synonym:* **bladder** [blædə].

rectum [ˈrɛktəm] the final section of the large intestine, terminating at the anus.

small intestine [smɔːl ɪnˈtɛstɪn] the lower part of the alimentary canal from the end of the stomach to the anus.

large intestine [lɑːdʒ ɪnˈtɛstɪn] a posterior section of the intestine, consisting typically of four regions: the cecum, colon, rectum, and anus. *synonym:* **colon** [ˈkəʊlən].

anus [ˈeɪnəs] the opening at the end of the alimentary canal through which solid waste matter leaves the body.

genitals [ˈdʒɛnɪt(ə)ls] a person's or animal's external organs of reproduction.

gonad [ˈgəʊnad] an organ that produces gametes.

lymph node [lɪmf nəʊd] one of many small, bean-shaped organs located throughout the lymphatic system.

ureter [jʊˈriːtə] a tube that carries urine from the kidney to the urinary bladder.

urethra [jʊˈriːθrə] a tube that connects the urinary bladder to the urinary meatus for the removal of urine from the body of both females and males.

Unit 4 Types of diseases

disorder [dɪsˈɔːdə] a problem or illness which affects someone's mind or body.

disease [dɪˈziːz] a particular abnormal condition that negatively affects the structure or function of all or part of an organism. *synonym:* **illness** [ˈɪlnəs].

physical disease [ˈfɪzɪk(ə)l dɪˈziːz] any deviation from the normal structural or functional state with certain signs and symptoms such as physical injury.

mental disease [ˈmɛnt(ə)l dɪˈziːz] any of various psychiatric conditions, usually characterized by impairment of an individual's normal cognitive, emotional, or behavioral functioning and caused by physiological or psychosocial factors.

infectious disease [ɪnˈfɛkʃəs dɪˈziːz] a disorder caused by organisms such as bacteria, viruses, fungi or parasites.

contagious disease [kənˈteɪdʒəs dɪˈziːz] a disease, which is transmitted to other persons, either by physical contact with the person suffering the disease, or by casual contact with their secretions or objects touched by them or airborne route among other routes.

deficiency disease [dɪˈfɪʃ(ə)nsi dɪˈziːz] a disease caused by the lack of an element in the diet, usually a particular vitamin or mineral.

inherited disease [ɪnˈhɛrɪtɪd dɪˈziːz] a disease caused by an abnormality in an individual's genome.

congenital disease [kənˈdʒɛnɪt(ə)l dɪˈziːz] a disease that is present at birth.

acute disease [əˈkjuːt dɪˈziːz] an illnesses which generally develops suddenly and last a short time.

chronic disease [ˈkrɒnɪk dɪˈziːz] an illness that lasts for a long time, keeps coming back or continues to happen.

diphtheria [dɪfˈθɪərɪə] an acute contagious disease typically marked by the formation of a false membrane in the throat and caused by a gram-positive bacterium that produces a toxin causing inflammation of the heart and nervous system.

mumps [mʌmps] a contagious and infectious viral disease causing swelling of the parotid salivary glands in the face, and a risk of sterility in adult males. *synonym:* **infectious parotitis** [ɪnˈfɛkʃəs parəˈtʌɪtɪs].

measles [ˈmiːz(ə)lz] an infectious viral disease causing fever and a red rash, typically occurring in childhood. *synonym:* **morbilli** [mɔːˈbɪlʌɪ / mɔːˈbɪliː]; **rubeola** [rʊˈbiːələ].

rubella [rʊˈbɛlə] a usually mild contagious viral disease characterized by fever, mild upper respiratory congestion, and a fine red rash lasting a few days.

typhus [ˈtʌɪfəs] an infectious disease spread by lice, characterized by a purple rash, headaches, fever, and causes a mortality during wars and famines.

cholera [ˈkɒlərə] an infectious and often fatal bacterial disease of the small intestine, typically contracted from infected water supplies and causing severe vomiting and diarrhoea which can lead to dehydration and even death.

plague [pleɪg] a contagious bacterial disease spread by fleas, characterized by fever and delirium, typically with the formation of buboes (*bubonic plague*) and sometimes infection of the lungs (*pneumonic plague*).

smallpox [ˈsmɔːlpɒks] infectious disease that begins with fever and headache and proceeds to an eruption of the skin that leaves pockmarks.

chickenpox [ˈʧɪkɪnpɒks] an infectious disease causing a mild fever and a rash of itchy inflamed pimples which turn to blisters. *synonym:* **varicella** [ˌvarɪˈsɛlə]; **waterpox** [ˈwɔːtəpɒks].

pertussis [pəˈtʌsɪs] a contagious bacterial disease chiefly affecting children, characterized by convulsive coughs followed by a whoop. *synonym:* **whooping cough** [ˈhuːpɪŋ ˌkɒf].

influenza [ɪnflʊˈɛnzə] a highly contagious viral infection of the respiratory passages causing fever, severe aching, and often occurring in epidemics. *synonyms:* **flu** [fluː]; **grippe** [grɪp].

tuberculosis (TB) [tjʊˌbəːkjʊˈləʊsɪs] a bacterial disease that spreads through droplets in the air and mainly affects the lungs.

meningitis [ˌmɛnɪnˈʤʌɪtɪs] a serious disease in which there is inflammation of the meninges, caused by viral or bacterial infection, and marked by intense headache and fever, sensitivity to light, and muscular rigidity.

jaundice [ˈʤɔːndɪs] yellow discoloration of the skin, whites of the eyes, etc., due to an increase of bile pigments in the blood.

hives [hʌɪvz] an allergic disorder marked by red patches of skin or mucous membrane and usually by intense itching caused by contact with a specific factor (as a food, drug, or inhalant).

tetanus [ˈtɛt(ə)nəs] a bacterial disease marked by rigidity and spasms of the voluntary muscles. *synonym:* **lockjaw** [ˈlɒkdʒɔː].

syphilis [ˈsɪfɪlɪs] a chronic bacterial disease that is contracted chiefly by infection during sexual intercourse, but also congenitally by infection of a developing fetus.

rabies [ˈreɪbɪz] a contagious and fatal viral disease of dogs and other mammals, transmissible through the saliva to humans and causing madness, convulsions and death.

malaria [məˈlɛːrɪə] is a mosquito-borne infectious disease that affects humans and is characterized by periodic attacks of chills and fever.

diabetes [dʌɪəˈbiːtiːz] a chronic disease associated with abnormally high levels of the sugar glucose in the blood.

asthma [ˈasmə] a respiratory condition marked by attacks of spasm in the bronchi of the lungs, causing difficulty in breathing.

heart failure [hɑːt ˈfeɪljə] a condition in which the heart can't pump enough blood to meet the body's needs.

isch(a)emia [ɪˈskiːmɪə] an inadequate blood supply to an organ or part of the body, especially the heart muscles.

gout [gaʊt] a disease in which defective metabolism of uric acid causes arthritis, especially in the smaller bones of the feet, deposition of chalk-stones, and episodes of acute pain.

rheumatoid arthritis [ˈruːmətɔɪd ɑːˈθrʌɪtɪs] a disease causing painful inflammation and stiffness of the joints.

cancer [ˈkansə] a disease caused by a malignant growth or tumour resulting from an uncontrolled division of abnormal cells in a part of the body.

anthrax [ˈanθraks] a serious bacterial disease of sheep and cattle, that can be transmitted to humans, typically affecting the skin and lungs, causing fever, swelling, and often death.

AIDS [eɪdz] a disease in which there is a severe loss of the body's cellular immunity, greatly lowering the resistance to infection and malignancy.

Ebola virus [iːˈbəʊlə ˈvʌɪrəs] an infectious and frequently fatal disease marked by fever and severe internal bleeding, spread through contact with infected body. *synonym:* **Ebola** [iːˈbəʊlə].

pneumonia [njuːˈməʊnɪə] an infection causes inflammation in the alveoli with fluid or pus in one or both lungs.

scurvy [ˈskəːvi] a disease resulting from a lack of vitamin C which is characterized by weakness, feeling tired, loosening of the teeth, and a bleeding into the skin. *synonym:* **scorbutus** [skɔːˈbjuːtəs].

rickets [ˈrɪkɪts] a disease of childhood, characterized by softening of the bones as a result of inadequate intake of vitamin D. *synonym:* **rachitis** [rəˈkaɪtɪs].

visual impairment [ˈvɪzjʊəl ɪmˈpɛːm(ə)nt] a decreased ability to see to a degree that causes problems not fixable by usual means, such as glasses. *synonym:* **nyctalopia** [ˌnɪktəˈləʊpɪə].

ambiopia [ˌæmblɪˈəʊpɪə] the perception of two images of a single object; also called, double vision.

cirrhosis [sɪˈrəʊsɪs] a chronic disease of the liver marked by degeneration of cells, inflammation, and fibrous thickening of tissue.

hemophilia [ˌhiːməˈfɪlɪə] a medical condition in which the ability of the blood to clot is severely reduced, causing the sufferer to bleed severely from even a slight injury.

Down syndrome [daʊn ˈsɪndrəʊm] a condition in which a person has an extra chromosome that impacts how a person looks and their ability to think, learn, and reason.

schizophrenia [ˌskɪtsə(ʊ)ˈfriːnɪə] a serious mental disorder in which people interpret reality abnormally.

neurosis (*pl* neuroses) [ˌnjʊəˈrəʊsɪs / njʊəˈrəʊsiːz] a relatively mild mental illness involving symptoms of stress (depression, anxiety, obsessive behaviour, hypochondria) but not a radical loss of touch with reality.

systemic lupus erythematosus [sɪˈstɛmɪk ˈluːpəsˌerəˌθēməˈtōsəs] a chronic, inflammatory, variable autoimmune disease of connective tissue that occurs chiefly in women and is typically characterized by fever, skin rash, fatigue, and joint pain and often by disorders of the blood, kidneys, heart, lungs, and brain.

stroke [strəʊk] the sudden death of brain cells due to lack of oxygen, caused by blockage of blood flow or rupture of an artery to the brain which is characterized by loss of speech, weakness, or paralysis of one side of the body.

gastric ulcer [ˈgastrɪk ˈʌlsə] ulcer located in the stomach's inner wall, caused in part by the corrosive action of the gastric juice on the mucous membrane. *synonym:* **stomach ulcer** [ˈstʌmək ˈʌlsə].

diarrhea [ˌdʌɪəˈrɪə] a condition in which faeces are discharged from the bowels frequently and in a liquid form.

