



SCIENCE FOR ALL

5031/01

Paper 1 Multiple Choice

October/November 2019

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 2 7 4 9 5 1 6 1 7 0 *



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.

1 Which shows structures in the correct order of size, starting from the smallest?

- A chromosome → gene → nucleus → cell
- B gene → chromosome → nucleus → cell
- C gene → nucleus → cell → chromosome
- D nucleus → chromosome → gene → cell

2 The table shows the number of males and females per million of the population in the United States.

number of males and females per million of the population	
males	females
497 500	502 500

There are 330 million people in the United States.

How many of these people have a Y chromosome in their cells?

- A 164 175 000
- B 165 000 000
- C 165 825 000
- D 330 000 000

3 Stem cells can be used in the treatment of some illnesses. Most of these stem cells come from cloned embryos. Scientists can now change blood cells into stem cells.

Why do people think that using blood stem cells is better than using stem cells from embryos?

- A Blood stem cells can become specialised.
- B Blood stem cells can form a wider range of tissues.
- C Embryos will not need to be destroyed.
- D Stem cells from embryos are specialised.

4 Jak has a genetic disease. This disease causes tiredness and damage to his eyes.

What is the name of Jak's disease?

- A AIDS
- B diabetes
- C influenza
- D sickle cell anaemia

- 5 Scientists took six measurements of the nitrogen dioxide concentration in the air next to two different roads.

Their results are shown in the table.

	nitrogen dioxide concentration in $\mu\text{g per m}^3$						
	1	2	3	4	5	6	mean (average)
road X	66	64	78	62	63	65	66
road Y	56	52	48	56	52	44	51

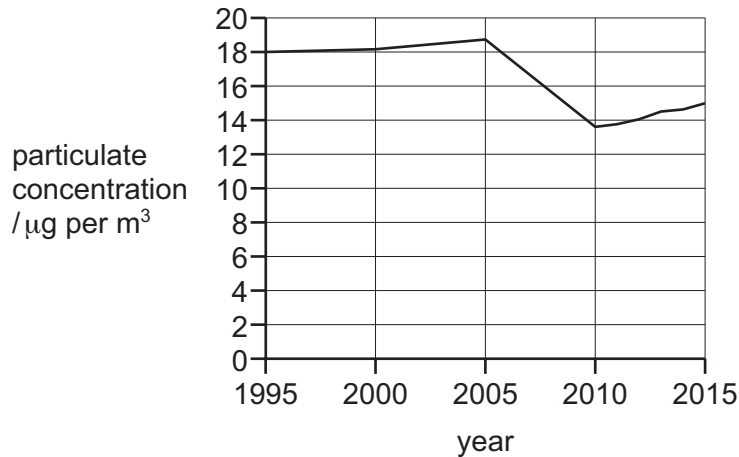
Which conclusion about a real difference between the measurements from the two roads is correct?

- A** There is no real difference because neither set of results contain any outliers.
- B** There is no real difference because there is a small variation between the mean values.
- C** There is a real difference because the ranges of values do not overlap.
- D** There is a real difference because the measurements were repeated and so were reliable.
- 6 The table shows information about four different pollutants.

Which row shows correct information?

	pollutant	formula	method of production
A	carbon dioxide	CO_2	made by photosynthesis
B	sulfur monoxide	SO_2	made from burning pure natural gas
C	nitrogen dioxide	NO	burning oxygen at high temperatures
D	carbon monoxide	CO	incomplete combustion

- 7 The concentration of particulates in the air in Mauritius between 1995 and 2015 are shown in the graph.



There is a strong positive correlation between high concentration of particulates and the number of people suffering from asthma.

During which 5-year period would you expect to see the biggest change in the number of people suffering from asthma?

- A** 1995 to 2000
- B** 2000 to 2005
- C** 2005 to 2010
- D** 2010 to 2015
- 8 A car company says that their new car has 'lower than ever carbon dioxide emissions'. Which statement is the most likely explanation for this?
- A** The new car has a catalytic converter.
- B** The new car runs on lower sulfur fuel.
- C** The new car is heavier than older cars.
- D** The new car travels more kilometres per litre of fuel.
- 9 Electric cars run on rechargeable batteries. The battery is charged by plugging the car into mains electricity overnight. Why do electric cars improve air quality in towns?
- A** Electricity is a renewable fuel.
- B** Generating electricity does not produce any air pollution.
- C** Less fossil fuel will be burned in power stations.
- D** Less fossil fuel will be burned in towns.

