5 Disease

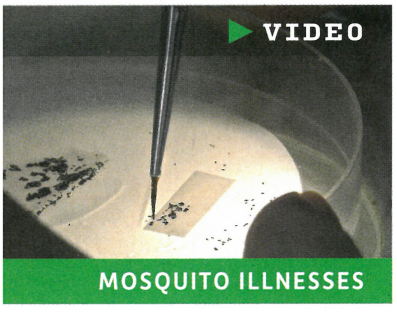
DISCUSSION POINT

Discuss with a partner.

1 How important is it to follow the advice in the infographic?
It's incredibly important for a number of reasons like ...

2 What should governments do to prevent the spread of diseases?
The most important thing to do is ...

3 Should medicine to prevent diseases be given free to those who need it? Why / why not?
I think it should / shouldn't because ...



BEFORE YOU WATCH

Match the words in bold with the correct definitions.

1 **bacteria** (n)
2 **inject** (v)
3 **sterile** (adj)
4 **suppress** (n)

a to stop a physical process from happening or developing
b unable to reproduce
c to introduce something into the body using a needle and syringe
d microscopic organism(s) that can cause disease and decay

UNIT AIMS

READING 1 Recognizing paragraph structure
READING 2 Identifying sentence functions
ACADEMIC SKILL Organizing a cause-and-effect essay

VOCABULARY Cause and effect
GRAMMAR *unless* and *provided*
WRITING A cause-and-effect essay

Sanitizing the stands in a stadium

WHILE YOU WATCH

Read the sentences then watch the video. Write *T* (True), or *F* (False).

1 The mosquito eggs are injected with bacteria. ___
2 Then the male mosquitos kill the females. ___
3 Each researcher can inject 200 eggs with bacteria a day. ___
4 The researchers in Shazai have reduced the mosquito population by 90%. ___
5 The technology has not worked well in Brazil. ___

AFTER YOU WATCH

Work with a partner. Discuss the questions.

1 Which of these do you think is more dangerous: mosquitos, tigers, or sharks? Justify your opinion.
I think ... because ...
2 Do you know any ways to prevent mosquitos from biting?
3 What are the major causes of disease and illness in your country? What can be done to prevent them?
I think the major causes are ... We should ...

FIGHTING CHOLERA

A VOCABULARY PREVIEW

Complete the sentences with the words below.

associate effective gather infected major polluted proof supply

1 There is _____ that shows that the disease is spread through the air.
2 A _____ of fresh water is essential to avoid disease.
3 Many people _____ malaria with long periods of rainfall.
4 _____ air can cause a number of health problems.
5 Antibiotics are the most _____ treatment for the illness.
6 Over 10,000 people were _____ by the disease.
7 Heart disease is a _____ cause of death worldwide.
8 Scientists are trying to _____ data together to test their theory.

B BEFORE YOU READ

Preparing to read

Work with a partner. How many of these diseases have you heard of? What do governments, organizations, and people do to fight the spread of these diseases?

bird flu cholera Ebola heart disease Zika virus

C GLOBAL READING

Predicting

1 These words are taken from each paragraph of *Fighting cholera*. What do you think the topic of each paragraph is?

1 paragraph 1 cholera, diarrhea, dehydration, infected, treatment, die
topic: _____

2 paragraph 2 outbreaks, started, transported, waste
topic: _____

3 paragraph 3 thought, theory
topic: _____

4 paragraph 4 transmitted, fresh water, drinking, waste
topic: _____

5 paragraph 5 outbreaks, water, not affected, not infected, evidence, stop
topic: _____

6 paragraph 6 sewer system ... built, propose ... theory, accepted
topic: _____

2 Read the text and check your predictions.

GLOSSARY

outbreak (n) the sudden start of war, disease, violence, etc.

sewer (n) an underground pipe or passage that carries sewage

Fighting CHOLERA

1 Cholera is a disease that is transmitted by drinking water contaminated with bacteria. It leads to diarrhea, which can result in high levels of dehydration. Today, according to the World Health Organization, around three to five million people are infected with cholera. These days the disease can successfully be treated provided that drinking water with added salt is consumed. As a result of this cheap and effective treatment, most people survive. However, the number of people that die from cholera still exceeds 100,000 every year.

2 Around the world there have been many outbreaks of cholera that have killed millions of people. During the first industrial revolution, the disease started to become an even bigger killer. Transported between major towns and cities by people buying and selling goods, once the disease reached a new area, many people were quickly infected, and it caused many pandemics. A pandemic is an outbreak of a disease that rapidly leads to large numbers of people being affected. As more and more people moved to cities, the infrastructure of many places did not undergo a development process at the required rate. Sewers were not built quickly enough to take human waste away, and many major rivers and other sources of water became polluted.

3 In the early days, most people thought that cholera was spread through polluted air. Known as the miasma theory, the visible effects of heavy industry understandably led people to suspect that bad air was the cause of the pandemic. The actual cause of the spread of infectious diseases—germ theory—was not yet known. This theory, suggested by Louis Pasteur, argued that small organisms, too small to see with the human eye, grow and reproduce on people, plants, and animals. However, one local doctor, John Snow, was not convinced that this was how cholera spread.

4 Snow felt that provided cholera was a disease transmitted through the air, then it would affect people's lungs. However, it had no impact on people's breathing. Instead, it attacked people's bowels and caused very bad diarrhea. At this time in London, people did not receive a fresh water supply to their homes. They took their drinking water from the river Thames, which was also where sewage was deposited. Essentially, people were drinking their own waste. Snow proposed that cholera was actually a disease transmitted through water rather than air. Initially, unless he could gather proof, his theory was unlikely to be accepted.