Unit 5 Signs of pain

pain [peɪn] highly unpleasant physical sensation caused by illness or injury. *synonym:* **ache** [eɪk].

chronic pain [ˈkrɒnɪk peɪn] an illness persisting for a long time or constantly recurring.

acute pain [əˈkjuːt peɪn] a pain that comes on quickly, can be severe, but lasts a relatively shorter period of time. *synonym:* **sharp pain** [ʃɑːp peɪn].

stabbing pain [ˈstabɪŋ peɪn] a pain or sensation sharp and sudden. *synonym:* **stinging pain** [ˈstɪŋɪŋ peɪn].

cutting pain [ˈkʌtɪŋ peɪn] a pain as sharp as knife.

burning pain [ˈbəːnɪŋ peɪn] a pain caused by damage or dysfunction in the nervous system.

colicky pain [ˈkɒlɪki peɪn] a sudden strong pain caused by a muscle suddenly contracting. *synonym:* **cramping pain** [krampɪŋ peɪn].

gnawing pain [ˈnɔː(r)ɪŋ peɪn] a dull, constant pain, or hunger pains. *synonym* **nagging pain** [ˈnagɪŋ peɪn].

shooting pain [ˈʃuːtɪŋ peɪn] a severe pain that starts in one place then quickly moves to another.

throbbing pain [ˈθrɒbɪŋ peɪn] a pain found in dental caries, headache and localized inflammation.

dull pain [dʌl peɪn] a chronic or persistent pain caused by radiculitis, neuritis, tension of ligaments.

symptom [ˈsɪm(p)təm] a physical or mental feature which is regarded as indicating a condition of disease. *synonym:* **sign** [sʌɪn].

chill [tʃɪl] a feeling of a moderate but penetrating coldness.

malaise [maˈleɪz] a general feeling of discomfort, of being ill or having no energy, or an uncomfortable feeling illness.

lassitude [ˈlasɪtjuːd] a state of physical or mental weariness; lack of energy. *synonym:* **fatigue** [fəˈtiːg]; **tiredness** [ˈtʌɪədnəs].

weakness [ˈwiːknəs] the state or condition of being weak.

prostration [prɒˈstreɪʃ(ə)n] an extreme physical weakness or emotional exhaustion.

paleness [ˈpeɪlnəs] the state of being pale.

insomnia [ɪnˈsɒmnɪə] habitual sleeplessness; inability to sleep.

restlessness [ˈrɛstləsnəs] the inability to rest or relax as a result of anxiety or boredom.

somnolence [ˈsɒmnələns] a state of strong desire for sleep, or sleeping for unusually long periods. *synonym:* **drowsiness** [ˈdraʊzɪnəs].

dizziness [ˈdɪzɪnəs] a sensation of spinning around and losing one's balance.

tumor [ˈtjuːmə] a swelling of a part of the body, generally without inflammation, caused by an abnormal growth of tissue.

swelling [ˈswɛlɪŋ] an abnormal enlargement of a part of the body, typically as a result of an accumulation of fluid.

discharge [dɪsˈtʃɑːdʒ] the flow of fluid from part of the body, such as from the nose or vagina.

bleeding [ˈbliːdɪŋ] losing blood from the body as a result of injury or illness. *synonym:* **hemorrhage** [ˈhɛmərɪdʒ].

irritability [ˌɪrɪtəˈbɪlɪti] the quality or state of being irritable.

fever [ˈfiːvə] an abnormally high body temperature, usually accompanied by shivering, headache. *synonym:* **heat** [hiːt].

runny nose [ˈrʌni nəʊz] a condition of discharge of mucus from the nose.

stuffy nose [ˈstʌfi nəʊz] the blockage of the nasal passages usually as a result of inflammation from a common cold virus infection

sore throat [sɔːθrəʊt] a condition marked by pain in the throat, typically caused by inflammation due to a cold or other virus.

dry cough [drʌɪ kɒf] a cough that doesn't bring up mucus. *synonym:* **hacking** [ˈhakɪŋ].

sneeze [sniːz] a sudden violent spasmodic audible expiration of breath through the nose and mouth. *synonym:* **sneezing** [sniːzɪŋ].

sputum [ˈspjuːtəm] a mucus that is coughed up from the trachea and bronchi.

sweating [swɛtɪŋ] the act of secreting fluid from the skin by the sweat glands.

vomiting [ˈvɒmɪtɪŋ] an involuntary forceful discharge of stomach contents.

rash [raʃ] an eruption on the body. *synonym:* **eruption** [ɪˈrʌpʃ(ə)n].

itch [ɪtʃ] an uncomfortable sensation on the skin that causes a desire to scratch.

lethargy [ˈlɛθədʒi] a lack of energy and enthusiasm.

palpitation [palpɪˈteɪʃ(ə)n] a rapid, strong, or irregular heartbeat due to agitation, exertion, or illness.

dyspnea [dɪspˈniːə] a feeling of not being able to breathe. *synonym:* **shortness of breath** [ˈʃɔːtnəs ɒv brɛθ].

heart attack [hɑːt əˈtak] the death of heart muscle due to the loss of blood supply.

numbness [ˈnʌmnəs] a loss of sensation or feeling in a part of your body.

nausea [ˈnɔːsɪə /ˈnɔːzɪə] the condition of feeling sick and the feeling that you are going to vomit.

renal failure [ˈriːn(ə)l ˈfeɪljə] a condition in which the kidneys stop working and are not able to remove waste and extra water from the blood or keep body chemicals in balance.

constipation [kɒnstɪˈpeɪʃ(ə)n] a condition in which there is difficulty in emptying the bowels, usually associated with hardened faeces.

heartburn [ˈhɑːtbəːn] a form of indigestion felt as a burning sensation in the chest, caused by acid regurgitation into the oesophagus.

fracture [ˈfraktʃə] a medical condition where the continuity of the bone is broken.

cramp [kramp] a painful involuntary spasmodic contraction of a muscle.

inflammation [ɪnfləˈmeɪʃ(ə)n] a localized physical condition in which part of the body becomes reddened, swollen, hot, and often painful, especially as a reaction to injury or infection.

redness [ˈrɛdnəs] the quality or state of being red or reddish.

anxiety [aŋˈzʌɪəti] a feeling of worry, nervousness about something with an uncertain outcome.

dehydration [ˌdiːhʌɪˈdreɪʃ(ə)n] a harmful reduction in the amount of water in the body.

ulcer [ˈʌlsə] a break in skin or mucous membrane with loss of surface tissue.

Unit 6 Plant, its parts and functions

plant [plɑːnt] a living organism that usually produces seeds and typically has a stem, leaves, roots, and sometimes flowers.

alga (*pl* algae) [ˈalgə / ˈæl.gi:] a simple, non-flowering, and typically aquatic plant of a large group that includes the seaweeds and many single-celled forms.

fungus (*pl* fungi) [ˈfʌŋ.gəs / ˈfʌŋ.gaɪ] any of a group of spore-producing organisms feeding on organic matter, including moulds, yeast, mushrooms, and toadstools.

grass [grɑːs] a low, green plant that grows naturally over a lot of the earth's surface, having groups of very thin leaves that grow close together in large numbers.

shoot [ʃuːt] the first part of a plant to appear above the ground as it develops from a seed, or any new growth on an already existing plant.

stem [stem] the main body of a plant or shrub, typically rising above ground but occasionally subterranean.

trunk [trʌŋk] the main woody stem of a tree as distinct from its branches and roots.

branch [brɑːntʃ] a part of a tree which grows out from the trunk or from a bough.

leaf (*pl* leaves) [liːf / liːvz] one of the flat, usually green parts of a plant that are joined at one end to the stem or branch.

flower [flaʊəʳ] the seed-bearing part of a plant, consisting of reproductive organs (stamens and carpels) that are typically surrounded by a brightly coloured petals and a green sepals.

petal [ˈpɛt(ə)l] any of the usually brightly coloured parts that together form most of a flower.

sepal [ˈsɛp(ə)l, ˈsiːp(ə)l] one of the parts forming the outer part of a flower that surround the petals and are usually small and green.

pistil [ˈpɪstɪl] the female organs of a flower, comprising the stigma, style, and ovary.

carpel [ˈkɑːp(ə)l/] the female reproductive organ of a flower, consisting of an ovary, a stigma, and usually a style.

stigma [ˈstɪgmə] the top of the central female part of a flower, where pollen is received.

style [staɪl] the middle part of the carpel (=female part) of a flower, connecting the ovary to the stigma.

ovary [ˈəʊv(ə)ri] the hollow base of the carpel of a flower, containing one or more ovules. *synonym:* **embryo** [ˈɛmbrɪəʊ].

ovule [ˈɒvjuːl, ˈəʊvjuːl] the part of the ovary of seed plants that contains the female germ cell and after fertilization becomes the seed.

stamen (*pl* stamina) [ˈsteɪmən / ˈstamɪnə] the male fertilizing organ of a flower, typically consisting of a pollen-containing anther and a filament.

stalk [stɔːk] the thin part of a flower that joins it to the plant or tree. *synonym:* **pedicle** [ˈpɛdɪk(ə)l].

receptacle [rɪˈsɛptək(ə)l] the stem to which the floral organs are attached.

filament [ˈfɪləm(ə)nt] a long, thin structure that anchors the anther to the bottom of the flower.

anther [ˈanθə] the part of a stamen that contains the pollen.

pollen [ˈpɒlən] a fine yellow powdery substance, transported by the wind, insects, or other animals, consisting of microscopic grains discharged from the male part of a flower each of which contains a male gamete that can fertilize the female ovule.

to pollen [ˈpɒlən] to take pollen from one plant or part of a plant to another so that new plant seeds can be produced. *synonym:* **to pollinate** [ˈpɒlɪneɪt].

pollination [pɒlɪˈneɪʃ(ə)n] the transfer of pollen to a stigma, ovule, flower, or plant to allow fertilization.

fruit [fruːt] the sweet and fleshy product of a tree or other plant that contains seed and can be eaten as food.

seed [siːd] the unit of reproduction of a flowering plant, capable of developing into another such plant.

root [ruːt] the part of a plant which attaches it to the ground.

tap root [tap ruːt] a straight tapering root growing vertically downwards and forming the centre from which subsidiary rootlets spring.

fibrous root [ˈfʌɪbrəs ruːt] a root system made up of numerous branching roots of more or less equal length, as in most grasses.

tuber [ˈtjuːbə] a much thickened underground part of a stem or rhizome, e.g. in the potato.

rhizome [ˈrʌɪzəʊm] a continuously growing horizontal underground stem which puts out lateral shoots and adventitious roots.

bud [bʌd] a compact growth on a plant that develops into a leaf, flower, or shoot.

lateral bud [ˈlat(ə)r(ə)l bʌd] a bud located on the side of the stem, usually in a leaf axil. *synonym:* **axillary bud** [akˈsɪlərɪ bʌd].

to anchor [ˈaŋkə] to act or serve as an anchor.

to absorb [əbˈsɔːb] to take in a liquid, gas.

absorption [əbˈsɔːpʃ(ə)n] the process by which a substance takes in a liquid.

to fertilize [ˈfəːtɪlʌɪz] to join male and female sexual cells so that young begin to develop.

fertilization [ˌfəːtɪlʌɪˈzeɪʃ(ə)n] the process of joining male and female sexual cells to produce young.

nutrient [ˈnjuːtrɪənt] a substance that provides nourishment essential for the maintenance of life and for growth.

gymnosperm [ˈdʒɪmnə(ʊ)spəːm] a plant of a group that comprises those that have seeds unprotected by an ovary or fruit.

angiosperm [ˈandʒɪə(ʊ)spəːm] a plant of a large group that comprises those that have flowers and produce seeds enclosed within a carpel, including herbaceous plants, shrubs, grasses, and most trees.

dicot [ˈdʌɪkɒt] a flowering plant with an embryo that bears two cotyledons (seed leaves). *synonym:* **dicotyledon** [ˌdʌɪkɒtɪˈliːd(ə)n].

monocot [ˈmɒnə(ʊ)kɒt] a type of plant that produces flowers and has only one cotyledon *synonym:* **monocotyledon** [ˌmɒnə(ʊ)kɒtɪˈliːd(ə)n].

cell [sɛl] the basic structural, functional, and biological unit of all known organisms.

blade [bleɪd] the leaf of an herb or a grass. *synonym:* **lamina** [ˈlamɪnə].

node [nəʊd] a place where a leaf and stem join on a plant.

internode [ˈɪntənəʊd] a part of a plant stem between two of the nodes from which leaves emerge.

bendable [ˈbendəbl] capable of being flexed or twisted without breaking.

insect [ˈɪnsɛkt] a small animal that has six legs and generally one or two pairs of wings.

female [ˈfiːmeɪl] belonging or relating to women, or the sex that can give birth to young or produce eggs.

male [meɪl] used to refer to men or boys, or the sex that fertilizes eggs.

soil [sɔɪl] the upper layer of earth in which plants grow.