10 What is one light-year?

- A the distance travelled by light in one year
- B the speed of light
- C the time taken for light to travel 300 000 km
- D the time taken for the Earth to travel around the Sun

11 In a typical year, tectonic plates in the seafloor move apart by a distance of 10 cm.

How far would the seafloor spread in a hundred years?

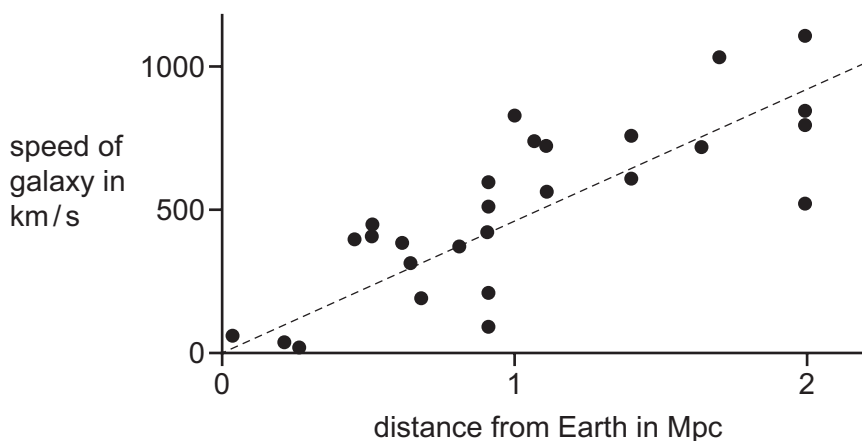
- A 0.1 m
- B 1 m
- C 10 m
- D 1000 m

12 A scientist makes new observations of galaxies. She wants to publish her observations, but first the work must be peer reviewed.

What is the best description of peer review?

- A Other scientists also make observations of galaxies.
- B Other scientists who are experts in galaxies read her work to see if they agree with it.
- C Scientists who have not studied galaxies read her work to see if they agree with it.
- D The scientist reviews her own observations and checks her conclusions.

13 The graph shows the results of Edwin Hubble's research into galaxies in 1929.



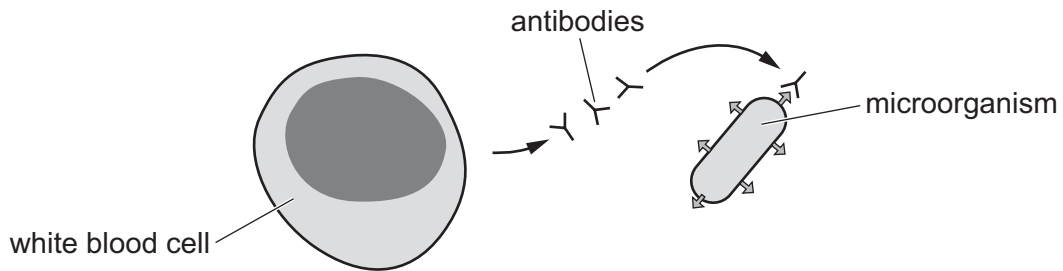
Which statement describes Hubble's results?

- A The fastest moving galaxies are closest to Earth.
- B As distance from Earth decreases, the speed of the galaxies increases.
- C As distance from Earth increases, the speed of the galaxies decreases.
- D As distance from Earth increases, the speed of the galaxies increases.

14 Which objects in the solar system travel the greatest distance from the Sun?

- A asteroids
- B comets
- C moons
- D planets

15 A white blood cell makes antibodies to destroy a microorganism.



Why do white blood cells in the body need to make many different types of antibodies?

- A Antibodies become resistant to microorganisms.
- B Each antibody recognises one type of microorganism.
- C Microorganisms can reproduce rapidly.
- D There are many different types of antibiotics.

16 A vaccine for influenza can be given in different ways.

The vaccine is usually given by injection but a new method involves sticking a patch on the skin.

Which two statements **when taken together** explain why using the patch could be more successful in reducing influenza?

- 1 The vaccine has similar side effects.
- 2 If a high percentage of the population are vaccinated the disease cannot spread.
- 3 The patch does not hurt and so more people may have the vaccination.
- 4 The vaccine needs to be repeated every year.