5 Snow went door to door mapping out where the main outbreaks occurred. This method led him to a young child, Frances Lewis. John discovered that the mother had washed Frances' soiled clothes in a nearby cesspool, used to store human waste. Unknown at the time, this cesspool had been leaking into the main local fresh water supply, polluting it. This simple action was the cause of the outbreak of cholera in the Broad Street area. At the same time, a local workhouse with over 500 employees was not affected. Only five people working there had died. Snow believed this was because the workhouse had its own fresh-water pump that was not infected. With this and other evidence, he was able to persuade the local government to close the Broad Street pump and arguably stop the pandemic.

6 Although Snow now had significant evidence to support his theory, it was still not widely accepted. Many people, including doctors, still believed the water in the Thames was fresh enough to drink. In 1858, John Snow died. Later that summer, the hot weather caused the smell of the river Thames to become so bad that politicians were nearly forced to leave the Houses of Parliament. As a result, a huge sewer system was built beneath London to give people access to clean water. However, nearly a decade later, in the last area to get access to the sewer system, there was another cholera outbreak. Henry Whitehead, a researcher who worked with John Snow, used this evidence and the previous examples they had gathered to propose the theory again. Finally, the theory was accepted. John Snow's words to Henry Whitehead had come true: "You and I may not live to see the day, and my name may be forgotten when it comes, but the time will arrive when great outbreaks of cholera will be things of the past; and it is the knowledge of the way in which the disease is propagated which will cause them to disappear."

D CLOSE READING

Recognizing paragraph structure

Texts sometimes have one overall structure such as cause and effect, problem and solution, etc. However, texts also often have paragraphs within them with particular structures. For example, one paragraph may describe an event and another may define a key term. Also paragraphs themselves will often have sentences with particular functions and structures.

1 Read the first paragraph in *Fighting cholera*. Match each sentence in the paragraph to these functions.

a Describing the effects of cholera ____
b Describing the effects of treatment ____
c Describing the treatment ____
d Explaining the cause of cholera ____
e Describing the effects of not treating it ____
f Describing cholera today ____

2 Read the rest of the text. Identify the sentences with these functions.

a paragraph 2 — defining a major situation
b paragraph 3 — the cause of cholera
c paragraph 4 — the effects of cholera
d paragraph 5 — the effects of the investigation
e paragraph 6 — the effect of a smelly river Thames

E CRITICAL THINKING

Work in a group. Discuss the questions.

1 Why do you think lots of people did not believe John Snow?

They perhaps didn't believe him because ...

2 Think about research you have heard or read about, for example, research into healthy or unhealthy foods, climate change, or mental health. Do you always believe the research? Why / why not?

I usually / don't usually believe it because ...

It depends. I sometimes believe it when ...

ACADEMIC SKILLS

ORGANIZING A CAUSE-AND-EFFECT ESSAY

A cause-and-effect essay is one style of descriptive essay (see page 109 in Unit 6 for more information about descriptive essays). This kind of essay does not need to present a point of view, but rather provide the information needed for the reader to think critically about the topic. There are different ways to organize a cause-and-effect essay:

1 One main effect with multiple, shared causes. This may require just one part on the causes and another on the effects. For example:

PART 1: Climate change causes → overpopulation / farming methods / burning fossil fuels / deforestation

PART 2: Climate change effects → drought / flooding / extinction of species / pollution

2 If the causes and effects are more directly linked to each other, you could discuss each cause and effect together in the same paragraph. For example:

TOPIC: Animal and plant extinction

PARA 1: Hunting → large mammals

PARA 2: Deforestation → plants and birds

PARA 3: Water pollution → marine wildlife

1 Read the *Organizing a cause-and-effect essay* box and then write *C* (cause) or *E* (effect) next to each word or phrase.

1	diet ___	heart disease ___	smoking ___	lack of exercise ___
2	stroke ___	high blood pressure ___	diabetes ___	obesity ___
3	air pollution ___	genetics ___	lung disease ___	smoking ___

2 Read the *Organizing a cause-and-effect essay* box again. Which way of organizing information (1 or 2) would you use for the issues (1–3) listed in Exercise 1? Why?

3 Work with a partner. Read the essay question below and brainstorm your ideas.

Today more people are overweight than ever before. What, in your opinion, are the primary causes of this? What are the main effects of this epidemic?

4 Use your ideas from Exercise 3 to plan the main body of an essay that answers the question.

HEALTH COMES AT A PRICE

A VOCABULARY PREVIEW

1 Choose the correct option that could replace the bold words and phrases.

1 Is the fact we **are dependent on** companies to develop drugs a problem?
a need **b** encourage

2 What impact might disease or illness have on a country's **productivity**?
a consumption of goods **b** ability to work efficiently

3 Are you ever **alarmed** when you hear about diseases around the world?
a upset **b** very worried

4 How do we **distinguish** between life expectancy and healthy life expectancy?
a describe the similarities **b** describe the differences

5 How do you think research funding and the number of deaths are **related**?
a connected **b** justified

6 **Overall**, deaths from heart disease are rising. Why?
a Surprisingly **b** As a whole

7 Are you ever **doubtful** when you read advice about how to be healthy?
a uncertain **b** worried

8 Why are some illnesses **overlooked** when it comes to research funding?
a given priority **b** ignored

2 Work with a partner. Discuss the questions in Exercise 1.

B BEFORE YOU READ

Preparing to read

Work with a partner and discuss the main health issues in your country. What are the causes of these issues and how can they be prevented?

