4 Mad science

Reading

VOCABULARY **Biology and scientific research**

1a Match these words with the definitions below.

chromosome (n) • contract (a disease) (v)
enzyme (n) • genetic engineering (n)
genetically modified (adj) • parasite (n)
prevalent (adj) • resistant (adj) • species (n)
transmit (a disease) (v)

1 to pass a disease from one person to another
2 a plant or animal group whose members all have similar general features
3 a plant or animal that lives in or on another type of animal and feeds on it
4 not harmed or affected by something
5 very common in a particular place or among a particular group
6 the practice or science of adding genes to a living thing
7 to become infected with a disease
8 a structure that exists in cells, often as one of a pair
9 a natural chemical produced by animal and plant cells
10 a plant or animal that has had its genetic structure changed

1b Complete the sentences with words from 1. Make a change to the verb or noun where necessary.

1 Females have two X ..... Males have one X and one Y.
2 Some people think that ..... food could reduce world hunger.
3 Animals infected with the virus can ..... the disease to humans.
4 Bacteria can become ..... to antibiotics.
5 He was healthy until he ..... pneumonia.
6 ..... has made it possible to grow plants in places they don't normally grow.
7 ..... break down the food we eat so that it can be converted into energy.
8 ..... such as fleas are common in cats and dogs.
9 The number of plant and animal ..... at risk of extinction is growing.
10 Malaria is still ..... in many countries.

2 SPEAKING **Work with a partner and read the article headline opposite. What information do you expect to read in the article?**

3 Read the article quickly, ignoring the gaps. How would you summarise the main points?

4 Read the article again. Six paragraphs have been removed. Choose from the paragraphs A–F the one which fits each gap (1–6).

✓ EXAM SUCCESS

In reading activities where you complete a text with paragraphs, begin with the paragraphs that you find easiest and are sure about. Cross these out so that you have fewer options for the more difficult gaps.

➤ EXAM SUCCESS page 150

5 Find the following in the article. Explain who or what they are and why they are significant.

I-Ppol • Dr Nikolai Windbichler • 627,000 • GMEP
$12 billion • Pirbright Institute

6 **CRITICAL THINKING**

Think! Then compare ideas with your class.

- Do you believe that humans have the right to eliminate species from the planet?
- What possible consequences can you see, both positive and negative, of this type of experiment?

7 Guess the meaning of the underlined words from the context. Then use your dictionary to check.

8 SPEAKING **What about *you*?**

1 Are mosquitoes a problem where you live? What are the best ways to get rid of them?
2 Would you like to work in scientific research? Why/Why not?
3 What other examples of genetic engineering in plants and animals can you think of?
4 What are the benefits and dangers of these?

MODIFYING MOSQUITOES

Genetically modified mosquitoes could help to eradicate malaria

Mosquitoes have been genetically modified so they only give birth to males in a new technique that scientists hope could help to wipe out malaria.

Scientists from Imperial College London have tested a new genetic method that changes the ratio of male to female *Anopheles gambiae* mosquitoes, the main transmitters of the malaria parasite, so that the female mosquitoes which bite and pass the disease to humans are no longer produced.

1 ___ In order to eliminate the female mosquitoes, scientists created a DNA-cutting enzyme called I-PpoI, which they inserted into a sample of *Anopheles gambiae* mosquitoes. In normal reproduction, the ratio of the X chromosome, which produces female offspring, and the Y chromosome, which produces males, is roughly equal. The enzyme used by the researchers cut the DNA of the X chromosome so that almost none could be produced. As a result, the offspring of the genetically-modified mosquitoes was almost exclusively male.

These genetically modified mosquitoes were then put into five cages containing general mosquito populations. In four of the five cages, the entire population was eliminated within six generations. The scientists hope that if they do the same thing with mosquitoes in the wild, the malaria-carrying mosquito population will ultimately die out within a few generations.

2 ___ This is the first time that scientists have been able to manipulate the ratios of male and female mosquito populations. The researchers believe the work paves the way for a pioneering approach to controlling malaria, which continues to threaten the lives of half of the global population.

3 ___ According to the latest estimates by the World Health Organization, over 3.4 billion people are at risk of contracting the disease and an estimated 627,000 die each year. Children under the age of five are particularly vulnerable, with one child dying every 60 seconds.

4 ___ Increased prevention and control measures in recent years have reduced global mortality rates by 42 per cent, but the disease persists, especially in high-risk regions of sub-Saharan Africa. Mosquitoes have become increasingly resistant to insecticides and the malaria parasite has become resistant to drugs.

5 ___ It's likely that mosquito populations would rebound after a few years, so the genetically engineered mosquitoes would need to be reintroduced into the wild regularly in order to control them. Nevertheless, scientists are hopeful that the approach could be used to fight all types of mosquito, including the species that transmit dengue fever, which is prevalent in over a hundred countries.

6 ___ According to Britain's Pirbright Institute, mosquitoes are not a keystone species in their ecosystems. While mosquitoes can act as pollinators as well as a food source for other animals, their absence would only be a temporary setback until another species filled the niche.

The question remains, however, whether humans have the right to eliminate entire species in this way. Eradicating mosquitoes may have positive benefits in reducing disease levels, but only time will tell if this experiment will have any lasting effects on humankind.

A Concerns have been raised about the possible effect of eliminating mosquitoes on local ecosystems. After all, mosquitoes have been on the planet for about 100 million years and they represent 3,500 species worldwide. Would we miss them if they disappeared?

B As research professor Andrea Crisanti from Imperial College London said: 'Malaria is debilitating and often fatal and we need to find new ways of tackling it. We think our innovative approach is a huge step forward.'