Unit 7 Medicinal Plants

herb [həːb] any seed-bearing plant which does not have a woody stem and dies down to the ground after flowering.

annual plant [ˈanjʊəl plɑːnt] a plant that completes its entire life cycle in one year.

biennial plant [bʌɪˈɛnɪəl plɑːnt] a plant that takes two years to grow from seed to fruition and die.

perennial plant [pəˈrɛnɪəl plɑːnt] a plant living for several years.

chamomile / camomile [ˈkaməmʌɪl] an aromatic European plant of the daisy family, with white and yellow flowers.

echinacea (purpurea) [ˌɛkɪˈneɪsɪə] a North American plant of the daisy family, used in herbal medicine for its antibiotic and wound-healing properties.

peppermint [ˈpɛpəmɪnt] an aromatic, perennial plant of the mint family having small purple or white flowers and used in some medicinal preparations.

aloe vera [ˈaləʊ ˈvɪərə] a succulent plant grown in the Caribbean area and the southern US whose leaves furnish a gelatinous emollient extract used especially in cosmetics and skin creams.

calendula [kəˈlɛndjʊlə] a Mediterranean annual plant, widely cultivated for its showy, yellow or orange, rayed flower heads used in medicine, coloring, and flavoring of food.

marigold [ˈmarɪgəʊld] a plant with bright yellow or orange flowers.

celandine [ˈsɛləndʌɪn] a common plant of the buttercup family which produces yellow flowers in the early spring.

valerian [vəˈlɪərɪən] a plant with small white or pink flowers and a root that is used in medicines.

yarrow [ˈjarəʊ] a Eurasian plant with feathery leaves and heads of small white or pale pink aromatic flowers, which has long been used in herbal medicine.

lemon balm [ˈlɛmən bɑːm] a bushy perennial Old World mint often cultivated for its fragrant lemon-flavored leaves and tops that have been used to make a diaphoretic tea.

foxglove [ˈfɒksglʌv] a tall plant that has pink or white flowers shaped like bells growing up its stem.

garlic [ˈgɑːlɪk] a plant of the onion family that has a strong taste and smell and is used in cooking and medicine.

catnip [ˈkatnɪp] a plant of the mint family, with downy leaves, purple-spotted white flowers, and a pungent smell attractive to cats. *synonym:* **catmint** [ˈkatmɪnt].

coltsfoot [ˈkəʊltsfʊt] a Eurasian plant of the daisy family, with yellow flowers which appear in the early spring before the large heart-shaped leaves, used in herbal medicine for the treatment of coughs and respiratory disorders. *synonym:* **foalfoot** [ˈfəulfut].

tutsan [ˈtʌts(ə)n] deciduous bushy Eurasian shrub with golden yellow flowers and reddish-purple fruits from which a soothing salve is made in Spain**.**

lavender [ˈlav(ə)ndə] a small aromatic evergreen shrub of the mint family, with narrow leaves and bluish-purple flowers, used in perfumery and medicine.

sage [seɪdʒ] an aromatic plant whose greyish-green leaves are used as a culinary herb, native to southern Europe and the Mediterranean.

thyme [tʌɪm] a low-growing aromatic plant of the mint family used as a culinary herb and like a medicinal oil.

opium poppy [ˈəʊpɪəm ˈpɒpi] the type of poppy in which opium and all refined opiates such as morphine, thebaine, codeine, papaverine and narcotine are naturally present.

nettle [ˈnɛt(ə)l] a herbaceous plant which has jagged leaves covered with stinging hairs. *synonym:* **common nettle** [ˈkɒmənˈnɛt(ə)l].

common hops [ˈkɒmən hɒp] European twining plant whose flowers are used chiefly to flavor malt liquors; cultivated in America.

ginseng [ˈdʒɪnsɛŋ] a plant tuber credited with various tonic and medicinal properties.

ginger [ˈdʒɪndʒə] a plant with a thick root that's used to spice food.

black elderberry [blak ˈɛldəbɛri] a common shrub with black fruit or a small tree of Europe and Asia; fruit used for wines and jellies.

milk thistle [mɪlk ˈθɪs(ə)l] a European plant with a solitary purple flower and glossy marbled leaves, naturalized in America and used in herbal medicine.

cannabis [ˈkanəbɪs] a tall plant with a stiff upright stem, divided serrated leaves, and glandular hairs used to produce hemp fibre and as a drug.

dandelion [ˈdandɪlʌɪən] a wild plant with milky sap which has yellow flowers with lots of thin petals that turn into white tufts that children blow into the wind.

inflorescence [ˌɪnflɔːˈrɛs(ə)ns] the arrangement of the flowers on a plant.

raceme [ˈrasiːm] a flower cluster with the separate flowers attached by short equal stalks at equal distances along a central stem.

corymb [ˈkɒrɪmb] a flower cluster whose lower stalks are proportionally longer so that the flowers form a flat or slightly convex head.

panicle [ˈpanɪk(ə)l] a loose branching cluster of flowers, as in oats.

spike [spʌɪk] a flower cluster formed of many flower heads attached directly to a long stem.

umbel [ˈʌmb(ə)l] an inflorescence that consists of a number of short flower stalks (called pedicels) which spread from a common point, somewhat like umbrella ribs.

cyme [sʌɪm] a flower cluster with a central stem bearing a single terminal flower that develops first, the other flowers in the cluster developing as terminal buds of lateral stems.

spadix [ˈspeɪdɪks] a type of spike inflorescence having small flowers borne on a fleshy stem.

capitulum [kəˈpɪtjʊləm] a dense flat cluster of small flowers or florets, as in plants of the daisy family.

head [hɛd] an inflorescence consisting of a dense cluster of small, stalkless flowers.

catkin [ˈkatkɪn] a slim, cylindrical flower cluster (a spike), with inconspicuous or no petals, usually wind-pollinated. *synonym:* **ament** [ˈeɪmɛnt / əˈmɛnt].

bark [bɑːk] the tough exterior covering of a woody root or stem specifically.

compress [ˈkɒmprɛs] a pad of lint or other absorbent material pressed on to part of the body to relieve inflammation or stop bleeding.

decoction [dɪˈkɒkʃ(ə)n] the action or process of extracting the essence of something.

essential oil [ɪˈsɛnʃ(ə)l ɔɪl] a natural oil typically obtained by distillation and having the characteristic odour of the plant or other source from which it is extracted.

extract [ˈɛkstrakt] a preparation containing the active ingredient of a substance in concentrated form.

ointment [ˈɔɪntm(ə)nt] a smooth oily substance that is rubbed on the skin for medicinal purposes or as a cosmetic.

powder [ˈpaʊdə] fine, dry particles produced by the grinding, crushing, or disintegration of a solid substance.

syrup [ˈsɪrəp] a sweet liquid made by dissolving sugar in boiling water, often used for preserving fruit.

tincture [ˈtɪŋ(k)tʃə] a medicine made by dissolving a drug in alcohol.

to harvest [ˈhɑːvɪst] to gather in crops.

to mature [məˈtʃʊə] to become fully grown or developed. *synonym:* **to ripen** [ˈrʌɪp(ə)n].

mature [məˈtʃʊə] fully developed physically; full-grown. *synonym:* **ripe** [rʌɪp].

Unit 8 Microorganisms

virology [vʌɪˈrɒlədʒi] the branch of science that deals with the study of viruses.

bacteriology [bakˌtɪərɪˈɒlədʒi] the branch of science that deals with the study of bacteria.

mycology [mʌɪˈkɒlədʒi] the branch of science that deals with the study of fungi.

protozoology [ˌprəʊtəˈzəʊɒlədʒi] the branch of science that deals with the study of protozoa.

kingdom [ˈkɪŋdəm] a taxonomic rank, which is either the highest rank or in the more recent three-domain system, the rank below domain.

species (*pl* **species**) [ˈspiːʃɪz /ˈspiːsiːz] a group of similar living things that ranks below the genus in scientific classification.

living being [ˈlɪvɪŋˈbiːɪŋ] any organism that shows the characteristics of being alive.

microorganism [mʌɪkrəʊˈɔːg(ə)nɪz(ə)m] a microscopic organism, especially a bacterium, virus, or fungus. *synonym:* **microbe** [ˈmʌɪkrəʊb], **germ** [dʒəːm].

protist [ˈprəʊtɪst] a single-celled organism of the kingdom *Protista*, such as a protozoan or simple alga.

bacterium (*pl* **bacteria**) [bakˈtɪərɪəm / bækˈtɪəriə] a member of a large group of unicellular microorganisms which have cell walls but lack organelles and an organized nucleus, including some which can cause disease.

virus [ˈvʌɪrəs] an infective agent that typically consists of a nucleic acid molecule in a protein coat, is too small to be seen by light microscopy, and is able to multiply only within the living cells of a host.

archaeon (*pl* **archaea**) [ɑːˈkiːon / ɑːˈkiːə] microorganisms which are similar to bacteria in size and simplicity of structure but radically different in molecular organization. They are now believed to constitute an ancient group which is intermediate between the bacteria and eukaryotes.

protozoan (*pl* **protozoa**) [ˌprəʊtə(ʊ)ˈzəʊən / ˌprəʊtəˈzəʊə] a single-celled microscopic animal of a group of phyla of the kingdom *Protista*, such as an amoeba.

amoeba (*pl* **amoebae** = **amoebas**) [əˈmiːbə / əˈmiːbiː] a one-celled organism, common in water and soil, possessing no set cell organs, structure, or defining shape.

euglena [juːˈgliːnə] any of various unicellular protist organisms that live in fresh water, have a cylindrical or sausage-like shape, and move by means of a flagellum.

paramecium (*pl* **paramecia**) [ˌparəˈmiːsɪəm / ˌparəˈmiːsɪə] a unicellular

organism with shape resembling the sole of a shoe.

mold [məʊld] a growth of fungus that occurs on food or in a home or other moist warm conditions. *synonym:* **mould** [məʊld].

yeast [jiːst] a microscopic fungus consisting of single oval cells that reproduce by budding, and capable of converting sugar into alcohol and carbon dioxide.

acellular [eɪˈsɛljʊlə] containing no cells; not made of cells.

unicellular [ˌjuːnɪˈsɛljʊlə] consisting of a single cell. *synonym:* **single-celled** [ˈsɪŋg(ə)l-selt].

multicellular [mʌltɪˈsɛljʊlə] an organism or part) having or consisting of many cells.

Gram-positive (bacterium) [gram-ˈpɒzɪtɪv bakˈtɪərɪəm] a bacterium that gives a positive result in the Gram stain test, which is traditionally used to quickly classify bacteria.

Gram-negative (bacterium) [gram-ˈnɛgətɪv bakˈtɪərɪəm] a bacterium that gives a positive result in the Gram stain test, which is traditionally used to quickly classify bacteria.

Gram staining / stain [gram steɪnɪŋ / steɪn] a method of staining used to distinguish and classify bacterial species into two large groups: gram-positive bacteria and gram-negative bacteria. *synonym:* **Gram's method** [gramz ˈmɛθəd].

staining [steɪnɪŋ] a technique used to enhance contrast in samples, generally at the microscopic level.

rod-shaped [rɒd ʃeɪpt] formed like a bacillus. *synonym:* **bacillus** (*pl* **bacilli)** [bəˈsɪləs / bəˈsɪlaɪ]**.**

spherical-shaped [ˈsfɛrɪk(ə)l ʃeɪpt] shaped like a sphere. *synonym:* **coccus** (*pl* **cocci**) [ˈkɒkəs / ˈkɒksaɪ].

helical-shaped [ˈhɛlɪk(ə)l ʃeɪpt] having the shape or form of a helix; spiral. *synonym:* **spirillum** (**pl spirilla**) [spʌɪˈrɪləm / ˈspaɪrɪlə].

eukaryote [juːˈkarɪəʊt] an organism consisting of a cell or cells in which the genetic material is DNA in the form of chromosomes contained within a distinct nucleus.

prokaryote [prəʊˈkarɪəʊt] a microscopic single-celled organism which has neither a distinct nucleus with a membrane nor other specialized organelles, including the bacteria and cyanobacteria.

vaccine [ˈvaksiːn] a substance used to stimulate the production of antibodies and provide immunity against one or several diseases, prepared from the causative agent of a disease

pathogen [ˈpaθədʒ(ə)n] a bacterium, virus, or other microorganism that can cause disease. *synonym:* **pathogenic microorganism** [paθəˈdʒɛnɪk mʌɪkrəʊˈɔːg(ə)nɪz(ə)m].

causative agent [ˈkɔːzətɪv ˈeɪdʒ(ə)nt] a biological pathogen that causes a disease, such as a virus, parasite, fungus, or bacterium.

substance [ˈsʌbst(ə)ns] any material that possesses physical properties.

penicillin [pɛnɪˈsɪlɪn] an antibiotic or group of antibiotics produced naturally by certain blue moulds, now usually prepared synthetically.

nucleus (*pl* **nuclei**) [ˈnjuːklɪəs / ˈnjuːklɪʌɪ] a dense organelle present in most eukaryotic cells, typically a single rounded structure bounded by a double membrane, containing the genetic material.

cell wall [sɛl wɔːl] a structural layer surrounding some types of cells, just outside the cell memrane.

membrane [ˈmɛmbreɪn] a thin layer of animal or vegetable tissue.

thread-like [θrɛd-lʌɪk] thin in diameter; resembling a thread. *synonym:* **filamentous** [ˌfɪləˈmentəs].

parasitic [parəˈsɪtɪk] an organism living as a parasite.

symbiotic [ˌsɪmbɪˈɒtɪk] involving interaction between two different organisms living in close physical association.

visible [ˈvɪzɪb(ə)l] able to be seen. ***antonym:*** ≠ **invisible** [ɪnˈvɪzɪb(ə)l].