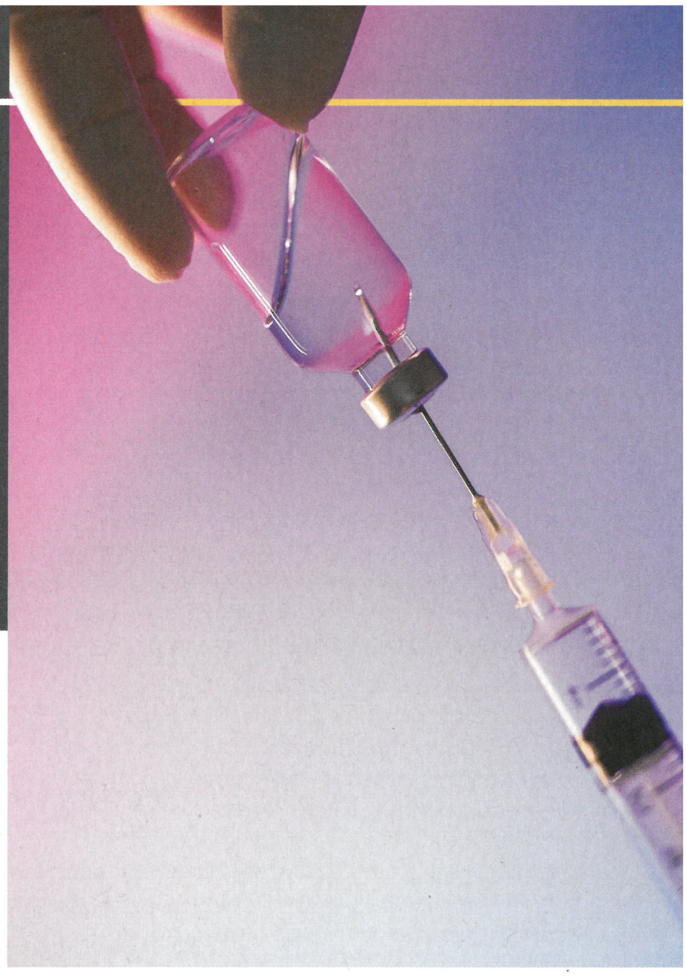
C GLOBAL READING

Identifying main ideas

Read *Health comes at a price* and match the main ideas (a–f) to the paragraphs (2–7).

a The amount spent researching a disease and how many people it affects ___
b Prevention may be better than cure for some diseases. ___
c Income differences and cause of death ___
d Companies want to make a profit, so only research certain areas. ___
e Increased funding is needed for some preventable diseases. ___
f Pharmaceutical companies can make profits without investing in research. ___

HEALTH COMES AT A PRICE



1 Overall, life expectancy has increased dramatically over the last 100 years. Transmission of many diseases which were once widespread, such as polio, tetanus, and hepatitis, has fallen significantly because of vaccinations. In fact, until recently, virtually all cases of polio had disappeared, and it nearly became the second disease, after smallpox, to be completely eradicated. Improved hygiene and medical advances have not only increased people's chances of living to old age, but also improved our quality of life. However, many millions die each year from preventable diseases because, when it comes to research funding, some diseases are largely overlooked.

2 There are a number of factors that can play a role in determining the main cause of death for a particular group. For example, cause of death can be very dependent on income. When we distinguish between low-income and high-income countries, there are big differences. Six out of ten of the main causes of death in low-income countries result from communicable diseases (illnesses we can catch from water, air, the things we touch, and other people). However, in high-income countries, nine out of ten of the main causes of death are related to noncommunicable diseases (illnesses that cannot be passed from one person to another). These include heart disease, stroke, or lung disease, which ultimately often come from lifestyle choices and are all on the increase.

3 Both companies and countries invest enormous amounts of money in researching various diseases. However, the amount spent does not always match the impact. For example, the American Heart Association predicted that by 2030, one hundred million people in the United States would suffer from heart disease. To the alarm of many, this prediction actually came true by 2015. Treating such conditions and the lost working days they result in cost the US economy $550 million in 2016. The situation is also forecast to get much worse. By 2035, 45% of the US population is predicted to suffer from heart disease, and this will have cost the US economy $1.1 trillion. Despite this, the US National Institutes of Health (NIH) spends just 4% of its budget on heart research.

4 Unfortunately, many preventable diseases do not receive the funding needed to deal with them. For example, a disease such as tuberculosis (TB) is both preventable and curable, but around 1.4 million people die from it each year in low- and middle-income countries. TB is spread through the air as a result of exposure to germs. The vaccine to prevent it is now over 100 years old and is cheap and easy to give. However, access to the vaccine and diagnosis of the illness is not the same across the world, hence it is still a major killer in lower income countries. Malaria is another disease that mainly affects low-income countries and causes over 600,000 deaths a year. Drugs to treat malaria have been available for decades; however, their cost is often too high for people in the areas most affected. In some parts of the world, the most effective drugs can be over 50 times the minimum daily wage. While a malaria vaccine has

been developed in recent years, it is doubtful this vaccine will reach enough people anytime soon. So far, a million children have received the vaccine, but it is estimated that 80–100 million doses will be needed annually.