C What's more, sub-Saharan Africa loses about $12 billion in economic productivity due to malaria infections. Eradicating the disease would have real implications for the quality of life of people in those areas. Doctors and hospitals would be able to address other health concerns and the environment would benefit from not having to use insecticides.

D Female mosquitoes use human blood to acquire the nutrients they need to create eggs. A female mosquito can lay about 200 eggs at a time and up to 3,000 eggs during her lifetime. About half of the offspring will be daughters, many of which will live long enough to produce the same number of offspring themselves. For people living in tropical and subtropical areas, these females present a very real threat.

E Dr Nikolai Windbichler, a lead researcher from the Department of Life Sciences at Imperial College London, said: 'What is most promising about our results is that they are self-sustaining. Once modified mosquitoes are introduced, males will start to produce mainly sons, and their sons will do the same, so essentially the mosquitoes carry out the work for us.'

F During the 1950s and 1960s, the Global Malaria Eradication Programme (GMEP) was successful in eliminating the disease from several parts of the world. If their efforts had continued, they would have been able to eradicate malaria completely, but a lack of funds halted progress.

Conditionals

1 Look at the sentences and answer the questions.

a The scientists hope that if they do the same thing with mosquitoes in the wild, the malaria-carrying mosquito population will die out.

b Would we miss them if they disappeared?

c If a person lives in an area with these mosquitoes, they are at risk of contracting malaria.

d If their efforts had continued, they would have been able to eradicate the disease.

1 How do we make zero, first, second and third conditionals?

2 Why do we use each one?

3 What type of conditional is each sentence a–d?

GRAMMAR REFERENCE ➤ PAGE 54

2 Complete the sentences with the correct form of the verbs given.

1 If the press hadn't found out about this story, it ..... (not appear) in the newspapers.

2 If research ..... (be) useful, people want to know about it.

3 If they ..... (not be) scientists, they wouldn't know how to carry out these experiments.

4 If they repeat the experiment, they ..... (get) the same results next time.

5 If the experiment ..... (not be) successful, they wouldn't have published the results.

6 If they achieve their aim, it ..... (help) a lot of people.

7 If they did experiments on some types of animal, it ..... (be) illegal.

8 If it ..... (not be) for past pioneers, their research wouldn't have been possible.

3 Rewrite these sentences using conditionals.

1 My brother must get good marks because he wants to study medicine next year.
If my brother gets good marks, he …

2 I didn't know you were at home last night. I wanted to call you for help with my homework.

3 You must water plants as without water, they die.

4 It's a pity scientists don't have more funding. They need it to do more research.

5 I'm glad I read this article. I hadn't heard about this breakthrough before.

6 I think you like sci-fi so you'll enjoy this film.

7 People tend to believe stories that they read in the newspapers.

8 I'm not a scientist because I don't want to do research on animals.

Other conditional structures

4 Look at the sentences. Check that you understand how and why we use the words in bold in these sentences.

a **Supposing/Suppose** mosquitoes die out, would that affect ecosystems?

b **Provided that/Providing that/As long as** they introduce genetically modified mosquitoes into the wild, the mosquitoes won't come back.

c **Unless** scientists take action against malaria, people will continue to contract the disease.

d Scientists won't confirm that the experiment will work in the wild **in case** they are wrong.

e **If only/I wish** they had a vaccine. It would solve a lot of problems.

f **I wish/If only** they had eliminated the disease.

GRAMMAR REFERENCE ➤ PAGE 54

5 Complete the second sentence so that it has a similar meaning to the first sentence, using the word given. Do not change the word given. You must use between three and six words, including the word given.

1 I'll help you, but only if you promise to pay close attention. **THAT**
I'll help you ..... pay close attention.

2 If they fail, they may lose all their funding. **UNLESS**
..... all their funding.

3 What a pity that we didn't see each other! **WISH**
..... each other.

4 If we can stop the situation, would it not be worth doing? **SUPPOSE**
....., would it not be worth doing?

5 I'll be right here waiting for you because you might need me. **CASE**
I'll be right here waiting for you .....

6 We'll publish your research but only if you have evidence of your findings. **LONG**
We'll publish your research ..... evidence of your findings.

✓ EXAM SUCCESS

In transformation activities, check that you have not changed the meaning from the original sentence or changed the form of the word given.

➤ EXAM SUCCESS page 150

6 SPEAKING Complete the sentences with your own ideas. Then discuss your ideas in pairs.

1 If I pass all my exams with outstanding marks, …

2 If I could have any job in the world, …

3 If I'd had more time last weekend, …

4 If I were a politician, …

Compound nouns and adjectives

1 Match the compound nouns 1–8 with their meanings a–h.

1	outlook	**a**	beginning, start
2	drawback	**b**	result (e.g. of a process, meeting, activity)
3	outcome	**c**	reduction in something (e.g. the amount of money to spend)
4	feedback	**d**	strong action that someone in authority takes to stop a particular activity
5	outset	**e**	sudden start of war, disease, violence, etc.
6	outbreak	**f**	disadvantage
7	cutback	**g**	idea of what a situation will be like in the future/your general attitude to things
8	crackdown	**h**	comments about how well or badly someone is doing something, intended to help them to do it better

2 Match 1–8 and a–h. Are the words compound nouns or compound adjectives? Are they written as one word, one word with a hyphen (-) or two words? Use your dictionary if necessary.