DNA [di:ɛnˈeɪ] deoxyribonucleic acid, a self-replicating material which is present in nearly all living organisms as the main constituent of chromosomes.

RNA [ɑ:rɛnˈeɪ] ribonucleic acid, a nucleic acid present in all living cells.

microscope [ˈmʌɪkrəskəʊp] an optical instrument used for viewing very small objects, such as mineral samples or animal or plant cells, typically magnified several hundred times.

magnifying glass [ˈmaɡnɪfʌɪɪŋ ɡlɑ:s] a lens that produces an enlarged image, typically set in a frame with a handle and used to examine small or finely detailed things**.** *synonym:* **hand lens** [hand lɛnz].

unaided eye [ʌnˈeɪdɪd ʌɪ] sight unassisted by an instrument such as a microscope or telescope. *synonym:* **naked eye** [ˈneɪkɪd ʌɪ].

mortality [mɔ:ˈtalɪti] the number of deaths in a given time or place.

decomposition [ˌdi:kɒmpəˈzɪʃn] the state or process of rotting; decay.

decay [dɪˈkeɪ] breaking down into component parts.

to conduct experiment [ˈkɒndʌkt ɛkˈspɛrɪm(ə)nt] to provide evidence for or against a hypothesis.

to replicate [ˈrɛplɪkeɪt] to make an exact copy of; reproduce.

to investigate [ɪnˈvɛstɪɡeɪt] carry out research or study into a subject or problem.

to discover [dɪˈskʌvə] to find unexpectedly or during a search.

layer [ˈleɪə] a quantity or piece of it that covers a surface.

Unit 9 Bacteriology

pair [pɛ:] a set of two things used together or regarded as a unit.

chain [ʧeɪn] a sequence of items of the same type forming a line.

tetrad [ˈtɛtrad] a group or set of four.

cluster [ˈklʌstə] a group of similar things or people positioned or occurring closely together.

colony [ˈkɒləni] a group of two or more conspecific individuals living in close association with, or connected to, one another.

diplobacillus **(*pl* -cilli)** [diplōbəˈsiləs] a pair of rod-shaped bacilli that remain joined together end-to-end following division.

streptobacillus **(*pl* -cilli)** [ˈstrɛptəʊbəˈsiləs] a nonmotile gram-negative rod-shaped bacteria in which the individual cells are often joined in a chain especially.

coccobacillus **(*pl* -cilli)** [ˈkɒkəbəˈsiləs] a type of bacterium with a shape intermediate between cocci (spherical bacteria) and bacilli (rod-shaped bacteria).

diplococcus **(*pl* -ci)** [ˌdɪplə(ʊ)ˈkɒkəs] a bacterium that occurs as pairs of cocci, e.g. pneumococcus.

streptococcus **(*pl* -ci)** [ˌstrɛptə(ʊ)ˈkɒkəs] a bacterium of a genus that includes the agents of souring of milk and dental decay, and haemolytic pathogens causing various infections such as scarlet fever and pneumonia.

staphylococcus **(*pl* -ci)** [ˌstafɪlə(ʊ)ˈkɒkəs] a bacterium of a genus that includes many pathogenic kinds that cause pus formation, especially in the skin and mucous membranes.

sarcina [ˈsärsinə] any of several spherical, saprophytic bacteria, having a cuboidal cell arrangement.

vibrio **(*pl* vibrios)** [ˈvɪbrɪəʊ, ˈvʌɪbrɪəʊ] a water-borne bacterium of a group that includes some pathogenic kinds that cause cholera, gastroenteritis, and septicaemia.

spirillum **(*pl* spirilla)** [spʌɪˈrɪləm / ˈspaɪrɪlə] a bacterium with a rigid spiral structure, found in stagnant water and sometimes causing disease.

spirochaete [ˈspʌɪrə(ʊ)ki:t] a flexible spirally twisted bacterium, especially one that causes syphilis.

Bacillus anthracis [bəˈsɪləs ˈanθrasis] the bacterium that causes anthrax.

Yersinia pestis [yərˈsinēə pestis] a causative agent of the systemic invasive

infectious disease often referred to as the plague.

Diplococcus pneumonia [ˌdɪplə(ʊ)ˈkɒkəs njuːˈməʊnɪə] a bacterium causing pneumonia in mice and humans.

Neisseria gonorrhoeae [nīˈsirēə ˌgɒnəˈrɪə] a bacterium causing gonorrhoea, one of the most frequent sexually transmitted diseases.

Neisseria meningitides [nīˈsirēəˌměnˈĭn-jīˈtĭs] a Gram-negative bacterium that can cause meningitis and other forms of meningococcal disease**.**

Streptococcus pyogenes [ˌstrɛptə(ʊ)ˈkɒkəs ˌpaɪəʊˈdʒɛnɪs] a common bacteria that causes streptococcal pharyngitis, skin infections, rheumatic fever, scarlet fever etc.

Staphylococcus aureus [ˌstafɪlə(ʊ)ˈkɒkəs ˈɔːrɪəs] a major bacterial human pathogen that causes a wide variety of clinical manifestations.

Vibrio cholerae [ˈvɪbrɪəʊ / ˈvʌɪbrɪəʊ ˈkɒlərə] an important pathogen that causes the acute diarrhea disease.

Helicobacter pylori [ˈhelikōˌbaktər pilə(ʊ)ri] a bacterium associated with gastritis and implicated as a causative agent of gastric and duodenal ulcers.

Treponema pallidum [ˈtrɛpəniːm paˈlɪdɪəm] a spirochaete bacterium that is parasitic or pathogenic in humans and warm-blooded animals, including the causal agents of syphilis and yaws.

infection [ɪnˈfɛkʃ(ə)n] the invasion of an organism's body tissues by disease-causing agents.

motile [ˈməʊtʌɪl] (of cells, gametes, and single-celled organisms) capable of motion. ***antonym:*** ≠ **nonmotile** [nonˈməʊtʌɪl].

locomotion [ləʊkəˈməʊʃ(ə)n] movement or the ability to move from one place to another.

nucleoid [nucleoid] the central region in a prokaryotic cell, as a bacterium, that contains the chromosomes and that has no surrounding membrane.

cytoplasm [ˈsʌɪtə(ʊ)plaz(ə)m] the material or protoplasm within a living cell, excluding the nucleus.

organelle [ˌɔːgəˈnɛl] any of a number of organized or specialized structures within a living cell.

ribosome [ˈrʌɪbə(ʊ)səʊm] a minute particle consisting of RNA and associated proteins found in large numbers in the cytoplasm of living cells.

capsule [ˈkapsjuːl] a membrane that encloses an organ or other structure in the organism.

cell / plasma membrane [sɛl / ˈplazmə ˈmɛmbreɪn] the semipermeable membrane surrounding the cytoplasm of a cell.

plasmid [ˈplazmɪd] a genetic structure in a cell that can replicate independently of the chromosomes, typically a small circular DNA strand in the cytoplasm of a bacterium or protozoan.

flagellum (*pl* **flagella**) [fləˈdʒɛləm] a microscopic appendage that enables many protozoa, bacteria, spermatozoa, etc. to swim.

pilus (*pl* **pili**) [ˈpɪləs / ˈpɪlɪ] a hair or a structure (as on the surface of a bacterial cell) resembling a hair. *synonym:* **fimbria** (*pl* **-e**) [ˈfɪmbrɪə].

appendage [əˈpɛndɪdʒ] an external body part, or natural prolongation, that protrudes from an organism's body.

cell division [sɛl dɪˈvɪʒ(ə)n] the action of separating something into parts or the process of being separated.

binary fission [ˈbʌɪnəri ˈfɪʃ(ə)n] an asexual reproduction by a separation of the body into two new bodies.

host organism [həʊst ˈɔːg(ə)nɪz(ə)m] an organism from which a parasite obtains its nutrition or shelter. *synonym:* **host** [həʊst].

photosynthesis [ˌfəʊtə(ʊ)ˈsɪnθɪsɪs] the process by which green plants and some other organisms use sunlight to synthesize nutrients from carbon dioxide and water.

protein [ˈprəʊtiːn] one of the many substances found in food such as meat, cheese, fish, or eggs, that is necessary for the body to grow and be strong.

peptidoglycan [pɛpˌtʌɪdə(ʊ)ˈglʌɪkan] a substance forming the cell walls of many bacteria, consisting of glycosaminoglycan chains interlinked with short peptides. *synonym:* **murein** [ˈmyʊrēən].

polysaccharide [ˌpɒlɪˈsakərʌɪd] a carbohydrate (e.g. starch, cellulose, or glycogen) whose molecules consist of a number of sugar molecules bonded together.

crystal violet [ˈkrɪst(ə)l ˈvʌɪələt] a synthetic violet dye, related to rosaniline, used as a stain in microscopy and as an antiseptic in the treatment of skin infections. *synonym:* **gentian violet** [ˈdʒɛnʃ(ə)n ˈvʌɪələt].

decolouration [diːˌkʌləˈreɪʃən] appearance with regard to color arrangement or use of colors.

counterstain [ˈkaʊntəˌsteɪn] an additional dye used in a microscopy specimen to produce a contrasting background or to make clearer the distinction between different kinds of tissue.

micron [ˈmʌɪkrɒn] a unit of length equal to one millionth of a metre, used in many technological and scientific fields.

micrometer [mʌɪˈkrɒmɪtə] one millionth of a metre.

environment [ɪnˈvʌɪrənm(ə)nt] the surroundings or conditions in which a person, animal, or plant lives or operates.

contamination [kənˌtamɪˈneɪʃ(ə)n] the process of making something dirty or poisonous, or the state of containing unwanted or dangerous substances.

vector [ˈvɛktə] an organism, typically a biting insect or tick, that transmits a disease or parasite from one animal or plant to another.

transmission [tranzˈmɪʃ(ə)n] the act of transferring something like a disease going from one person to another.

Unit 10 Laboratory

laboratory [ləˈbɒrəˌt(ə)ri] a room or building equipped for scientific experiments, research, or teaching, or for the manufacture of drugs or chemicals. *abbreviation:* **lab** [lab].

equipment [ɪˈkwɪpm(ə)nt] the necessary items for a particular purpose.

tools [tuːls] a piece of equipment that you use with your hands to make or repair something.

glassware [ˈglɑːswɛː] equipment used in scientific work, and traditionally made of glass such as bowls, drinking containers etc.

vessel [ˈvɛs(ə)l] an object used especially for liquids as a device for heating substances above their boiling point, for manufacturing chemicals or for sterilizing surgical instruments.

sink [sɪŋk] a large fixed container in a kitchen, with taps to supply water.

fume hood [fjuːm hʊd] a type of local ventilation device that is designed to limit exposure to hazardous or toxic fumes, vapors or dusts. *synonym:* **fume cupboard** [fjuːm ˈkʌbəd].

eyewash station [ˈʌɪwɒʃ ˈsteɪʃ(ə)n] a portable or permanent station for the exclusive purpose of rinsing the eyes after worksite contamination.

fire extinguisher [ˈfʌɪə ɪkˈstɪŋgwɪʃə] a portable device that discharges a jet of water, foam, gas, or other material to extinguish a fire.

(analytical) balance [(anəˈlɪtɪk(ə)l) ˈbal(ə)ns] a class of balance designed to measure small mass in the sub-milligram range.

thermometer [θəˈmɒmɪtə] an instrument for measuring and indicating temperature.