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 2 and 4

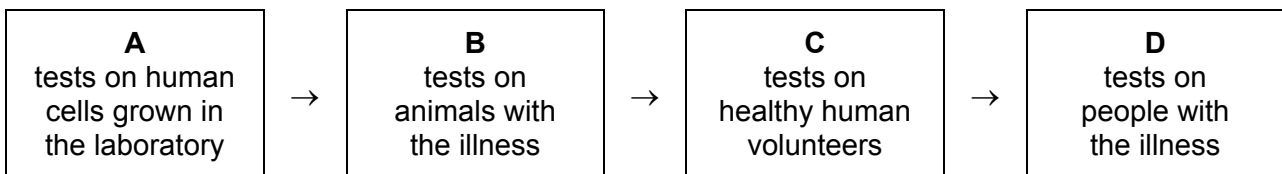
17 It is difficult to develop an effective vaccine against the HIV virus (which causes AIDS).

What is the reason for this?

- A Antibiotics do not work against viruses.
- B The HIV virus mutates rapidly.
- C Vaccines contain weakened microorganisms.
- D AIDS has many different symptoms.

18 A new drug has been developed to treat an illness. It must be tested to make sure the drug is **safe** and **effective**.

Which stage does **not** test for **effectiveness**?



19 Which statement describes a main cause of heart attacks?

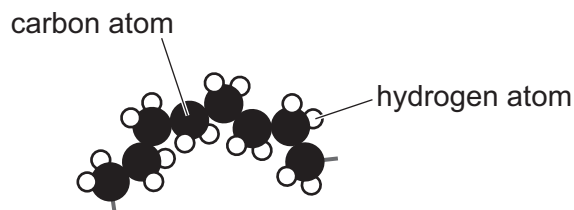
- A fatty deposits in arteries supplying the heart muscle
- B low blood pressure in the arteries leaving the heart
- C over-production of insulin by the pancreas
- D toxins produced by microorganisms

20 Solid materials have many different properties.

Which property has the correct definition?

- A Density is the mass of material per unit volume.
- B Hardness is how much a material resists bending.
- C Stiffness is how much a material resists denting or scratching.
- D Strength (in compression) is the force needed to pull the material until it breaks.

21 The diagram shows a section of a molecule of the polymer poly(ethene).

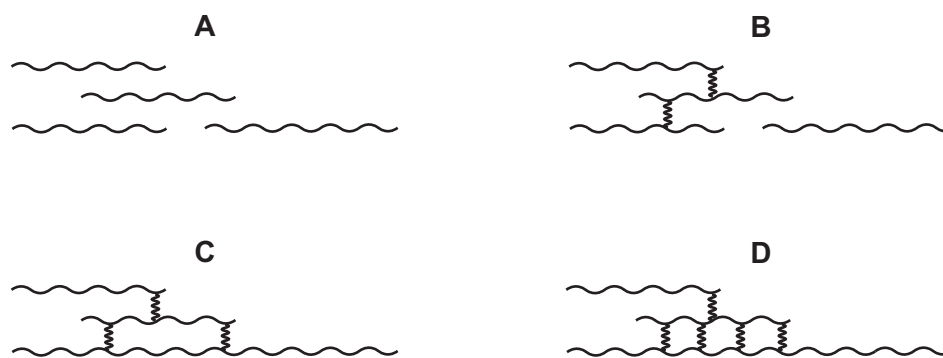


What is the formula of a **monomer** of poly(ethene)?

- A CH B CH₂ C C₂H D C₂H₄

22 A polymer is modified to increase the temperature at which it melts.

Which polymer would melt at the **lowest** temperature?



23 Lecithin, sodium benzoate and vitamin C are food additives:

Lecithin helps different parts of the food to mix together.

Sodium benzoate stops the growth of bacteria.