1	genetically	**a**	time
2	set	**b**	wide
3	high	**c**	through
4	life	**d**	while
5	world	**e**	modified
6	break	**f**	back
7	off	**g**	risk
8	worth	**h**	spring

3 Complete the sentences with compound nouns from 1.

1 I began reading this book yesterday and from the ..... I knew I was going to love it.

2 They discussed whether they should continue with their research and the ..... of the meeting was that they should.

3 Organisations which protect animal rights have made sure that there has been a ..... on using animals in experiments.

4 Scientists had to work hard to find a cure when there was a sudden ..... of a deadly new type of flu.

5 Because of the economic recession there was a ..... in the amount of money spent on research and development.

6 I think you and I have the same ..... on life.

7 The ..... from potential customers about the product was generally positive.

8 There are both benefits and ..... to genetic engineering when it comes to food.

4 Complete the compound nouns and adjectives in the news article.

THE END OF THE OLIVE FLY?

Scientists at a biotechnology company have made a (a) b..... in producing (b) g..... olive flies and are seeking permission to release them in Spain. If the plan goes ahead, male flies will first be sterilised in a laboratory and then they will be released into the environment where they will mate with wild olive females. Their (c) o..... will be infertile, and the flies will eventually die out.

Although olive flies currently destroy whole harvests of olives, from the (d) o....., the proposal has met with criticism. The main (e) d....., critics say, is that the bodies of the flies could remain in the olives. No-one knows the effect of eating these olives over a (f) l..... While the experiment may be (g) w..... for farmers, for consumers it is a (h) h..... strategy.

The organisation Friends of the Earth has called for a (i) c..... on such experiments. Meanwhile, the company is still waiting for the (j) o..... of their permission request.

Reading articles CRITICALLY

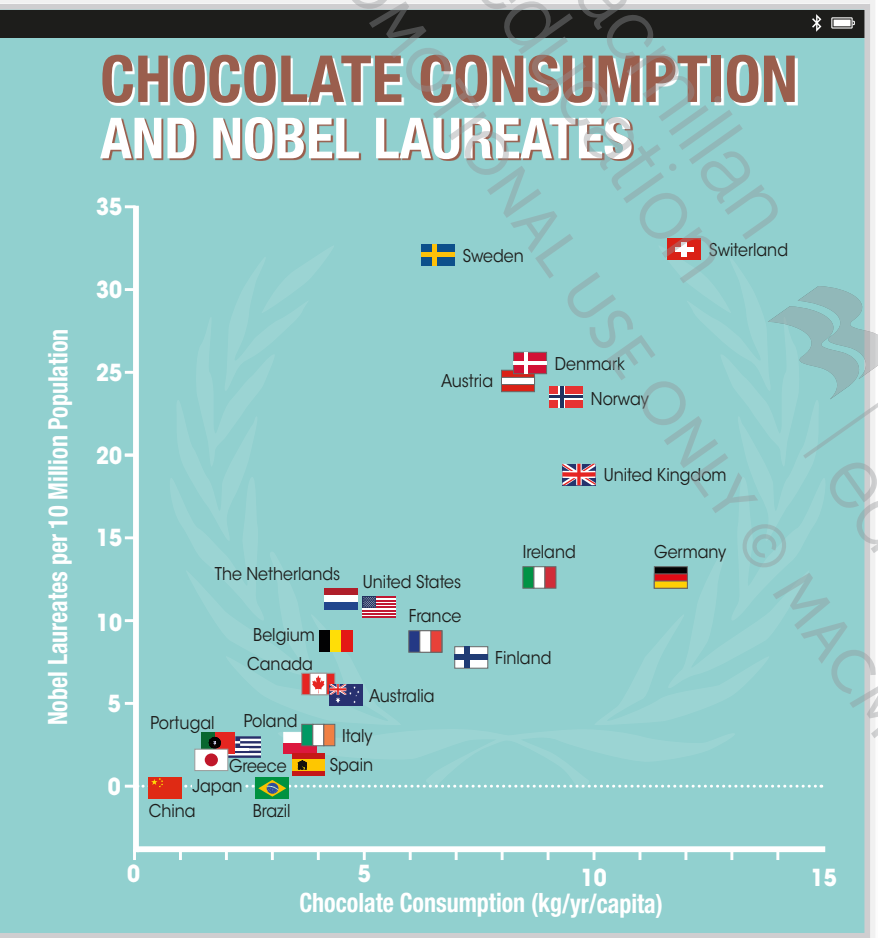
21ST CENTURY SKILLS OBJECTIVES

- To question how scientific facts are interpreted in news articles
- To identify what to look for in science articles to decide how reliable they are
- To critique an article

KEY CONCEPTS

causation [n]: *Correlation does not mean causation; in other words just because there is a correlation between two things, it doesn't mean that one causes the other.* **corroborate [v]:** *You need to corroborate information by looking at other research to see if it reaches the same conclusions.* **conclusive [adj]:** *Just because there is some evidence, it doesn't mean that the results of the research are conclusive.*

1 SPEAKING **Work with a partner. Look at the table. What does it show? What conclusions can you draw from this information?**



2 READING **Read the article and answer these questions.**

1. Who collected the data in the table and why?
2. What conclusion did he draw from the information?
3. How does he explain the anomaly?
4. What else supports his conclusions?

Does chocolate make you clever?

If you've ever worried about eating too much chocolate, good news is at hand. According to recent research, chocolate may actually make you more intelligent!

A cardiologist at Columbia University, Franz Messerli, decided to look into the possibility of a link between chocolate and intelligence after he had read studies stating that cocoa was beneficial for health. One study had found a connection between the consumption of cocoa and improved mental function in elderly patients. Another found that animals such as rats and even snails live longer and have better cognitive function when they eat chocolate.

Messerli decided to test his theory by comparing the number of Nobel Prize winners in a country, in proportion to the population of that country, with the nation's chocolate consumption. And the results of his study were significant.



When the two factors were compared – chocolate consumption and the number of Nobel prize winners – there was a very strong correlation. Switzerland, which has the highest consumption of chocolate per capita, has also produced the highest number of Nobel Laureates. Meanwhile, China appeared at the bottom of the table in both chocolate consumption and the number of prize winners.