Bunsen burner [bʌnsn ˈbəːnə] a small adjustable gas burner used in laboratories as a source of heat.

(lab) ring stand [(lab) rɪŋ stand] an item of laboratory equipment which consists of a metal pole with a solid, firm base, used to hold or clamp laboratory glassware and other equipment in place, so that it does not fall down.

(lab) ring clamp [(lab) rɪŋ klamp] an item of laboratory equipment which is commonly used in chemistry laboratories for supporting apparatus above the work surface.

tongs [tɒŋz] an instrument with two movable arms that are joined at one end, used for picking up and holding things. *synonym:* **forceps** [ˈfɔːsɛps,ˈfɔːsɪps].

spatula [ˈspatjʊlə] a flat thin metal instrument used especially for spreading or mixing soft substances. *synonym:* **scoopula** [ˈskopjʊlə]

beaker [ˈbiːkə] a cylindrical glass vessel for mixing, measuring, and pouring liquid chemicals. *synonym:* **measuring glass** (BrE) [ˈmɛʒərɪŋ glɑːs].

flask [flɑːsk] a bottle, usually of glass, having a rounded body and a narrow neck, used especially in laboratory experimentation.

test tube [tɛst tjuːb] a thin glass tube closed at one end, used to hold small amounts of material for laboratory testing or experiments.

desiccator [ˈdɛsɪkeɪtə] a glass container or other apparatus holding a drying agent for removing moisture from specimens and protecting them from water vapour in the air.

burette = buret [bjʊˈrɛt] a graduated glass tube with a tap at one end, for delivering known volumes of a liquid, especially in titrations.

graduated / measuring cylinder [ˈgradjʊeɪtɪd / ˈmɛʒərɪŋ ˈsɪlɪndə] a tall narrow container with a volume scale used especially for measuring liquids.

(glass) retort [glɑːs rɪˈtɔːt] a glass bulb with a long neck bent downward, used for distilling or decomposing substances by heat.

evaporating dish [ɪˈvapəreɪtɪŋ dɪʃ] a small ceramic dish in which liquids are heated over a flame so that they evaporate, leaving a solid residue. *synonym:* **watch glass** [glɑːs rɪˈtɔːt].

funnel [ˈfʌn(ə)l] a cone-shaped utensil for conducting liquid or other substance through a small opening, as into a bottle or jug.

Petri dish [ˈpɛtri dɪʃ] a shallow, circular, transparent dish with a flat lid, used for the culture of microorganisms.

crucible [ˈkruːsɪb(ə)l] a ceramic or metal container in which metals or other substances may be melted or subjected to very high temperatures.

dropper [ˈdrɒpə] a short glass tube with a rubber bulb at one end and a tiny hole at the other, for measuring out drops of medicine or other liquids. *synonym:* **Pasteur pipette** [pastœr pɪˈpɛt].

pipette = pipet [pɪˈpɛt] a laboratory tool commonly used in chemistry, biology and medicine to transport a measured volume of liquid.

stirring rod = stir rod [ˈstəːrɪŋ rɒd] a piece of laboratory equipment used to mix chemicals and liquids for laboratory purposes.

microscope slide [ˈmʌɪkrəskəʊp slʌɪd] a piece of glass or other transparent substance on which material is placed for examination under the microscope.

laboratory coat [ˈlab(ə)rəˌt(ə)ri kəʊt] a white protective coat worn by workers in a laboratory. *abbreviation:* **lab coat** [ˈlab kəʊt].

face mask [feɪs mɑːsk] a protective mask covering the nose and mouth or nose and eyes.

(lab) apron [ˈlab ˈeɪpr(ə)n] a protective knee-length overcoat worn over the front of one's clothes and tied at the back.

goggles [ˈgɒg(ə)lz] protective glasses set in a flexible frame worn to protect the eyes from hazards such as chemicals. *synonym:* **safety glasses** [ˈseɪfti ˈglɑːsɪz].

(lab) gloves [ˈlab glʌvz] protective gloves which are used as protection from all chemicals.

sample [ˈsɑːmp(ə)l] a small part or quantity intended to show what the whole is like. *synonym:* **specimen** [ˈspɛsɪmɪn].

chemical [ˈkɛmɪk(ə)l] a substance produced by or used in a chemical process.

liquid [ˈlɪkwɪd] a substance which is not solid but which flows and can be poured.

solid [ˈsɒlɪd] a substance or object that is solid rather than liquid or fluid.

volume [ˈvɒljuːm] the amount of space that a substance or object occupies.

measurement [ˈmɛʒəm(ə)nt] a number that shows the size or amount of something.

to measure [ˈmɛʒə] to ascertain the size, amount, or degree of (something) by using an instrument or device marked in standard units.

to heat [hiːt] to make or become hot or warm.

to dry [drʌɪ] to become dry.

to mix [mɪks] to combine or put together to form one substance or mass.

to stir [stəː] to move a spoon round in (a liquid or other substance) in order to mix it thoroughly.

to weigh [weɪ] find out how heavy (someone or something) is, typically using scales.

to spill [spɪl] cause or allow (liquid) to flow over the edge of its container, especially unintentionally.

accident [ˈaksɪd(ə)nt] an event that happens by chance.

hazard [ˈhazəd] a danger or risk.

safety [ˈseɪfti] the condition of being protected from or unlikely to cause danger, risk, or injury.

flammable [ˈflaməb(ə)l] easily set on fire.

explosive [ɪkˈspləʊsɪv] able or likely to shatter violently or burst apart.

Videoscripts

Unit 1.
Steps to becoming a pharmacist in the USA

Tree minutes summaries. Think you might want to be a pharmacist? Here is some steps on how to get started and a little about the job.

First of all, what is a pharmacist? A pharmacist is a health care professional who fills medical prescriptions and advises you about them. You might see a pharmacist at a drugstore, a grocery store or in a hospital. To be a good pharmacist you'll need to be a people person: pharmacists talked to people about medical conditions and helped them understand their medications. Be detailed-oriented: accuracy is extremely important in this job. Be good at science and chemistry: you'll need to know all about side effects and interactions.

Here's the educational path to becoming a pharmacist. This is the traditional path so yours may vary. After you've gotten your high school diploma or equivalent, you'll need to go to college and complete a Bachelor's Degree. Then, you'll take the PCAT at an aptitude test for pharmacists based on your score in college grades. You'll attend a farm deep program where you'll get your PharmD degree. This will take three or four years. After you finish your education, you may need to complete a residency, getting on-the-job experience. Finally, you'll need to pass the North American pharmacist licensure exam or NAPLEX and the Multistate Pharmacy Jurisprudence Exam. After that you are on the job. Pharmacology is a field that's expected to keep growing as our population ages.

Ok. We've told you how you can become a pharmacist but we don't want you to feel overwhelmed. Here are some steps you can take today to get yourself started on making your goal a reality. Go and talk to your pharmacist. Ask them if they like their job, how long it took them to complete their education. You know what an average day is like volunteer in a hospital. This will get you familiar with medical conditions terminology and pharmaceuticals. Sign up for a chemistry or biology course, get a job as a clerk or cashier in a pharmacy. That way you can get paid to learn on the job and see firsthand what a pharmacist does if you like what you see you're all set.

Unit 2.
Your super skeleton!

Believe it or not, there's something a lot like this inside of you and inside me, too! It's a skeleton! You may have seen skeletons in a museum – like the ones they have of dinosaurs – or maybe plastic models of human skeletons, like this. Maybe you've even seen dancing skeletons around Halloween. But do you know how important, cool, and powerful your skeleton really is? Let's get to know your bones – from how they help you move, to the different kinds you have, and even a super special job they have to do! Let's get started!

One of a skeleton's important jobs is, of course, to hold your body up! Your muscles are strong, but they need a frame, something to hold on to. Without a skeleton, you'd be all loosey-goosey, and you wouldn't be shaped like … you! And it goes both ways! Without your muscles, your skeleton would just be a pile of bones. It's only by squeezing and relaxing your muscles that you're able to move your bones. So that silly dancing Halloween skeleton? It's just pretend – because it doesn't have muscles. So, your bones are hard enough to hold the weight of the rest of your body. But they're also hard enough to act like a protective shield around your soft, squishy organs. Your ribs, for example, are bones that protect your lungs and heart so that even when you get a big strong bear hug, your insides don't get squeezed too!

And speaking of strong – the strongest bone in your body is also the biggest, the longest and the heaviest one you have. It's the bone that goes from your hip to your knee, called the femur! And that bone has to be big and strong – because when you run, jump, walk, or even just stand still, a lot of the weight of your body falls on the femur.

Now, where do you think your smallest bone might be? The very smallest bone you have is actually in your ear. This little bone, called the stapes, looks kind of like a stirrup. Even in

adults, it's only about the size of a grain of rice. But this tiny bone has a big job. When sounds enter your ear, they make this little bone move back and forth. These vibrations are what your ears pick up as sound. So, without this teeny tiny bone, you wouldn't be able to hear.

Now, I have a question, how many bones do you think we have? Well … it kinda depends. It sounds crazy, but you have fewer bones now than when you were born! Newborn babies have about 300 bones, but – by the time you're finished growing – you'll have only 206. So, where did all those extra bones go? Nowhere! As babies grow, some of their bones grow together, of fuse, into one bigger bone. For example … your skull! Your hard noggin is actually 21 bones that are fused together, plus one bone that always separates – your jaw! Your skull starts out as a bunch of separate bones, because that leaves lots of room for your brain to get bigger. And once you're fully grown, the fused parts make an incredibly strong shield to protect your precious brain.

One final fun fact about your skeleton? Your bones … are alive! Even though we often think of skeletons as not living – like the ones we see in a museum, or in this model – your bones are full of living cells. Some of these cells are what make your bones grow, and repair them if they get hurt. And other cells – which are tucked away in a thick spongy layer deep inside your bones – have a very special job: they make your blood. That's right! Most of the stuff that's in your blood is actually made inside of your bones! It's because your bones are alive that they're able to grow – like they are doing in you, right now! And they won't be done until you're about 25 years old. But even then, your bones will still be busy holding you up, helping you hear, and making your blood.

So bones in museums are cool, and Halloween skeletons are fun – don't get me wrong. But nothing's more scary-powerful than your own living skeleton and all the great stuff it does for you!

Do you have a question about animals with big bones, small bones, or no bones at all? Just let us know by getting help from adults, and leaving a comment below or emailing us at kids@thescishow.com. See you next time!

Unit 3.
Human body systems

The human body is a complex network of cells, tissues and organs, that together make life possible.

Ten major systems are responsible for the body's functions: skeletal, muscular, cardiovascular, nervous, endocrine, lymphatic, respiratory, digestive, urinary, reproductive. The skeletal, muscular, cardiovascular and nervous systems in particular create an infrastructure that facilitates the other systems.

The adult skeletal system is a framework of over 200 bones. They hold the body together, give it shape and protect its organs and tissues. The skeleton also provides anchor points for the muscular system, which includes three types of muscles: skeletal, smooth and cardiac. They are found throughout the body and facilitate movement.

Nestled within these muscles is the cardiovascular system – a pipeline that includes the heart blood vessels and the blood itself – also called circulatory system. The cardiovascular system delivers oxygen, white blood cells, hormones and nutrients throughout the body.

Lastly the nervous system is a communication network of nerve cells that the body uses to transmit information and coordinate bodily functions. It's comprised of the brain – the hub of sensory and intellectual activity, the spinal cord and the many cranial and spinal nerves that emanate from them. This infrastructure created by neurons, blood, muscles and bones allows three other systems to regulate the body's environment: the endocrine, lymphatic and urinary systems.

The endocrine system is a series of glands that use information carried by the nervous system to help regulate the body's processes. Thanks to this neural connection endocrine glands such as the thyroid are aware of the amount of hormones and other chemicals they need to produce. These chemicals are then distributed throughout the body by way of the cardiovascular system. The cardiovascular and nervous systems are also utilized by the lymphatic system. A collection of lymph nodes and vessels that help regulate the body's defenses.