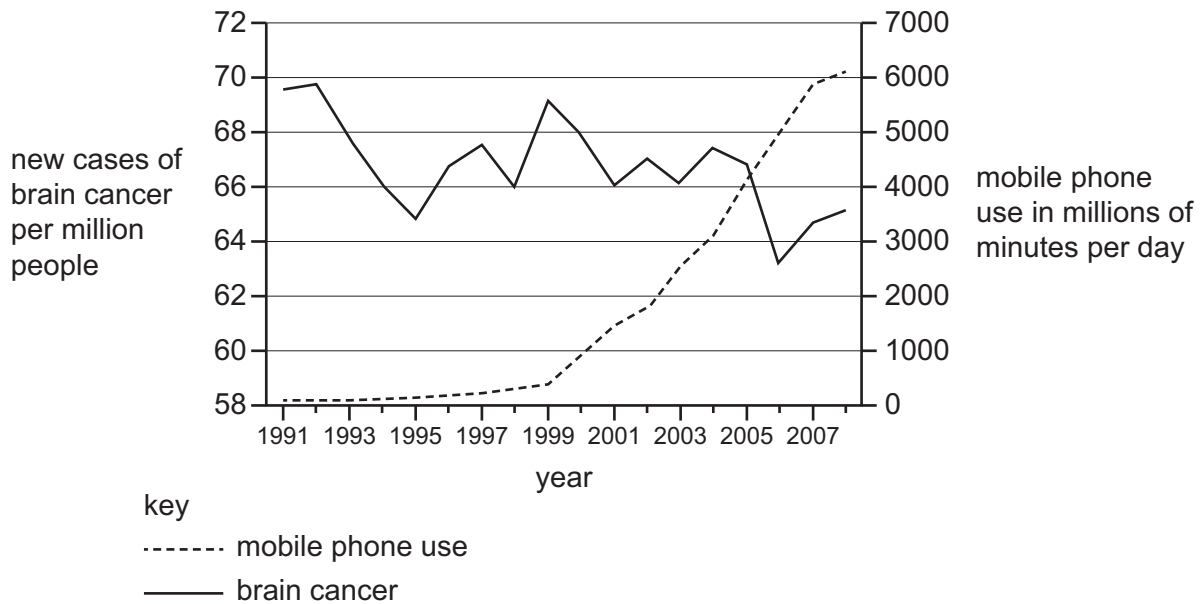
Vitamin C stops food being affected by oxygen.

Which row has each of these additives in the correct category?

	antioxidant	emulsifier	preservative
A	vitamin C	lecithin	sodium benzoate
B	lecithin	sodium benzoate	vitamin C
C	vitamin C	sodium benzoate	lecithin
D	sodium benzoate	vitamin C	lecithin

24 Some people are concerned that there are health risks with using mobile phones.

The graph shows information about mobile phone use and brain cancer.



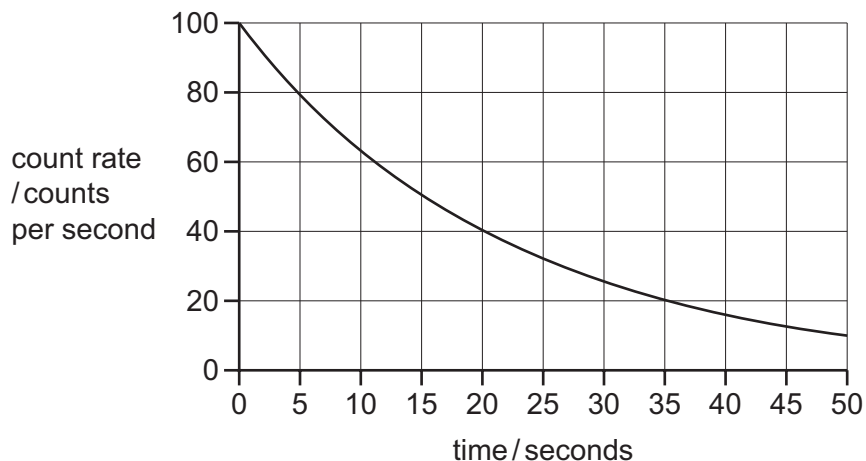
Which conclusion can be made from the data in the graph?

- A Mobile phone use causes brain cancer.
- B People with brain cancer should avoid using mobile phones.
- C There is no correlation between mobile phone use and brain cancer.
- D There is no trend in mobile phone use.

25 How does sunscreen lotion prevent damage from the Sun?

- A It protects the skin from microwave radiation.
- B It reflects background radiation.
- C It absorbs ultraviolet radiation.
- D It stops gamma rays which can cause cancer.