The evidence suggests a clear relationship between chocolate and intelligence. The correlation found has a "P value" of 0.0001, which means there is a less than one-in-10,000 chance of getting results like these if there is no relationship between the two.

Sweden does not fit the pattern, producing a large number of Nobel laureates while eating much less chocolate. However, Messerli explains this anomaly by pointing out that Sweden is responsible for donating and evaluating the prize, so it's possible that there is a national bias. Another theory is that Swedes may have a higher sensitivity to cocoa, and a lower level of consumption would therefore be needed to produce the same effect on their intelligence.

Though it hasn't yet been proven that it is chocolate that causes the increased intelligence, it is clear from other research that chocolate, and especially dark chocolate, can be very beneficial for your health, particularly for the brain and the heart. It is known to have a high level of antioxidants, which can lower cholesterol levels and improve blood pressure. And other studies have shown that eating chocolate can reduce the chances of stroke.

So perhaps we should all eat more chocolate?

3 SPEAKING **Work in a small group. Discuss these questions.**

1 Do you agree with the conclusions in the article? Why/Why not?
2 What aspects of the article suggest that it is reliable?
3 Is there anything that makes you question the conclusions?

4 LISTENING ▶ 12 **A science journalist is discussing the article. Watch the video or listen. Do they mention any of the points you talked about in 3?**

5 LISTENING ▶ 12 **Watch or listen again. Make notes about what the science journalist says about the things to consider when reading a science article.**

- the news outlet
- the source and quotes
- the references to scientific research
- the context and purpose
- correlation and causation

6 **Look at the article again. Find further examples to support the points made by the science journalist in 5.**

21ST CENTURY TASK

Work in groups of three. You are going to read a science article and critique it.

Follow this plan:

1 *Choose one of the articles on page 162–3 or find one of your own.*
2 *Identify the different points discussed in 5.*
3 *Decide together whether you think the conclusions in the article are reliable or not and make a list of reasons why.*
4 *Prepare and present your conclusions to another group. Give reasons to defend your opinion.*

Flipped classroom: watch the grammar presentation video.

1 SPEAKING **Work with a partner. Discuss these questions.**

1 What animals do you know are in danger of extinction?
2 What animals have already become extinct?
3 Why did this happen?

2 LISTENING 13 **Listen to a podcast about bringing animals back from extinction and choose the best answers.**

1 What does Professor Rogers think about the cloning of dinosaurs?
   a No suitable DNA samples exist because dinosaurs froze too fast.
   b It's difficult because you need to have organic remains.
   c You can only clone animals using DNA samples.
2 What is the experiment at Harvard Medical School?
   a To create elephants that are hairy and woolly.
   b To insert DNA from a woolly mammoth into an elephant.
   c To engineer elephants so that they don't become extinct.
3 What is the main reason given for bringing back woolly mammoths?
   a They could graze on grass in Arctic regions.
   b Their weight would help to strengthen the ice.
   c To reduce the escape of carbon gases into the atmosphere.
4 How are scientists trying to bring back the passenger pigeon?
   a They're engineering another species of pigeon.
   b They're inserting cells into museum specimens.
   c They're using pigeons from the forests of the East Coast.
5 Why does the professor support de-extinction?
   a Humans have made a lot of mistakes in the past.
   b Animals are becoming extinct at an alarming rate.
   c It can help to restore natural habitats.
6 Which of the following does the professor believe?
   a It isn't important to spend money on saving endangered species.
   b The technology can be used for de-extinction and saving endangered species.
   c Bringing back animals from extinction is the priority.

3 SPEAKING **Work with a partner. Discuss these questions.**

1 If it were possible to bring any animal back from extinction, which would you choose? Why?
2 What are the best ways of saving endangered species?
3 In your opinion, is it better to focus on saving endangered species or bring animals back from extinction? Why?

Mixed conditionals

4 **Look at the sentences and answer the questions.**

a If a dinosaur had been frozen quickly, and had stayed at that temperature, then you'd have DNA samples.
b If we hadn't caused destruction in these areas, we wouldn't need to recreate species now.
c If we did more to protect endangered species, these animals wouldn't have become extinct.

1 What is the form of these conditional sentences?
2 Which sentence(s) describe an imaginary past and its present consequence?
3 Which sentence(s) describe an imaginary present situation and its past consequence?

GRAMMAR REFERENCE ➤ PAGE 54

5 **Choose the correct alternative.**

1 If I could bring any animal back from extinction, I'd *choose/have chosen* the dinosaur.
2 If I'd slept more last night, I wouldn't *be/have been* so tired now.
3 I'd *go/have gone* out last night if I hadn't had so much homework.
4 If I had eaten breakfast, I wouldn't *feel/have felt* hungry now.
5 I wouldn't know this city so well if I *didn't live/hadn't lived* here all my life.
6 I'd *speak/have spoken* perfect English if I'd been born in an English-speaking country.
7 If I'd finished all my homework last night, I'd *be/have been* able to go out later.
8 I'd let you borrow my mobile if I *didn't lose/hadn't lost* it.

6 SPEAKING **If you could go back in time, what three things would you change about the world? How would the world be different now?**

Talking about statistics

1 **Look at the charts and graphs. Which:**

1 is a bar chart?
2 is a pie chart?
3 is a table?
4 is a line graph?
5 show statistics which total 100 per cent?
6 shows a change or trend over a period of time?
7 shows a non-diagrammatic comparison of statistics?
8 shows a diagrammatic comparison of statistics?