5 As to why research is prioritized in certain areas, cost and profit often come into play. Much research is undertaken by large pharmaceutical companies, and their funding is channeled into areas where they can make the most money. Therefore, it makes sense for these companies to target patients in high-income countries, and develop drugs that will need repeated use. For instance, vaccine research was largely neglected by these companies until the COVID-19 pandemic, when it suddenly became an issue for rich countries. Government funding started to pour in, and vaccine research rapidly became much more productive as companies fought to devise the first vaccines.

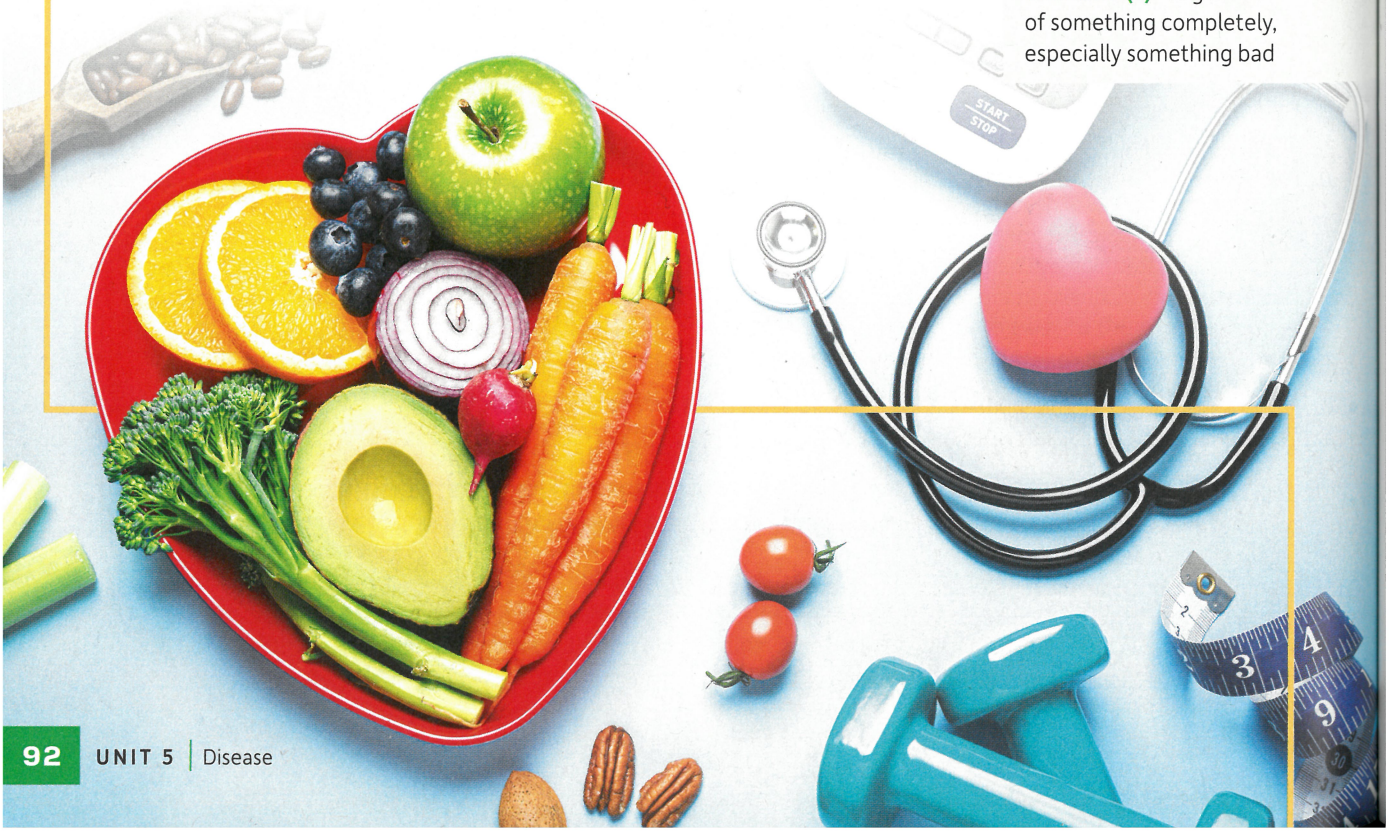
6 The institutions and organizations that invest in research are not necessarily the ones making the profit. Another interesting thing to bear in mind is that big pharmaceutical companies have not actually developed a lot of the drugs they own the patent to. A patent gives a company the legal right to be the sole producer of a drug. However, large pharmaceutical companies have often bought the patents from another organization. The NIH gives nearly $40 billion a year to universities, medical schools, and research organizations. Once these institutions develop a successful drug, pharmaceutical companies buy the license to sell them. The government and universities are arguably the innovative ones, and the pharmaceutical companies make the profits. Potentially, the whole system needs to undergo major changes to focus on the health needs of societies, rather than on profit.

7 Diseases can be dealt with in one of two main ways: prevention or cure. While communicable diseases often need higher investment in developing and distributing cures, noncommunicable diseases need investment in prevention. One insight from the World Health Organization (WHO) is that if we spent just $1 per person worldwide on preventing noncommunicable diseases, we could save seven million lives by 2030. The WHO estimates this would save countries $230 billion by 2030, as many productive years of life would be saved.

8 When COVID-19 first appeared, many feared it was going to lead to the collapse of society. Consequently, governments spent huge sums of money, and pharmaceutical companies quickly developed vaccines. It seems that when there's enough desire, things can be achieved in record time. With more effort and less direct focus on profit, millions more lives could be saved from heart disease, malaria, and TB.