Also called the immune system, the lymphatic system uses neural pathways to transmit information about affected areas of

the body and then sends out healing agents like white blood cells via the blood stream.

Another key, regulatory system is the urinary system, which includes the kidneys, ureters, bladder and urethra. The urinary or renal system maintains the body's electrolyte levels and filters wastes from the blood. This waste is sent through the blood vessels into the kidneys and then expelled as urine.

All of these require energy to function and that's where the respiratory and digestive systems come in. The respiratory system is a group of passageways and organs that extracts life-giving oxygen from the air we breathe. Air enters the body through nasal cavities travels down the throat and is then transported to the lungs. The lungs extract oxygen for the body to use and then expel a carbon dioxide by product when we exhale energy.

Can also come in the form of food? The digestive system is an approximately 30 foot series of organs that convert food into fuel. Food enters the system through the mouth then moves into the esophagus the stomach and the intestines. Nutrients are absorbed into the body while solid waste is expelled through the anal canal the end of the digestive tract.

No matter the roll size or shape of any of the body systems each began with a reproductive system. This system is responsible for creating life. The primary organs involved differ between the sexes with ovaries, fallopian tubes, the uterus and vagina found in women and testes and a sperm channel found in men together. Fertilization may occur organ systems form and then a child is born.

Humans are complicated organisms. But when our 10 major organ systems are healthy, they ensure our well-being.

Unit 4.
Why is meningitis so dangerous?

In 1987, tens of thousands of people gathered in Saudi Arabia for the annual Hajj pilgrimage. But what started out as a celebration led to a health crisis: just a few days after the pilgrimage, more that 2 000 cases of meningitis broke out spreading across Saudi Arabia and the rest of the world. The outbreak was so fierce that it was believed to have sparked a wave of deadly meningitis epidemics that ultimately infected tens of thousands of people worldwide.

Meningitis is the inflammation of the meninges, three tissue layers responsible for protecting the brain and spinal cord. What makes meningitis so dangerous compared to other diseases is the sheer speed with which it invades a person's body. In the worst cases, it causes death within a day. Fortunately, that's rare for patients who receive early medical treatment. The disease primarily comes in three forms: fungal, viral, and bacterial – the last being the most deadly by far, and what we'll focus on.

People usually contract bacterial meningitis by breathing in tiny particles of mucus and saliva that spray into the air when an infected person sneezes or coughs. It can also be transmitted through kissing, or sharing cigarettes, toothbrushes or utensils. Some people can be infected and carry the disease without showing symptoms or getting sick, which helps the disease spread quickly to others. Once the bacteria enter the nose, mouth, and throat, they cross the surrounding membranes and enter the bloodstream. From there, bacteria have rapid access to the body's tissues – including a membrane called the blood-brain barrier. This is made of a tight mesh of cells which separate blood vessels from the brain, and block everything except for a specific set of particles, including water molecules and some gases.

But in ways that scientists are still trying to understand, meningitis bacteria can trick the barrier into letting them through. Inside the brain, the bacteria swiftly infect the meninges. This triggers inflammation as the body's immune response kicks into overdrive, bringing on fever and intense headaches. As swelling in the meninges worsens, the neck begins to stiffen. Swelling in the brain disrupts its normal function – causing symptoms like hearing loss and extreme light sensitivity. As pressure increases in the cranium, it may also make the person confused – one of the hallmarks of the disease. A few hours in, the rapidly multiplying bacteria start to release toxins, leading to septicemia also known as blood poisoning. This breaks down blood vessels, letting blood step out and from what starts out looking like a rash, and evolves into big discoloured blots beneath the skin. At the same time, these toxins burn through oxygen in the blood, reducing the amount that gets to major organs like the lungs and kidneys. That increases the chance of organ shut down – and alongside spreading septicemia, threatens death.

That all sounds scary, but doctors are so good at treating meningitis that a visit to the hospital can drastically reduce an adult's risk of dying

from it. The longer it's left untreated, though, the more likely it will lead to lasting damage. If declining oxygen levels cause cell death in extreme parts of the body like fingers, toes, arms and legs – the risk of amputation goes up. And if bacterial toxins accumulate in the brain and trigger cell death, meningitis could also cause long-term brain damage and memory loss. So fast treatment, or better yet, prevention, is critical.

That's why most countries have vaccines that defend against the disease in its deadliest forms. Those are usually given to the people who are most at risk-like young children, people with weak immune systems, or people who gather in large groups where an outbreak of meningitis could potentially happen. In addition to those gatherings, meningitis is most common in a region called the meningitis belt that stretches across Africa, though cases do happen all over the world. If you're concerned that you or someone you know may have meningitis, get to the doctor as soon as possible; quick action could save your life.

Unit 5.
The surprising cause of stomach ulcers

In 1984, an enterprising Australian doctor named Barry Marshall decided to take a risk. Too many of his patients were complaining of severe abdominal pain due to stomach ulcers, which are sores in the lining of the upper intestinal tract. At the time, few effective treatments for ulcers existed, and many sufferers required hospitalization or even surgery. Desperate for answers, Dr. Marshall swallowed a cloudy broth of bacteria collected from the stomach of one of his patients. Soon, Dr. Marshall was experiencing the same abdominal pain, bloating and vomiting. Ten days later, a camera called an endoscope peered inside his insides. Marshall's stomach was teeming with the same bacteria as his patient. He'd also developed gastritis, or severe inflammation of the stomach, the hallmark precursor of ulcers. Dr. Marshall's idea challenged a misconception that still persists to this day: that ulcers are caused by stress, food or too much stomach acid. Marshall thought the culprit was bacterial infections. Initially, his idea was considered crazy by the brightest medical minds in the planet.

But in 2005, he and Dr. Robin Warren received the ultimate validation when they were awarded the Nobel Prize for medicine.

Our stomachs are J-shaped organs with surprisingly intricate ecosystems awash in hormones and chemicals. The stomach is under constant attack by digestive enzymes, bile, proteins, microbes and the stomach's own acid. In response, it produces bicarbonate, mucus and phospholipids called prostaglandins to maintain the integrity of its own lining. This delicate balance is constantly regulated and referred to as mucosal defense.

Since the mid-1800s, doctors thought stress alone caused most stomach ulcers. Patients were given antidepressants or tranquilizers and told to visit health spas. This belief eventually shifted to the related notion of spicy foods and stress as culprits. Yet no convincing study has ever demonstrated that emotional upset, psychological distress or spicy food directly causes ulcer disease.

By the mid-20th century, it was widely accepted that excess hydrochloric acid prompted the stomach to eat itself. Fervent proponents of this idea were referred to as the acid mafia. The biggest hole in this theory was that antiacids only provide temporary relief. We now know that some rare ulcers are indeed caused by too much hydrochloric acid. But they make up less than 1% of all cases. Dr. Marshall and Dr. Warren pinpointed a spiral-shaped bacteria called Helicobacter pylory, or H. pylory, as the real offender. H. pylory is one of humanity's oldest and most frequent companions, having joined us at least 50 000 years ago, and now found in 50% of people. Previously, we thought the stomach was sterile on account of it being such an acidic, hostile environment.

Yet H. pylory survives the acidic turmoil of the stomach with a variety of features that disrupt mucosal defense in its favor. For example, it produces an enzyme called urease that helps protect it from the surrounding gastric acid. H. pylori can make over 1 500 proteins, many of which are dedicated to maximizing its virulence. We still have unanswered questions, like why specific people develop ulcers at particular times. However, we do know individual genetics, other medical problems, use of certain medications, smoking and genetic diversity of Helicobacter strains all play a role. In particular, certain pain medications used to reduce inflammation in joints have been discovered to work with H.pylori to create more severe stomach ulcers.

Dr. Marshall ended up being fine after his famous, albeit dangerous, experiment. He ingested a course of antibiotics similar to the ones taken now for ulcers. To be treated by simple antibiotics is a modern triumph for a disease that previously needed surgery. Marshall's work also reminded us that scientific progress is not always smooth. But there's value in trusting your proverbial, and sometimes literal, gut.

Unit 6.
Photosynthesis

Hello, friends! Welcome to a new happy learning video. Have you ever wondered how plants feed? To answer this question we need to understand photosynthesis.

Photosynthesis is a process in which plants make their own food to be able to grow and develop. In order to perform photosynthesis they need various elements: sunlight, carbon dioxide, obtained from air and water, and chlorophyll which is a green substance that all plants have and is fundamental for performing photosynthesis since it could not happen without it. By the way, chlorophyll is what gives all plants the green color but how does photosynthesis take place?

Look at these plants. As you can see, its roots are anchored to the ground and through them the plant absorbs water and minerals in the soil. Water with minerals are transported up the stem, reaching the leaves. The leaves are full of tiny pores called stomata which absorb carbon dioxide that the air in the surrounding contains. All this containing water minerals and carbon dioxide is called raw sap.

Now it's chlorophyll's turn. The chlorophyll in the leaves has all the necessary ingredients for photosynthesis to take place and, when it receives sunlight, the process begins by transforming the raw sap into elaborated sap which also circulates around the plants and works as food.

All plants feed from elaborated sap and they store it in their roots like a carrot or in their fruit like an apple or a pear. Now we know how photosynthesis takes place but why is it so important? Without plant there would be no life on earth. We wouldn't have oxygen to breathe or food to feed on. You already know that herbivores eat plants and carnivores eat herbivores. Plants are fundamental for the food chain and they are also fundamental for our respiration. Actually when humans breathe, we turn oxygen into carbon dioxide. Quite the opposite of when plants perform photosynthesis.

A curious fact you do know is that at night because plants don't have sunlight to photosynthesize they breathe like humans do, they take in oxygen and release carbon dioxide. Remember that. And one last thing, so you understand the importance of photosynthesis when plants absorb dirty and contaminated gases, they transform them into pure air, into oxygen and this way they clean the atmosphere and all nature. Plants are the best solution to fight against contamination, don't you think?

Unit 7.
Garden time: Medicinal plants

***Journalist*:** Bebhimn, that's really fragrant, what is this?

Bebhimn: This is *Lemon Balm* and it's something you might find in your garden. It's bred all over the place but it's really lovely and as Mrs. Mondtbrie says it makes the mind glad.

Journalist: That's a great one to talk about first on this medicinal plant segment and we're at Portland Nursery own Division with Bebhimn and she is really into this kind of classes and really knowledgeable. And you have something else for us and it's like I know that plant and this is what the flower looks like.

Bebhimn: Uh, *Echinacea* and we have some species of *Echinacea* that are really great for enhancing the immune system. People use it for that and for infections.

Journalist: And Bebhimn, I'm having trouble with my knees and some of my joints and I heard that this was a good one.

Bebhimn: *Arnica* that's great. People would use that for a long time. They discovered it by watching boots who would rub their ankles on it up in the mountains when they got a hurt ankle.

Journalist: And there's other plant set?

Bebhimn: We've heard about the *Horny Goat Weed*, all otherwise known as epimysium.

Journalist: But, it's right and if you want any more information about that, you're going to have to come into the Division Street Portland Nursery. Now, I like this one and this one I like just for a plant. It smells nice. What is this?

Bebhimn: This is beautiful native plant *Yerba Buena* and it's used mostly to flavor tea. It has a wonderful flavor.

Journalist: Does.