2 SPEAKING **Work with a partner. Find words in the Speaking bank to talk about each chart or graph in 1. Check that you understand all the words.**

SPEAKING BANK

Useful words and expressions to talk about statistics

Numbers and proportions

- a half/third/quarter/fifth/sixth, etc.
- one in two/three/five/ten, etc.
- 5/10/15 per cent
- the majority/minority
- just under/over
- approximately/roughly
- twice/three/four/five times as many/big as
- slightly/considerably more/fewer
- a large/small/considerable number/proportion of (+ countable noun)
- a large/small/considerable amount/quantity of (+ uncountable noun)
- the (second/third/fourth) largest/biggest/highest
- in comparison with

Trends

- rise/increase/grow/double/treble/rocket
- fall/decrease/drop/decline/half/plunge/plummet
- stay the same/change little/level off/stabilise
- fluctuate
- reach a high/low
- slow(ly)/gradual(ly)/slight(ly), steady (steadily) (adj/adv)
- significant(ly)/sharp(ly)/dramatic(ally) (adj/adv)

3 **Write a short description of each chart or graph in 1. Think carefully about which tense(s) you need to use in each case.**

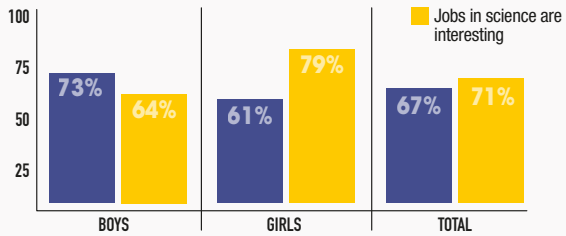
4 SPEAKING **Work with a partner. What do you think about the information in the charts and graphs? Do you find it surprising, shocking, predictable, etc.? Why?**

5 LISTENING 14 **Listen to four students talking about the charts and graphs in 1. Are the speakers' descriptions and reactions similar to yours?**

THE STATE OF PUBLIC ATTITUDES TO SCIENCE 2014

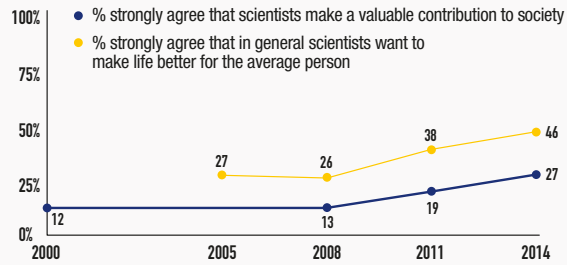
A

A PERCEPTIONS OF JOBS IN ENGINEERING AND SCIENCE AMONG 16-24-YEAR-OLDS



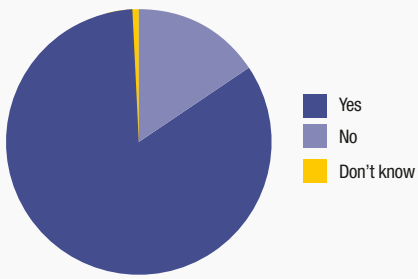
B

PERCEPTIONS OF SCIENTISTS OVER TIME



C

PECENTAGE OF 16-24-YEAR-OLDS WHO THINK THE MATHS AND SCIENCE LEARNT AT SCHOOL ARE USEFUL IN DAILY LIFE.



D

SOURCES OF INFORMATION ABOUT SCIENCE

	Adults 16+	16-24-year-olds
TV news	42%	34%
Other TV programmes	26%	17%
Print newspapers	23%	11%
Online newspapers or news websites	15%	24%
Family, friends and colleagues	12%	13%
Other websites	9%	10%
Radio programmes	15%	11%
Magazines	7%	6%
Social networks	6%	21%
Books	6%	10%

6 PRACTICE MAKES PERFECT SPEAKING **Work with a partner. Turn to page 164 and take it in turns to talk about the statistics and your reactions to them. Use words and expressions from the Speaking bank.**

✓ EXAM SUCCESS

In stimulus-based discussions, talk about the most important statistics; don't explain every single fact. Remember to give personal reactions to the statistics, giving reasons to justify and explain your opinion.

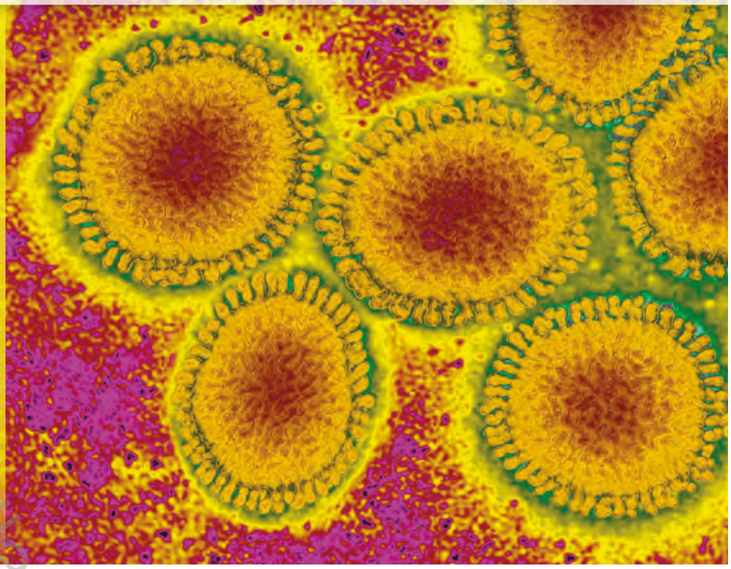
➤ EXAM SUCCESS page 150

A for-and-against essay

1 SPEAKING **Work with a partner. Read the beginning of a science article and discuss what you think the different reactions to the news have been.**

SCIENTISTS CREATE DEADLY FLU VIRUS

Scientists at the University of Wisconsin-Madison have artificially created a life-threatening flu virus. The virus resembles the 1918 Spanish flu strain that was responsible for the deaths of around 50 million worldwide. Until the controversial experiment, the virus had been extinct. Scientists say that their research will help them to understand more about the health risks posed by viruses in the future. Not surprisingly, this news has been met with strong, and widely different, reactions. Some people …



2 Look at this essay task. What exactly do you need to write? Work with a partner and write a paragraph plan.

> Write about the following topic:
> *Some people think that artificially creating viruses is acceptable because it could help to save lives in the future. Others think that it could have terrible consequences and put more lives in danger.*
> First discuss both these views and then give your own opinion.
> Give reasons for your answer and include any relevant examples from your own knowledge.