GLOSSARY

eradicate (v) to get rid of something completely, especially something bad



D CLOSE READING

Identifying sentence functions

Identifying the function of a sentence can help you to understand the intention of the writer and the organization of a text. Functions include **defining**, **speculating**, **classifying**, **reporting**, and **naming**.

Defining: *A noncommunicable disease is one that cannot be caught or transmitted.*

Speculating: *While a vaccine has been developed in recent years, it is doubtful the vaccine will reach enough people anytime soon.*

Classifying: *Diseases can be categorized into two types: communicable or noncommunicable.*

Reporting: *One insight from the World Health Organization is that spending just $1 per person worldwide on preventing noncommunicable diseases could save seven million lives by 2030.*

Naming: *For example, a disease such as tuberculosis is both preventable and curable.*

Read the sentences and match them to the functions from the *Identifying sentence functions* box. Write *D* (defining), *S* (speculating), *C* (classifying), *R* (reporting), or *N* (naming).

1 Transmission of many diseases which were once widespread, such as polio, tetanus, and hepatitis, has fallen significantly because of vaccinations. ___

2 Six out of ten of the main causes of death in low-income countries result from communicable diseases (illnesses we can catch from water, air, the things we touch, and other people). ___

3 For example, the American Heart Association predicted that by 2030, one hundred million people in the United States would suffer from heart disease. ___

4 Diseases can be dealt with in one of two main ways: prevention or cure. ___

5 The WHO estimates this would save countries $230 billion by 2030, as many productive years of life would be saved. ___

E CRITICAL THINKING

Work in a group. Discuss the questions.

1 Should governments control all research funding and profit? Why / why not?
Yes / no, because ...

2 Is it right that companies can patent lifesaving drugs? Why / why not?
I think they should / shouldn't be able to patent ... because ...

VOCABULARY DEVELOPMENT

Cause and effect

We use a number of different words and expressions to show cause and effect. Some words place the cause first and the effect second, and others place the effect first and the cause second. For example:

cause effect

*Unclean water can **result in** an increase in diseases.*

effect cause

*Diseases such as typhoid are **caused by** unclean water.*

1 Underline the cause and circle the effect in each of these sentences.

1 Many days can be taken off sick. As a result, companies may lose income.
2 In the worst cases, a lower birth rate can result from a sharp rise in an infectious disease.
3 Lifestyle choices can result in an increase in many diseases.
4 The world's population fell by 5% because of the 1918 flu.
5 People often fear a breakout of a new disease. Therefore, governments need to communicate their effects quickly.
6 A sharp increase in the levels of any disease can place pressure on the medical profession. Consequently, many governments have emergency plans to help deal with this.

2 Choose the correct word or phrase to complete each sentence.

1 The outbreak **resulted in** / **as a result** a fall in tourism.
2 Diseases can have significant economic impacts. **Consequently,** / **Because of,** countries need to fund research into diseases.
3 More days being taken off work **therefore** / **resulted from** increased levels of depression and stress.
4 Governments have a responsibility for the welfare of their residents. **Therefore,** / **Because of,** they should develop vaccines that fight dangerous diseases.
5 **Consequently** / **Because of** lost working days, the government's income from taxes fell.
6 The government reduced funding for disease research. **As a result,** / **Result in,** fewer cures are being discovered.

3 Work with a partner. What are the major causes of falls and rises in diseases in the last 50 years? What have been the effects of these changes?

ACADEMIC WORDS AND IDIOMS

1 Match the words in bold with the correct definitions.

1 **bear in mind** (id)
2 **collapse** (v)
3 **come into play** (id)
4 **exposure** (n)
5 **hence** (adv)
6 **insight** (n)
7 **transmission** (n)
8 **ultimately** (adv)
9 **undergo** (v)
10 **virtually** (adv)
11 **widespread** (adj)

a the state of being put into a situation in which something harmful or dangerous might affect you
b used to emphasize the main point you are speaking about
c to suddenly fail or stop existing
d used to emphasize that a statement is almost completely true
e used for introducing something that is a result of the fact that has just been stated
f a process by which a disease spreads from one person to another
g happening or existing in many places, or affecting many people
h to experience something, especially something that is unpleasant but necessary
i to consider something when you are thinking about or doing something else
j to start to happen or have an effect
k a clear, deep understanding of something

2 Complete the sentences with words from Exercise 1.

1 _____ all diseases will have a cure in the next 100 years, but not all.
2 _____, we are each responsible for looking after our own health.
3 If we stop public funding, the research industry would _____.
4 Some patients had to _____ painful treatments.
5 Diseases are mainly spread by individuals. _____, we all need to do what we can to prevent passing them on to others.
6 _____ to a disease, such as Ebola, can be fatal. Therefore, governments should place restrictions on travel.
7 The residents of a local community are responsible for preventing the _____ of diseases such as the flu.
8 Many diseases are now more _____ due to international travel.
9 _____ from medical research will gradually prevent all diseases.
10 When we consider health, wealth _____ in many ways.
11 We need to _____ that many diseases can be prevented by lifestyle choices.

3 Choose the sentences you agree with in Exercise 2. Compare your opinions with a partner.

ACADEMIC IDIOMS

COME INTO PLAY

The phrase *come into play* is linked to playing games. For example, in a chess game, the Queen comes into play when you use this piece for the first time and then it has an effect on the game.

CRITICAL THINKING

Evaluating evidence

It is important that any evidence you use directly and logically supports the point you want to make. A vague or loose connection is not enough. The data should also be sufficient enough to support the claim being made. In other words, you should not make generalizations above and beyond the data without sufficiently hedging your opinion.