Bebhimn: And to flavor other feeds that may not taste that well that you need to take.
Journalist: Okay, and you know this one, I think, is a really famous one but I forget the name.
Bebhimn: Oh, *Ginkgo* and it's used to increase blood circulation and especially in the mine.
Journalist: Ah, that's a good one to remember.
Bebhimn: Yes.
Journalist: And what's this one with the pretty flower?
Bebhimn: *Marshmallow*, it's an useful genus and so people use it for ulcers and you'd make a tea with it.
Journalist: Now, Bebhimn, what is this one, here?
Bebhimn: *Valerian*, that grows natively up in the mountains and people use it for to go to sleep, it's in it for insomnia and help you relax and… But another thing about it, is the roots when they're dried, the cats, they go nuts for it. The cats, they go crazy.
Journalist: Like *Catnip*.
Bebhimn: Yep, however it smells like dirty socks.
Journalist: Okay, now Chinese herbs. We can actually grow in the Pacific Northwest and you have some available to in Portland.
Bebhimn: Yes, we should do. We have lovely *Codonopsis* or *Deng-shen* which is a Qi-tonic beautiful perennial plant, we have *Wolfberry*, the *Lycium* and *Boop Lorem* among the few, but yeah, we have a bunch of them.
Journalist: Now, if I wanted to start using this or making tinctures or something, I probably shouldn't do that just without any knowledge.
Bebhimn: Yeah, that's true. I definitely want to check in with professional herbalist with Chinese medicine and your doctor to make sure there's nothing contraindicated with other medicines you might be picking right.
Journalist: And I know you have this great book that would help you get to know a little bit about those things.
Bebhimn: Yeah, definitely, check this book out if you'd like to know especially the natives and their medicinal uses and preparations. This is a wonderful book that can show you how to do it.
Journalist: Oh, great, well, I know there's many people on staff at the Stark Street Portland Nursery or at the Division Street and they have tons of knowledge. So, please come in talk to the people here and pick up some medicinal for you yard.

Unit 8.
Biology: microorganisms

Would you be surprised to hear that over 60% of life on Earth is so small that it can only be seen with a microscope? We call all of these little things microbes or microorganisms. There is estimated to be about 2 to 3 billion different species of these little guys and the best thing we can't live without them. Oxygen to breathe, food eat. Thank you, microbes. They generate oxygen in the atmosphere and they fix nitrogen in our soils so that plants can grow, forming the base of our food chains. In this video we're going to look at a few of them and what they do both good and bad. Microorganisms divided into six main groups. Can you fill in the missing letters to work out what they are? Pause the video and have a think. Did you get them all?

Protozoa are made up of a single cell. They are usually found in water bodies and soil and make up the backbone of many food webs by providing nutrients for other organisms to grow.

I'm sure you'll all come across fungi before. Those mushrooms on your pizza! Those are obviously big enough to see, but there are also many types of fungi that are too small to be seen by a naked eye, like some yeasts and molds. In fact, we have yeasts to thank for bread that rises and fermenting in some alcohol. Om the downside there are many types of fungi that cause diseases like yeast infections in your body.

Bacteria, these generally have a bad reputation but it's actually rather unfair. Yes, some of them can be harmful, but lots of bacteria species are actually extremely beneficial. We have about 100 billion bacterial cells living on our skin alone and many, many more inside our digestive system. Smelly armpits, the odor is actually being produced by the bacteria that lived there. We've spent the last 50 years trying to kill all bacteria but we're now starting to understand more about good bacteria and the benefits they bring. They can help boost our immune system and aid digestion. Some bacterial species are even being investigated as producers of insulin to potential replace incident shots in future. You are a cheese lover, thank bacteria. They are used in making cheese and yogurt. Bacteria are also used to create biogas in an anaerobic digesters. So, they are providing us with a much greater alternative for fossil fuels, fertile soils. Thank you, bacteria. Plants need nitrogen to grow but how does the nitrogen get into the soil? Of course, the answer is bacteria,

They carry out a process called nitrogen fixation. So, what the limits to these wonderful microorganisms?

Viruses, another word that makes us all think of bad things. This time it's more fair than with bacteria. Maybe in the future viruses will have some beneficial uses. I'll discuss in a little more detail at the end. The suspense, it's worth waiting for.

Algae are another set of essential microbes occupying the bottom of the food chain. They are photosynthetic, meaning they take energy from the Sun and release oxygen into the environment. Pretty important, as it means we can breathe and survive. They use the energy to produce carbohydrates which form the base of many food chains. I bet you didn't know that algae, based ingredients, also pop up in ice creams, salad dressings, drinks, lipsticks and toothpastes. 7 billion people, trillions of animals, how come the world isn't just one huge pile of dung. Of course it's a wonderful community of microorganisms coming to the rescue.

Microbes, mostly bacteria and fungi carry out decomposition which is the breakdown of organic matter like dead organisms and material waste into simpler substances which are then recycled back into the soil. The best news of all, microbes aren't limited to organic matter, they can eat almost anything: toxic waste, plastic, saving us from living on one huge dung pile and I've even saved the best for last. Microbes could be the answer to our antibiotic crises. They could be used to produce new antibiotics that are powerful enough to kill even the worst superbugs. In the past 50 years all new antibiotics have come from bacteria living in the soil pretty much in your backyard or maybe they'll replace antibiotics altogether. Scientists are trying to find ways to use viruses to kill bad bacteria instead of using antibiotics. I said earlier we might yet find wonderful uses for viruses so there we have the wonderful world of microbes. We absolutely could not survive without them. Yes, some do cause disease and illness but they can also cure disease, produce oxygen energy and food.

Unit 9.
The past, present and future of the bubonic plague

Plague is notorious for causing mass sickness and devastation. But as much tragedy as the disease has caused, it also helped drive crucial scientific and social progress.

Plague is an infectious disease caused by the bacterium Yersinia pestis. It mainly affects rodents and spreads by way of insects. Because of these insect carriers, plague has been passed onto humans with devastating consequences.

Three major plague pandemics have occurred in human history. And while they occurred centuries apart, they shared similar traits that paved the way for the spread of disease.

One cause of plague pandemics was the rise of international trade. Trade routes connected once-isolated communities and created large economic networks. But by facilitating the movement of goods between communities, trade routes also facilitated the movement of germs. International trade was an impetus for the first plague pandemic on record, the plague of Justinian. In the sixth century, outbreaks began in Egypt, and, thanks to land and sea trade routes, they spread throughout the Byzantine Empire. Named after the emperor at the time, the Plague of Justinian is estimated to have wiped out about half of Europe's population.

Growing economies also made way for urbanization and a rising urban population. This resulted in crowded neighborhoods and the accumulation of waste, which created unsanitary living conditions. Cities and their residents essentially become incubators for germs and diseases.

This was particularly evident in the second and most infamous plague pandemic. In the 14th century, Europe was experienced an economic and population boom, especially in cities. Proper waste management did not exist at the time, making cities vulnerable to disease. After trade routes brought plague from Asia, where it killed millions in China and the Middle East, the disease wiped out about a third of Europe's population, earning itself the moniker the Black Death.

What also aided in the transmission of the disease was the lack of medical knowledge. For most of human history, the cause of illnesses, germs, was unknown, making sicknesses like the plague a mystery. This lack of knowledge drove the spread of disease as recently as the 19th century. Outbreaks in northwest India eventually reached major port cities in China. In just over a century, plague was exported throughout the globe and cause outbreaks in every continent except Antarctica, making in the most widespread pandemic in history. This plague pandemic, however, was the last.

1894, scientists discovered the bacteria behind plague outbreaks. Their discovery helped further developments in microbiology, medicine, urban planning, and sanitation methods, which led to the treatment and prevention of the disease.

Economic expansion, urbanization, and a lack of medical knowledge contributed to the disastrous spread of plague. In turn, however, the disease helped catapult crucial advancements in science and public health, very well making plague pandemics a thing of the past.

Unit 10.
The immortal cells of Henrietta Lacks

Imagine something small enough to float on a particle of dust that holds the keys to understanding cancer, virology and genetics. Luckily for us, such a thing exists in the form of trillions upon trillions of human lab-grown cells called Hela.

Let's take a step back for a second. Scientists grow human cells in the lab to study how they function, understand how diseases develop, and test new treatments without endangering patients. To make sure that they can repeat these experiments over and over, and compare the results with other scientists, they need huge population of identical cells that can duplicate themselves faithfully for years, but until 1951, all human cell lines that researches tried to grow had died after a few days.

Then a John Hopkins' scientist named George Gey received a sample of a strange looking tumor: dark purple, shiny, jelly-like. This sample was special. Some of its cells just kept dividing, and dividing, and dividing. When individual cells died, generations of copies took their place and thrived. The result was an endless source of identical cells that's still around today. The very first immortal human cell line. Gey labeled it "Hela" after the patient with the unusual tumor, Henrietta Lacks.

Born on a tobacco farm in Virginia, she lived in Baltimore with her husband and five children. She died of aggressive cervical cancer a few months after tumorous cells were harvested, and she never knew about them. So, what's so special about the cells from Henrietta Lacks that let's them survive when other cell lines die? The short answer is we don't entirely know!

Normal human cells have built-in control mechanisms. They can divide about 50 times before they self destruct in a process called apoptosis. This prevents the propagation of genetic errors that creep in after repeated rounds of division. But cancer cells ignore these signals, dividing indefinitely and crowding out normal cells. Still, most cell lines eventually die off, especially outside the human body. Not, Hela, though, and that's the part we can't yet explain.

Regardless, when Dr.Gey realized he had the first immortal line of human cells, he sent samples to labs all over the world. Soon the world's first cell production facility was churning out 6 trillion Hela cells a week, and scientists put them to work in an ethically problematic way, building careers and fortunes off of Henrietta's cells without her or her family's consent, or even knowledge until decades later.

The polio epidemic was at its peak in the early 50s. Hela cells, which easily took up and replicated the virus, allowed Jonas Salk to test his vaccine. They've been used to study diseases, including measles, mumps, HIV, and Ebola.

We know that human cells have 46 chromosomes because a scientist working with Hela discovered a chemical that makes chromosomes visible. Hela cells themselves actually have around 80 highly mutated chromosomes. Hela cells were the first to be cloned. They've traveled to outer space. Telomerase, an enzyme that helps cancer cells evade destructing by repairing their DNA, was discovered first in Hela cells. In an interesting turn of fate, thanks to Hela, we know that cervical cancer can be caused by a virus called HPV and now there's a vaccine.

Hela-fueled discoveries have filled thousands of scientific papers, and that number is probably even higher than anyone knows. Hela cells are so resilient that they can travel on almost any surface: a lab-worker's hand, a piece of dust, invading cultures of other cells and taking over like weeds, countless cures, patents and discoveries all made thanks to Henrietta Lacks.

Answer Key

Unit 1.

Exercise 3.

1. E; 2. J; 3. A; 4. B; 5. I; 6. C; 7. H; 8. G; 9. D; 10. F.

Exercise 5.

1. objects (subjects); 2. student (scientist); 3. shape (size); 4. analgesic (radioactive); 5. school (university); 6. idea (effect); 7. fruits (plants); 8. carbon compounds (matter in a state)

Exercise 7.

1. D; 2. A; 3. B.

Exercise 8.

1. guideline; 2. mentor; 3. opportunity; 4. primary care network; 5. interaction; 6. background; 7. to take the plunge

Exercise 10.

1. + 2. + 3. – (clinical director) 4. – (rheumatology) 5. + 6. + 7. + 8. – (professionals)

Exercise 11.

1. The position will develop your skills and bring you in-line with other pharmacists. 2. Both pharmacists have settled comfortably into their roles and have a good understanding of what is expected of them. 3. The basic skills required to excel in your role within a PCN are no different to the skills required of a community pharmacist. 4. These are questions that I found frustrating and I am sure you do too. 5. I acknowledge that there will be learning needs. 6. We have resources that will be useful to support pharmacists in activities they will be involved in. 7. The RPS has a medicines optimisation hub, which includes our good practice guidance on medicines optimization.

Exercise 12.

1.B 2. C 3. - 4. - A 5.

Exercise 13.

Advises you about prescription
Needs to be a people person
Talks to people about medical conditions
Helps people to understand their medication
Knows all about side effects and interactions

Exercise 14.

pharmacist, diploma, Bachelor's Degree, PharmD, pharmacy, pharmacology

Exercise 15

I. 1 b
II. 3a
III. 2c

Exercise 16

1. +
2. +
3. +
4. –
5. –
6. +
7. +
8. –

Unit 2.

Exercise 3.

1. G; 2. I; 3. D; 4. A 5. B; 6. J; 7. C; 8. E; 9. F; 10. H; 11. L; 12. K

Exercise 5.

1. cranium (chest); 2. temple (neck); 3. knee (ankle); 4. respiratory (digestive); 5. chest (neck); 6. arm (leg); 7. toe (elbow); 8. to eat (to move); 9. external (internal); 10. cartilage (bone)

Exercise 7.
1. tissue; 2. sofware; 3. clinical trial; 4. immune rejection; 5. stem cells; 6. immunosuppressive drug; 7. vasculature

Exercise 8.
1. D; 2. B; 3. A; 4. E ; 5. C.