3 Read the essay on the right and answer these questions.

1. Does the essay do what the task asks for?
2. Is the organisation similar to your ideas in 2?
3. Do you agree with the writer's opinion? Why/Why not?

4a Put these headings in the correct place (1–6) in the Writing bank.

- Adding arguments
- Concluding
- Expressing consequences
- Making contrasts
- Expressing your and other people's opinions
- Introducing and sequencing arguments

Recent news that an extinct flu virus has been reconstructed at a laboratory in the US has given rise to a fierce debate between those who think that experiments such as this are necessary to protect people and those who believe it puts the global population in danger.

Some scientists claim that recreating viruses is essential so that governments can prepare for possible outbreaks of disease in the future. To take the example of the flu virus, they say the research will enable scientists to develop a vaccine that could save thousands of lives. Moreover, if the right precautions are taken, there should be no threat to the general public.

On the other hand, there are people who argue that it is impossible to know the full repercussions of creating a genetically-engineered virus. Despite the fact that the research is carried out in a secure laboratory, there is always the risk that the virus could escape or there is an accidental infection, which, in turn, could lead to a pandemic. A further criticism of these experiments is that there is no threat at present, and if the disease were to re-occur, scientists would be able to react quickly to deal with it. Last but not least, some people believe that the scientists who do these experiments are motivated by ambition and that there is no benefit to public health.

To sum up, this is a complex issue, but one that we cannot simply ignore. My own view is that it can be highly dangerous to play with nature unless we know the full consequences of what we are doing. Recreating viruses may solve future problems, but it is vital that measures are taken to ensure that the research is carefully controlled and that these viruses do not escape, which could have catastrophic results for our planet as a whole.

4b Add the underlined words and expressions in the essay in 2 to the relevant sections of the Writing bank.

WRITING BANK

Useful expressions in for-and-against essays

1 .....
- First and foremost,
- Secondly,
- Lastly,
- .....

2 .....
- Furthermore,
- .....
- What is more,
- In addition,
- not only … but also
- a further advantage of
- .....

3 .....
- On the one hand,
- .....
- In contrast,
- in spite of (+ noun/ gerund/the fact that …)
- .....
- However,/ Nevertheless,
- conversely
- by way of contrast

4 .....
- Therefore,
- and so
- as a result
- as a consequence
- consequently

5 .....
- In my opinion,
- Personally, I believe that
- .....
- As far as I'm concerned
- .....
- It is said that …
- .....

6 .....
- In conclusion,
- All in all
- .....

VOCABULARY Causes, reasons and results

5 Choose the correct alternative. In some cases, both alternatives are possible. Check that you know what all the alternatives mean.

1 The news has *given rise/risen* to a fierce debate.
2 People are afraid of some scientific research *since/as* they don't know what effects it might have.
3 There is always a risk of accidental infection which could, *on its way/in turn*, lead to a general pandemic.
4 We still cannot know *the full repercussions/all the negative consequences* of artificially creating viruses.
5 The *second/side* effects of some vaccines are still unknown.
6 We must be careful because playing with nature could have *disastrous/catastrophic* results.
7 The research could *bring about/lead to* changes in the way governments prepare.
8 The news about the experiment *sparked off/stemmed from* a lot of criticism.
9 I believe the research will prompt the government *change/to change* the law.
10 Some experiments are risky *due to/owing to* the lack of proper precautions.

6 Read the beginning of another science article. Think of advantages and disadvantages of manipulating the weather.

According to Chinese scientists, for them the words to this children's rhyme are not just wishful thinking. They say that they have the ability to control the weather. In November 2009, there was an unusual fall of snow. China claims that it prompted the snow by firing 186 chemical rockets into clouds passing over Beijing. They did this to help stop the long drought the city had been suffering. But scientists are worried that if each country unilaterally decides to use geo-engineering to manipulate the weather, the global repercussions could be catastrophic and global-warming could get worse, not better. Scientists at …

7 SPEAKING Discuss your ideas in 6 as a whole class. Do most people think that controlling the weather would be a good thing or a bad thing?

8 Look at the essay task. Work with a partner and use the ideas in 6 and 7 to write a paragraph plan for the essay.

Write about the following topic:
Some people think that having scientists manipulate the weather could be beneficial for the planet. Others think that the consequences could be very worrying.
Discuss both these views and then give your own opinion.
Give reasons for your answer and include any relevant examples from your own knowledge.

9 PRACTICE MAKES PERFECT Write your essay for the task in 8. Use words and expressions from the Writing bank and the vocabulary section on this page, and advice from Exam success.

WRITING BANK ➤ PAGE 157

EXAM SUCCESS

Read the task very carefully to see if you should be giving your own opinion of a particular question, arguments on both sides of the question, or a mixture of both. The way that you organise your essay in each case will be different, and you will be evaluated according to how well you have completed the task.

➤ EXAM SUCCESS page 150

Grammar reference

For zero conditional, first conditional and second conditional, see page 166

Third conditional

FORM

If + **past perfect**, … ***would/wouldn't have*** + past participle

If I ***had studied****, I* ***would have*** *passed the exam.*

USE

We use the third conditional to talk about imaginary or impossible situations in the past and their consequences. The situations are impossible because we cannot change them now that they have happened.