> Workplace illnesses are one of the major factors affecting company profitability throughout the world and ultimately lead to a huge loss of income. In one survey of 200 leading European companies, it was estimated that on average each person takes six days off sick each year. For a company of 2,000 employees, this is 12,000 lost working days.

1 Read the *Evaluating evidence* box. Then read the first sentence of the example paragraph again and answer the questions.

1 Does the data in the paragraph strongly support this opinion?

2 Is the data sufficient enough?

2 Read the following evidence. Which statement could possibly be used to support the essay question: "*How important is it for countries to fund research into disease?*"

1 Countries with high investment into disease prevention research have lower rates of most diseases.

2 Companies spend the most money researching drugs that will be the most profitable.

3 It is estimated that cancer costs the UK alone nearly £20 billion annually, of which £5 billion is directly in national healthcare costs.

3 Work with a partner. Discuss the questions.

1 How can you decide whether evidence is sufficient enough to support your point?

2 How can you eliminate irrelevant information?

3 What is the weakness in making generalizations beyond the data?

WRITING MODEL

You are going to learn about using *provided* and *unless*, and including definitions in your writing. You are then going to use these skills to write a cause-and-effect essay about funding research into disease.

A ANALYZE

Read the essay question and use the brainstorm below to complete the model essay.

"How important is it to teach children about how diseases are transmitted?"

Effects of hand washing	Effects of vaccination
a Provided good hygiene is established at a young age, it can be effective in reducing the breakout of a disease.	**c** However, as a result of vaccination, this number was reduced to just a few hundred within 20 years.
b Unless children do this before eating, they have a significantly increased chance of being infected.	**d** Many diseases, unless prevented by a vaccine, can potentially lead to a loss of life.

B MODEL

While much research funding focuses on developing cures for infectious diseases, we should bear in mind that one of the most effective tools is educating people to stop the transmission of a disease. This is particularly true when considering young children. Provided these techniques are taught at a young age, the spread of these diseases could be significantly reduced.

The spread of many diseases can be reduced simply by educating children to regularly wash their hands. [1] ____

When children develop poor hand-washing methods, it can lead to diseases such as the flu, and other illnesses such as diarrhea, becoming widespread. [2] ____

Another technique, which affects both children and parents, is that of the importance of vaccines. [3] ____

Polio is an infectious disease that destroys muscles. In 1985 over 400,000 people were infected with polio. [4] ____

Education is key in disease prevention. The education of everyone is important; however, developing children's knowledge and habits could ultimately lead to significant reductions in long-term disease breakout.

Discuss the questions with a partner.

1 Do you think educating children about things such as hand washing is effective?
2 Do you think governments should spend money on programs educating people about diseases?
3 Who should be responsible for funding research into diseases?

GRAMMAR

Unless and *provided*

Unless

Unless means "except if" or "only if"

*Initially, **unless** he could gather proof, his theory was unlikely to be accepted.*
= His theory would be accepted only if he could get proof.

*Furthermore, **unless** it is well managed, it could also result in panic and the closure of public services such as schools.*
= except if it isn't well managed, panic may occur and schools could close

Provided

Provided means "if" or "on condition that"

*Today, the disease can largely be fought **provided** drinking water with added salt is consumed.*
= If water and salt are consumed, the disease can be fought.

1 Choose the correct word to complete each sentence.

1 **Provided** / **Unless** the media react in a calm way, people tend not to panic.
2 **Unless** / **Provided** people are educated about the importance of vaccination, they may not accept it.
3 **Provided** / **Unless** people wash their hands, the spread of diseases can be reduced.
4 **Unless** / **Provided** more funding is made available, a cure is unlikely to be found.
5 **Unless** / **Provided** all children have the vaccine, the risk of an outbreak is very low.
6 **Unless** / **Provided** infected people follow the advice to stay at home, the outbreak should be controlled.

2 Rewrite the sentences with the same meaning. Use *unless* in each of your sentences.

1 People need to listen carefully or they won't know what to do.
2 Governments must act soon or there might be a pandemic.
3 It is a holiday today. Doctors will only see people for an emergency.
4 You're not allowed in. Only relatives can come in.

WRITING SKILL

Writing definitions

Definitions are usually written using two structures.

noun + a prepositional phrase:

This kind of vaccination and other medicines *can be used for fighting diseases.*

Word being defined category *use / detail*

relative clause:

A pandemic is a disease outbreak *that leads to many people being affected.*

Word being defined category *use / detail*

1 Read the sentences and identify:

a the word being defined
b the category
c the use or detail.

1 The flu is a contagious illness transmitted between individuals.
2 Quarantine is a secure place for putting infected people in isolation.
3 A campaign is a series of organized events for raising awareness of and protesting against an issue.

2 Reorder the words to make sentences.

1 is an infectious disease / transmitted by consuming contaminated water / Typhoid
2 that are made up of one tiny cell / bacteria / are small living organisms
3 that protects you from contracting diseases / the immune system / is a complex system within the body

3 Write definitions for the following words.

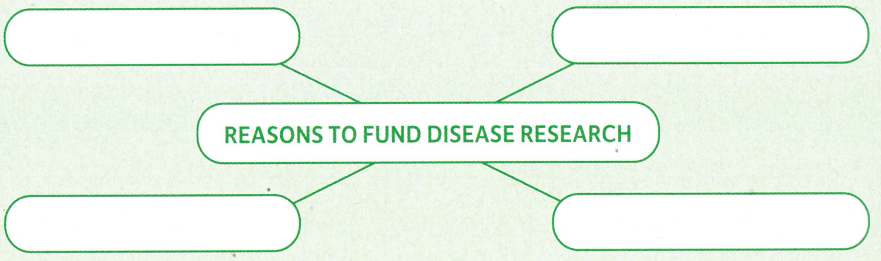
1 medicine _____
2 non-infectious disease _____
3 evidence _____
4 researcher _____

WRITING TASK

You are going to write a cause-and-effect essay in response to the following: *"How important is it for countries to fund research into disease?"*

Brainstorm

Complete the brainstorm below with your ideas.