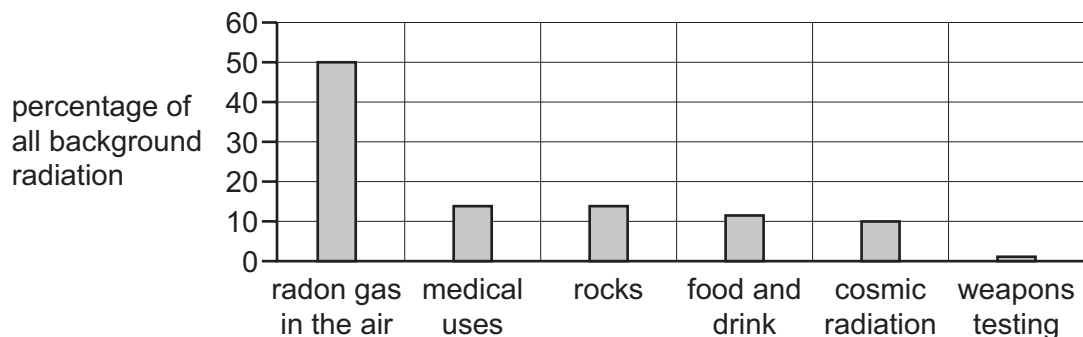
26 The graph shows the change in radioactivity of a sample of a radioactive element.



What is the half-life of this element?

- A 15 seconds
- B 25 seconds
- C 30 seconds
- D 50 seconds

27 The graph shows the sources of background radiation.



An average person's dose of ionising radiation is $3000 \mu\text{Sv}$.

How much of an average person's radiation dose per year comes from rocks?

- A $14 \mu\text{Sv}$
- B $360 \mu\text{Sv}$
- C $420 \mu\text{Sv}$
- D $840 \mu\text{Sv}$

- 28** Some people in the UK put bird feeders into their gardens. Wild birds use their beaks to reach seeds through small holes in the feeder.

Scientists have measured the mean lengths of the beaks of one type of bird.

Scientists have found that over time the beaks of wild birds have become slightly longer.

How could the theory of natural selection explain this observation?

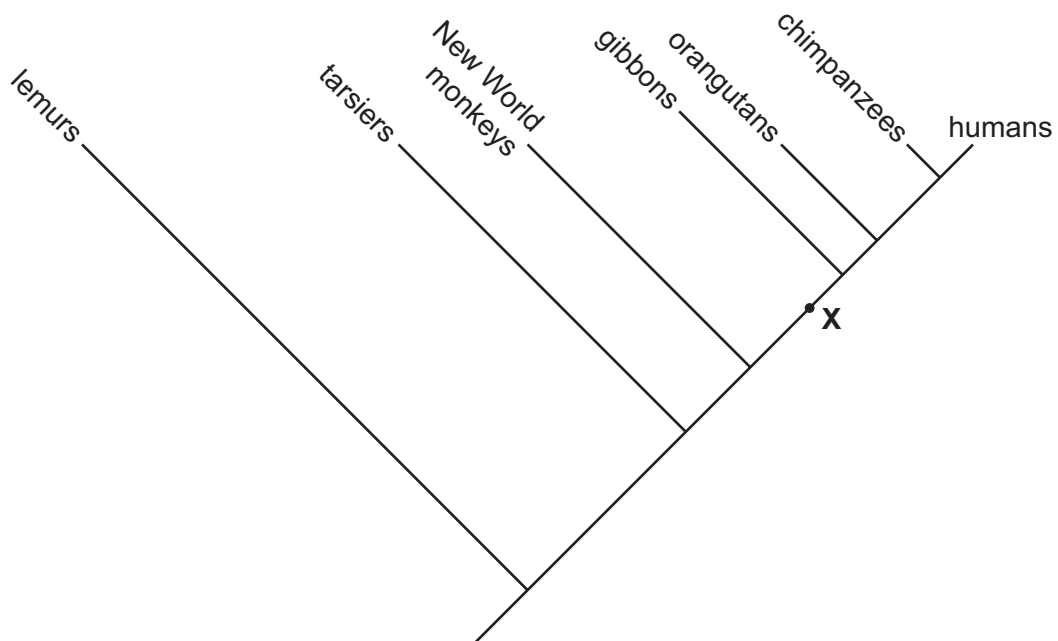
- A** Eating more seeds makes beaks grow longer.
 - B** Birds with longer beaks are more likely to survive and reproduce.
 - C** Using the bird feeders has stretched the birds' beaks.
 - D** Eating from the feeder causes mutations that lead to longer beaks.
- 29** There are several theories to explain evolution.

Many scientists accept the theory of natural selection.

Which statement describes why?

- A** The evidence from fossils has proved natural selection is correct.
- B** Natural selection accounts for observations that have been made.
- C** All other theories have been proved incorrect.
- D** Natural selection is the only theory that uses imagination and creativity.

- 30 Primates are the group of mammals which include humans, other apes and monkeys. The diagram shows the evolution of some primates.