Mixed conditionals

FORM

If + **past simple**, … ***would/wouldn't have*** + past participle

If + **past perfect**, … ***would/wouldn't*** + infinitive

USE

Mixed conditionals are a mixture of the second and third conditional. They can describe an imaginary present situation and its past consequence.

If I ***liked*** *that group I* ***would have gone*** *to see them in concert.*

Or they can describe an imaginary past situation and its present consequence.

If I ***had had*** *breakfast, I* ***wouldn't be*** *hungry now.*

Other conditional structures

unless = if … not, except if

We won't be able to swim ***unless*** *the swimming pool is open.*

as long as, provided/providing (that) = if, only if

We'll be able to swim ***as long as/provided*** *the swimming pool is open.*

in case = because, maybe

We'll take our swimsuits ***in case*** *the swimming pool is open.*

supposing/suppose = imagine …

Supposing *he came to eat tonight, would we have enough food?*

should/were to/happened to = when something is less probable

If it ***were to/should/happened to*** *rain tomorrow, what would we do?*

I wish/If only + **the past** = talking about imaginary situations in the present. It expresses wishes for things to be different in the present.

I wish I was *on the beach right now.*

I wish/If only + **past perfect** = talking about past situations that we would have liked to be different. It expresses regrets.

If only I hadn't spent *all my money last weekend.*

I wish/If only with **would/wouldn't + infinitive** = talking about somebody's habitual behaviour that we want to criticise and change.

My dad smokes, ***I wish he wouldn't*** *do it.*

Vocabulary

For compound nouns and adjectives, biology and scientific research and causes, reasons and results, see wordlist page 138.

Grammar revision

Conditionals / 7 points

1 Complete the conditional sentences with the correct form of the verb in brackets.

1 If he had come to school yesterday, he ..... (do) the exam.
2 If I ..... (be) better at sport, I'd play more.
3 If I ..... (not see) you tonight, I'll see you tomorrow.
4 If my sister gets a cold, I usually ..... (catch) it, too.
5 If it's warm this afternoon, I ..... (walk) home.
6 If I ..... (see) him yesterday, I'd have given him the message.
7 If he had a part-time job, he ..... (not be able) to do all his homework.

Other conditional structures / 6 points

2 Complete the sentences with these words.

case • long • only • providing • supposing • unless

1 I'll lend you my laptop as ..... as you promise to return it.
2 I bought a spare pen in ..... this one ran out of ink.
3 ..... you won the money, how would you spend it?
4 If ..... I could remember his name!
5 ..... that the weather stays fine, we'll have dinner outside.
6 ..... you have a passport, they won't let you into the US.

Mixed conditionals / 7 points

3 Write conditional sentences for the situations below, using the words given.

1 I'm annoyed today because you didn't help me.
If you .....
2 We couldn't go out last night because we have an exam today.
If we .....
3 I'm afraid of heights so I didn't go to the top.
If I .....
4 I don't know any French so I couldn't translate it.
If I .....
5 He didn't take his medication. That's why he's sick.
If he .....
6 They didn't let us in because we aren't old enough.
If we .....
7 She isn't happy now because she didn't get the job.
If she .....

Vocabulary revision

COMPOUND NOUNS AND ADJECTIVES / 8 points

1 Complete the compound nouns or adjectives.

1 More than 50 people have been arrested in a crack..... on organised crime.
2 Doctors are worried because there are going to be cut..... in health spending.
3 In the feed..... meeting, they're going to tell me how I can improve my presentations.
4 Right from the start of the journey, from the very out....., I knew it would be special.
5 Raising money for charity is so worth.....
6 It took years of research before they made a break.....
7 Nuclear power has some obvious draw.....
8 I doubt if they'll cure malaria during my life.....

CAUSES, REASONS AND RESULTS / 6 points

2 Write a definition or explanation for these words.

1 spark off
2 as
3 prompt
4 due to
5 in turn
6 stem from

BIOLOGY AND SCIENTIFIC RESEARCH / 6 points

3 Complete the sentences with the correct form of these words.

contract (v) • parasites • prevalent
resistant • species • transmit

1 Sleep disorders may be more ..... than previously thought.
2 Some ..... of birds are dying out because of the use of insecticides.
3 People who have ..... the virus can now be treated successfully.
4 Scientists are concerned that the disease could be ..... by air.
5 Some natural remedies, such as garlic, can remove ..... from the body.
6 Infections that have become ..... to drugs could cost lives.

Total: / 40 points

Reading

1 You are going to read an article about a book. Six paragraphs have been removed from the article. Choose from the paragraphs A–F the one which fits each gap (1–6).

➤ TIP FOR READING EXAMS

In paragraph completion activities, remember … When you think you have finished, read through the complete text and see if the meaning is logical. Check pronouns and linking words and look for ideas repeated from one paragraph to the next by using synonyms.

➤ EXAM SUCCESS page 150

Leonardo's Brain

He was the archetypal genius. A painter. A scientist. An inventor. An engineer. Leonardo Da Vinci was perhaps the most diversely-talented man that ever lived. In *Leonardo's Brain*, best-selling author Leonard Shlain attempts to apply modern neuroscience to understand the workings of one of history's most innovative brains.

1 .....

Yet he also excelled as a painter, and composed music and sang as well. Leonardo Da Vinci stands out in history for his talents in the fields of both art and science.

2 .....

According to Shlain, Leonardo was, in many ways, an outsider. To begin with, he was a pacifist, and he was a strict vegetarian at a time when eating meat was a symbol of wealth and power. In fact, he had such an extraordinary empathy for animals that he would stop to buy caged birds when he saw them in shops and set them free.