Plan

1 Do you think it is important for countries to fund disease research?
2 What are the effects of funding disease research?
3 What are the effects of not funding disease research?

Write

Use your plan to help you write your essay. Remember to use *provided* and *unless* to talk about conditions where appropriate, and to use language of cause and effect. Your text should be about 250 words long.

Review

Exchange your essay with a partner. Review the following together.

- Have you included both causes and effects in your essay?
- Have you used a range of cause-and-effect vocabulary?
- Have you defined any key terms?

Rewrite and edit

Consider your partner's comments. Before writing the final draft of your essay, check whether your essay:

- uses *unless* to mean "except if" or "only if."
- uses *provided* to mean "if" or "on condition that."
- uses language of cause and effect appropriately.

WORDLIST

*** very frequent ** frequent * not frequent

Vocabulary preview

alarm (n) **
associate (v) ***
dependent (adj) ***
distinguish (v) ***
doubtful (adj) **
effective (adj) ***
gather (v) ***
infected (adj)
major (adj) ***
overall (adv) **
overlook (v) **
polluted (adj)
productive (adj) **
proof (n) **
related (adj) **
supply (n) ***

Vocabulary development

as a result (phr)
because of (phr)
consequently (adv) **
result from (phr)
result in (phr)
therefore (adv) ***

Academic words and idioms

bear in mind (id)
collapse (v) **
come into play (id)
exposure (n) **
hence (adv) ***
insight (n) **
transmission (n) **
ultimately (adv) **
undergo (v) **
virtually (adv) ***
widespread (adj) **

ACADEMIC WORDS AND IDIOMS REVIEW

Complete the sentences with the words in the box. Change the form if necessary.

bear in mind collapse come into play hence nevertheless undergo widespread

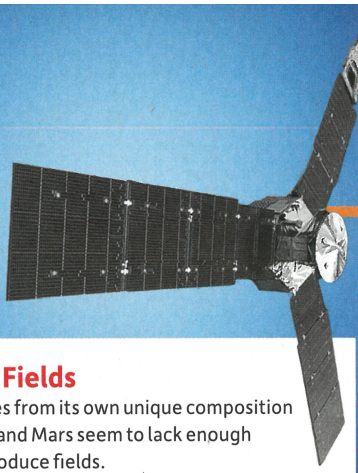
1 A new vaccine has caused the number of new infections to _____.
2 The disease was not well known to scientists. _____, it was to have an enormous impact on the population.
3 The disease was highly infectious, _____ the panic among the local community.
4 There was _____ alarm when news of the disease spread.
5 Everyone in my company has to _____ a health check.
6 _____ that it takes two weeks for the vaccine to become effective.
7 The role of a nurse _____ the moment a patient enters a hospital.

UNIT REVIEW

Reading 1	☐ I can recognize text organization.
Reading 2	☐ I can identify sentence functions.
Vocabulary	☐ I can use words and expressions to show cause and effect.
Academic skill	☐ I can organize a cause-and-effect essay.
Grammar	☐ I can use *unless* and *provided*.
Writing	☐ I can write a cause-and-effect essay.

SCIENTIFIC AMERICAN

THE SOLAR SYSTEM'S MYSTERIOUS MAGNETIC FIELDS

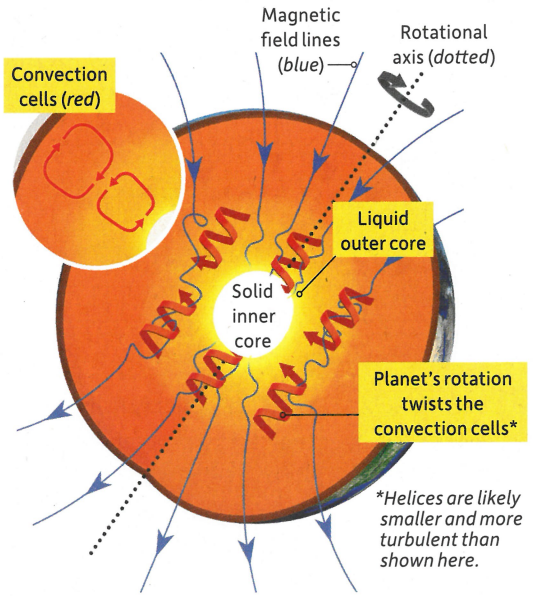


The magnetic fields in our solar system are surprisingly diverse. The two strongest—Jupiter's and Saturn's are extremely strong, but Mercury's is puny. Uranus's and Neptune's are out of whack with the direction of their rotation, although others are closely aligned. And each has a unique set of conditions that gives rise to a dynamo—the engine thought to activate a magnetic field.

Several upcoming space missions seek to study planetary magnetic fields, which offer a window into planets' internal makeup as well as their history and formation. NASA's Juno mission, for instance, is orbiting Jupiter with two sensor experiments to make the first global map of its magnetic field, the strongest in the solar system. And the European Space Agency has a mission in orbit now called Swarm, focused on monitoring how Earth's magnetic field changes over time.