Exercise 10.
1. + 2. – (no one) 3. – (small objects) 4. + 5. + 6. – (skin and bone) 7. + 8. +

Exercise 11.
1. many researchers have moved beyond printing with plastics and metals – printing with cells that then form living human tissues. 2. the printer would piece that design into the complete product. 3. The team showed that the cells beating rate decreased dramatically after exposure to the drug. 4. There are a number of companies who are attempting to do things like 3-D print ears. 5. The matrix in this case was the cellular material that made up the heart ventricle. 6. A gelatin-like ink pushed these cells gently out of the way to create a network of channels. 7. That's far more intricate than what researchers have printed so far. 8. Due to hurdles with adding vasculature and many other challenges that still face 3-D–printed tissues, laboratory-built organs won't be available for transplant anytime soon. 9. In the meantime, 3-D printing portions of tissue is helping accelerate both basic and clinical research about the human body.

Exercise 12.
1.E;2. G ; 3. A; 4. B; 5. F; 6. C; 7. H; 8. D

Exercise 13.
loosey-goosey, pile, squeezing, shield, squishy, bear hug

Exercise 14
1. +
2. – (femur)
3. – (in your ear)
4. +
5. +

Exercise 15
1. A; 2. C; 3. B; 4. D; 5. C.

Exercise 16
1. A ; 2.C ; 3. C

Unit 3.

Exercise 3.
1. G; 2. J; 3. D; 4. A 5. B; 6. I; 7. C; 8. E; 9. F; 10. H;

Exercise 5.
1. apple-shaped (bean-shaped); 2. cell (organism); 3. gullet (chest); 4. mucus (blood); 5. organs (substances); 6. pollination (reproduction); 7. leg (skull); 8. chemicals (materials)

Exercise 7.
1. fabella; 2. mesentery; 3. meninges; 4. interstitium; 5. drain; 6. fetuses; 7. misconception

Exercise 8.
1. C; 2. E; 3. A; 4. B; 5. D.

Exercise 10.
1. + 2. – (of tissues and cells) 3. – (a handful) 4. + 5. +

Exercise 11.
1. c 1. c
2. a 2. a
3. b 3. b

Exercise 12.
1.cadaver;2. bowels ; 3. fetus; 4. embryo; 5. specimen; 6. researchers;

Exercise 13.
1. B; 2. C; 3. D; 4. A

Exercise 14
1. A; 2. C.

Exercise 15
1. E; 2. C; 3. H; 4. A; 5. G ; 6. B; 7. D; 8. F.

Exercise 16
approximately, fuel, uterus, sperm channel, fertilization

Exercise 17
1. + ; 2. – (from the blood); 3. + ; 4. – (8)

Unit 4.

Exercise 3.
1. G; 2. E; 3. I; 4. A 5. B; 6. J; 7. C; 8. F; 9. D; 10. H;

Exercise 5.
1. mammals (fungi); 2. asthma (coughs); 3. saliva (blood); 4. mucus (blood); 5. ants (dogs);

Exercise 7.
1. gunshot wound; 2. contamination; 3.nosocomial; 4. neurotoxin; 5. to germinate; 6. debridement; 7. bacillus; 8. haemorrhage 9. booster dose.

Exercise 8.
I. 3a
II. 2c
III. 1b

Exercise 9
1. E; 2. B; 3. C; 4. A; 5. D

Exercise 11.
1. + 2. – (frequent) 3.+ 4. – (soil) 5. +

Exercise 12.
1.gunshot wound; 2. haemorrhage; 3. contamination; 4. neurotoxin; 5. germinate; 6. bacillus; 7. debridement; 8. booster dose

Exercise 13.
1. E; 2. H; 3.A ; 4. B; 5. C; 6. D; 7. F; 8. G

Exercise 14
Hajj pilgrimage, outbreak, inflammation, sheer, disease.

Exercise 15
1. +; 2. – (without); 3. +; 4. – (hearing loss); 5. – (a few hours) ; 6.+ .

Exercise 16
1. B; 2. A; 3. C; 4. D.

Unit 5.

Exercise 3.
1. E; 2. J; 3. G; 4. A; 5. B; 6. C; 7. I; 8. D; 9. F; 10. H;

Exercise 5.
1. future (feature); 2. pleasant (unpleasant); 3. week (weekness); 4. low (high); 5. dental (mental); 6. function (dysfunction); 7. heart (muscle); 8. mucus (sputum).

Exercise 7.
1. D; 2. B; 3. E; 4. A; 5. C; 6. F.

Exercise 8.
1. abundance; 2. psychosis; 3. caveat; 4. species; 5. neurotransmitter; 6. minocycline; 7. microbiome; 8. hippocampi

Exercise 10.
1. + 2. – (of human) 3. + 4. – (stool samples) 5. +

Exercise 11.
I. 3a; II. 1b; III. 2c.

Exercise 12.
1. D; 2. A; 3. B; 4. C;

Exercise 13.
1. B; 2. D; 3. E; 4. A; 5. C; 6. F.

Exercise 14
1. H; 2. F; 3. A; 4. B; 5. C ; 6. G; 7. D; 8. E.

Exercise 15
1. lining; 2. bloating; 3. enzymes; 4. proponents; 5. offender; 6. virulence.

Exercise 16
1. + ; 2. – (his patient); 3. – (2005) ; 4. +; 5. – (stress alone); 6. +

Exercise 17
1. D; 2. A; 3. B; 4. C; 5. A.

Unit 6.

Exercise 3.
1. G; 2. J; 3. D; 4. A 5. B; 6. I; 7. C; 8. E; 9. F; 10. H;

Exercise 5.
1. apple-shaped (bean-shaped); 2. cell (organism); 3. gullet (chest); 4. mucus (blood); 5. organs (substances); 6. pollination (reproduction); 7. leg (skull); 8. chemicals (materials)

Exercise 7.
1. fabella; 2. mesentery; 3. meninges; 4. interstitium; 5. drain; 6. fetuses; 7. misconception

Exercise 8.
1. C; 2. E; 3. A; 4. B; 5. D.

Exercise 10.
1. + 2. – (of tissues and cells) 3. – (a handful) 4. + 5. +

Exercise 11.
1. c 1. c
2. a 2. a
3. b 3. b

Exercise 12.
1.cadaver;2. bowels ; 3. fetus; 4. embryo; 5. specimen; 6. researchers;

Exercise 13.
1. B; 2. C; 3. D; 4. A

Exercise 14
1. A; 2. C.

Exercise 15
1. E; 2. C; 3. H; 4. A; 5. G ; 6. B; 7. D; 8. F.

Exercise 16
approximately, fuel, uterus, sperm channel, fertilization

Exercise 17
1. + ; 2. – (from the blood); 3. + ; 4. – (8)

Unit 7.

Exercise 3.
1. G; 2. J; 3. D; 4. A 5. B; 6. I; 7. C; 8. E; 9. F; 10. H;

Exercise 5.
1. apple-shaped (bean-shaped); 2. cell (organism); 3. gullet (chest); 4. mucus (blood); 5. organs (substances); 6. pollination (reproduction); 7. leg (skull); 8. chemicals (materials)

Exercise 7.
1. fabella; 2. mesentery; 3. meninges; 4. interstitium; 5. drain; 6. fetuses; 7. misconception

Exercise 8.
1. C; 2. E; 3. A; 4. B; 5. D.

Exercise 10.
1. + 2. – (of tissues and cells) 3. – (a handful) 4. + 5. +

Exercise 11.
1. c 1. c
2. a 2. a
3. b 3. b

Exercise 12.
1.cadaver;2. bowels ; 3. fetus; 4. embryo; 5. specimen; 6. researchers;

Exercise 13.
1. B; 2. C; 3. D; 4. A

Exercise 14
1. A; 2. C.

Exercise 15
1. E; 2. C; 3. H; 4. A; 5. G ; 6. B; 7. D; 8. F.

Exercise 16
approximately, fuel, uterus, sperm channel, fertilization

Exercise 17
1. + ; 2. – (from the blood); 3. + ; 4. – (8)

Unit 8.

Exercise 3.
1. G; 2. J; 3. D; 4. A 5. B; 6. I; 7. C; 8. E; 9. F; 10. H;

Exercise 5.
1. apple-shaped (bean-shaped); 2. cell (organism); 3. gullet (chest); 4. mucus (blood); 5. organs (substances); 6. pollination (reproduction); 7. leg (skull); 8. chemicals (materials)

Exercise 7.
1. fabella; 2. mesentery; 3. meninges; 4. interstitium; 5. drain; 6. fetuses; 7. misconception

Exercise 8.
1. C; 2. E; 3. A; 4. B; 5. D.

Exercise 10.
1. + 2. – (of tissues and cells) 3. – (a handful) 4. + 5. +

Exercise 11.
1. c 1. c
2. a 2. a
3. b 3. b

Exercise 12.
1.cadaver;2. bowels ; 3. fetus; 4. embryo; 5. specimen; 6. researchers;

Exercise 13.
1. B; 2. C; 3. D; 4. A

Exercise 14
1. A; 2. C.

Exercise 15
1. E; 2. C; 3. H; 4. A; 5. G ; 6. B; 7. D; 8. F.

Exercise 16
approximately, fuel, uterus, sperm channel, fertilization

Exercise 17
1. + ; 2. – (from the blood); 3. + ; 4. – (8)

Unit 9.

Exercise 3.
1. G; 2. J; 3. D; 4. A 5. B; 6. I; 7. C; 8. E; 9. F; 10. H;

Exercise 5.
1. apple-shaped (bean-shaped); 2. cell (organism); 3. gullet (chest); 4. mucus (blood); 5. organs (substances); 6. pollination (reproduction); 7. leg (skull); 8. chemicals (materials)

Exercise 7.
1. fabella; 2. mesentery; 3. meninges; 4. interstitium; 5. drain; 6. fetuses; 7. misconception

Exercise 8.
1. C; 2. E; 3. A; 4. B; 5. D.

Exercise 10.
1. + 2. – (of tissues and cells) 3. – (a handful) 4. + 5. +

Exercise 11.
1. c 1. c
2. a 2. a
3. b 3. b

Exercise 12.
1.cadaver;2. bowels ; 3. fetus; 4. embryo; 5. specimen; 6. researchers;

Exercise 13.
1. B; 2. C; 3. D; 4. A

Exercise 14
1. A; 2. C.

Exercise 15
1. E; 2. C; 3. H; 4. A; 5. G ; 6. B; 7. D; 8. F.

Exercise 16
approximately, fuel, uterus, sperm channel, fertilization

Exercise 17
1. + ; 2. – (from the blood); 3. + ; 4. – (8)

Unit 10.

Exercise 3.
1. G; 2. J; 3. D; 4. A 5. B; 6. I; 7. C; 8. E; 9. F; 10. H;

Exercise 5.
1. apple-shaped (bean-shaped); 2. cell (organism); 3. gullet (chest); 4. mucus (blood); 5. organs (substances); 6. pollination (reproduction); 7. leg (skull); 8. chemicals (materials)

Exercise 7.
1. fabella; 2. mesentery; 3. meninges; 4. interstitium; 5. drain; 6. fetuses; 7. misconception

Exercise 8.
1. C; 2. E; 3. A; 4. B; 5. D.

Exercise 10.
1. + 2. – (of tissues and cells) 3. – (a handful) 4. + 5. +

Exercise 11.
1. c 1. c
2. a 2. a
3. b 3. b

Exercise 12.
1.cadaver;2. bowels ; 3. fetus; 4. embryo; 5. specimen; 6. researchers;

Exercise 13.
1. B; 2. C; 3. D; 4. A

Exercise 14
1. A; 2. C.

Exercise 15
1. E; 2. C; 3. H; 4. A; 5. G ; 6. B; 7. D; 8. F.

Exercise 16
approximately, fuel, uterus, sperm channel, fertilization

Exercise 17
1. + ; 2. – (from the blood); 3. + ; 4. – (8)

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