3 .....

What's more, he used to write with his left hand. For Shlain, this penmanship suggests that the two hemispheres of Leonardo's brain were connected in an extraordinary way.

4 .....

For Shlain, creativity is a combination of courage and inventiveness. While it is impossible to say what work Leonardo would have done if he had attended university, Shlain argues that it was precisely this lack of education that allowed Leonardo to free his mind from restraints. He had what has been described as 'the gift of ignorance', which allowed him to ask new questions and look at the world in a fresh way.

5 .....

Shlain explains that the left hemisphere, the side of the brain associated with critical thinking, is usually dominant in humans. Meanwhile, the right side of the brain, the side which processes information without rules and is usually associated with artistic talents, has less influence. For true creativity, both sides of the brain are necessary, and there must be a free connection, or exchange of ideas between the two sides of the brain.

6 .....

The question then is, did Leonardo's brain represent a jump to the future of humankind? Supposing we were able to engage both sides of the brain equally, would that lead to more creativity and innovative thinking? Shlain is optimistic. He claims that Leonardo's brain suggests what is possible for the future of our species.

A Da Vinci's childhood was also unusual and significant in his brain development. Born to a single mother, Leonardo grew up in the countryside and did not have the privilege of a formal education. Because his mother was unmarried, he was not eligible to attend the schools of the day. He didn't learn Latin or Greek, without which it was almost impossible to find out about the world. Instead, he had to rely on his own experience.

B Using information pieced together from Leonardo's notebooks and various biographical resources, Shlain sets out to explain the reasons for Da Vinci's ability to make connections between the two disciplines, and for his unparalleled creativity.

C Shlain argues that Leonardo, who is best known for painting the eternally mysterious Mona Lisa, had an exceptional scientific mind. He created visionary anatomical drawings long before medical anatomy existed, made observations of bird flight in greater detail than any previous scientist, and mastered engineering, architecture and mathematics. In fact, many of his designs for inventions were spectacularly ahead of his time and if they had actually been built, might have revolutionised the history of technology.

D Shlain believes that Leonardo's left-handedness and his mirror writing were indications that he had a non-dominant brain, and that there was an exceptional communication between the two hemispheres. As a result, Da Vinci was able to access different ways of thinking, and combine an extraordinary understanding of science with an ability to communicate that understanding through art.

E More importantly though, his lack of formal education and attentive parenting meant that he was never forced to write with his right hand, which was the practice during the Middle Ages. For Shlain, this turned out to be crucial in the anatomy of Leonardo's genius.

F He was also the only individual in recorded history who is known to write comfortably backwards, a feat known as 'mirror writing'. Instead of writing from left to right, as is the norm in all European languages, Leonardo chose to write from right to left. He would also switch sometimes in the middle of a sentence, writing some words in one direction and others in the opposite direction. Whichever way he wrote, the fluency of his writing was the same.

Speaking

➤ TIP FOR SPEAKING EXAMS

When giving presentations, remember …
Don't let mistakes stop you from speaking. Correct your own mistakes if possible, or start the sentence again, but don't stop completely. Don't worry excessively about vocabulary either. When you don't know a word, explain it or use a simpler word.

➤ EXAM SUCCESS page 149

2 Read the extract about Leonardo Da Vinci's legacy. Which do you think was his most influential design?

Leonardo's legacy

Although Leonardo Da Vinci is best known for his great works of art, he was also an inspired inventor. He sketched the first so-called flying machine 400 years before one was actually made, and designed a diving suit that would allow humans to breathe under water. Ironically, given his loathing of war, he also pioneered a number of instruments of warfare. These included an armoured vehicle and a machine gun. Perhaps his most extraordinary vision was for a robot which could move its arms and mouth.

There's no doubt that Leonardo's legacy was significant and without him, the world would be a different place today.

3 Look at this topic and prepare a presentation.

Inventions throughout history have improved our lives in many ways, but there are some things that should never have been invented.
Do you agree? Why/Why not?

4 Give your presentation to the class.

Writing

➤ TIP FOR WRITING EXAMS

For guidance on writing reviews, see page 150.

➤ EXAM SUCCESS page 150

5 Write your review for the task below.

You see this announcement in an English language magazine.
Book reviews wanted!
Have you read a book in which the main character impressed you?
Write a review of the book explaining what the character did and why he/she impressed you.
Tell us whether or not you would recommend the book.
The best reviews will be published in this magazine.

Use of English

➤ TIP FOR USE OF ENGLISH

In sentence transformations, remember …
Think about the meaning and possible uses of the word given. Think also about its grammatical function and whether it always or usually goes with another word or tense.

➤ EXAM SUCCESS page 150

6 Complete the second sentence so that it has a similar meaning to the first sentence, using the word given. Do not change the word given. You must use between three and six words, including the word given.

1 In primary school they would make us learn poetry by heart. **FORCE**
In primary school, they ..... poetry by heart.

2 Scientific research isn't dangerous if there are strict regulations. **PROVIDED**
Scientific research isn't dangerous .....

3 Unfortunately, we never studied anatomy at school. **WISH**
I ..... at school.

4 We were tired, but we worked until late. **KEPT**
We ..... even though we were tired.

5 In spite of the fact that I didn't like the book, I finished it. **MANAGE**
In spite of the fact that I didn't like the book, ...

6 If it were possible to travel back in time, what time would you visit? **SUPPOSING**
....., what time would you visit?

7 They've been investigating this branch of science for a while. **RESEARCH**
They've been ..... this branch of science for a while.

8 He didn't pass his exams, so he can't find a job. **ABLE**
If he had passed his exams, he ..... a job.