Dynamo Basics

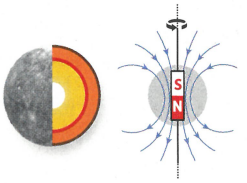
Dynamos form inside planets when moving electric charges give rise to magnetic fields. Earth's magnetic field, for instance, originates in its outer core, which is mostly made of molten iron. This iron, a metal, is essentially a river of electrically charged particles. These particles churn and flow because of convection—the tendency of denser material to sink and hotter, less dense stuff to rise—as well as our planet's rotation. The result is a constantly moving electric current, which produces a continuous magnetic field.



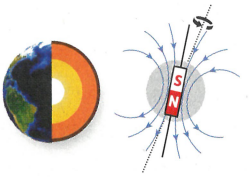
Planets with Magnetic Fields

Each planet's magnetic field arises from its own unique composition and rotational properties. Venus and Mars seem to lack enough convection in their interiors to produce fields.

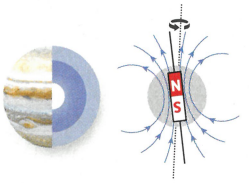
Mercury
The smallest of the planets also has the weakest magnetic field. Its internal dynamo is counteracted by the solar wind of particles streaming off the sun.



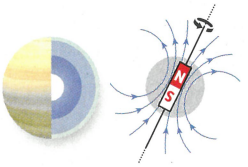
Earth
Our planet's magnetic north pole happens to point toward its geographic south pole, as do Mercury's and Uranus's.



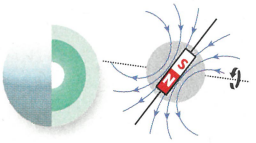
Jupiter
The solar system's strongest magnetic field is much more intense and complex than Earth's because of the gas giant's rapid rotation and larger metallic interior.



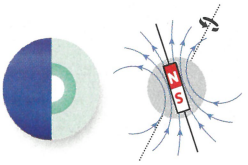
Saturn
Saturn's magnetic field is weaker than Jupiter's and symmetric around its axis of rotation, possibly because of helium rain that dampens convection in the atmosphere.



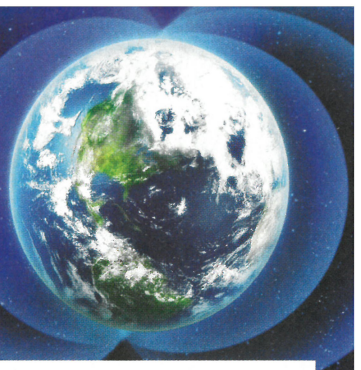
Uranus
The magnetic field here is tilted 60 degrees from the planet's rotational axis, causing the field's strength and orientation to fluctuate as Uranus spins.



Neptune
The farthest planet's magnetic axis is also misaligned from its rotational axis, giving it a lopsided shape that interacts with the solar wind in unbalanced ways.



- Solid iron
- Silicate mantle
- Liquid hydrogen
- Liquid iron
- Silicate crust
- Water, methane, and ammonia
- Iron sulfide
- Liquid metallic hydrogen and helium
- Hydrogen and helium



GLOSSARY

aligned (adj) in line with each other
dynamo (n) a piece of equipment that turns movement into electricity
out of whack (phr) not working normally
puny (adj) small, thin, and weak
rotation (n) the way a planet (or a ball, etc.) rotates (spins around an axis)

INTEGRATED SKILLS

You will read a text about magnetic fields and analyze a diagram. You will then hear a short audio related to the topic. There are some questions to help you with language and the main ideas. Finally, you will summarize the points in both texts.

A CLOSE READING

Read the *Scientific American* text about magnetic fields and look at the diagram. Which planet(s) does each statement refer to?

1 It has the second strongest magnetic field in the solar system.

_____

2 They don't have a magnetic field at all.

_____

3 Their magnetic axes are not aligned with their rotational axes.

_____

4 Their magnetic fields are affected by the solar wind.

_____

5 They rotate around their magnetic poles.

_____

B READING ANALYSIS

Work with a partner. Discuss the questions.

1 What are the goals of the Juno and Swarm missions?

2 What two processes cause molten (liquid) iron to churn and flow (move around a lot inside the Earth)?

C CLOSE LISTENING

3 Listen to a podcast about the way some birds use magnetic fields. Complete the summary with words and phrases from below. Use one word or phrase twice.

blue light chemical reactions chickens
cryptochrome genome landmarks
magnetic field migratory birds retinas robins

1 Migratory songbirds use the stars, the sun, smell, _____, and the Earth's _____ to find their way.

2 Songbirds have magnetic sensors in their _____, most likely a protein called _____.

3 Researchers used the _____ from European _____ to make the protein.

4 Next, they shined _____ onto the protein samples and exposed them to a _____.

5 This caused one of two _____, which depended on the strength of the magnetic field.

6 Cryptochromes in _____ seem to be more sensitive to magnetic fields than those in other birds, such as _____.

D LISTENING ANALYSIS

Work with a partner. Discuss the questions.

1 What did scientists already know before the research? What didn't they know?

2 What happens inside a bird's eye to help it sense a magnetic field?

E INTEGRATED WRITING

Summarize the points made in the podcast and say how they relate to what you learned about the Earth's magnetic field in the reading text and diagram. Write between 200 and 275 words for your answer.