X marks the position of a common ancestor of many primates.

Which primates are descended from **X**?

- A lemurs, tarsiers and New World monkeys
 - B gibbons only
 - C gibbons, orangutans, chimpanzees and humans
 - D New World monkeys and gibbons
- 31 Which is **not** an example of using resources in a sustainable way?
- A burning fossil fuels
 - B maintaining biodiversity
 - C recycling
 - D use of renewable resources

32 Some chemicals in household products are acids and some are alkalis.

Which row gives correct information?

	household product	contains	acid or alkali
A	baking powder	detergent	acid
B	indigestion remedy	ibuprofen	acid
C	oven cleaner	sodium hydroxide	alkali
D	vinegar	hydrochloric acid	alkali

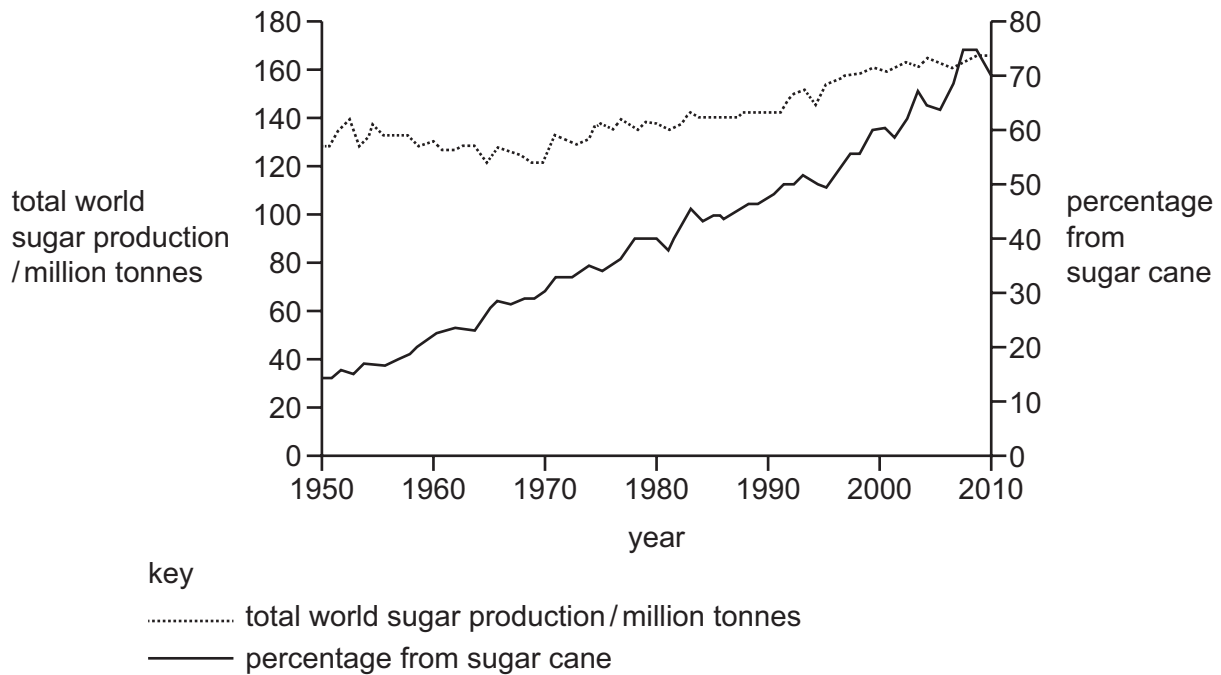
33 Tap water is treated with chlorine to kill microorganisms.

Some scientists are concerned that chlorine in water may cause certain types of cancer.

Which statement best describes why water is still treated with chlorine?

- A** The risk from chlorine is known but microorganisms cause unknown risks.
- B** Diseases caused by microorganisms are more dangerous than cancer.
- C** The chance of chlorine causing cancer may be significant but the consequences are not.
- D** The benefits of using chlorine outweigh the chance of chlorine causing cancer.

- 34 The graph shows the total world sugar production since 1950 and the percentage of this production that comes from sugar cane.



Which statement about the graph is correct?

- A Other sources, as well as sugar cane, are used to produce sugar.
 - B The highest world production of sugar was 70%.
 - C The percentage of sugar from sugar cane has shown an increase of 20% since 1950.
 - D The world sugar production has risen every year since 1950.
- 35 Over time, land used to grow crops becomes less fertile.

Which statement gives the best explanation for this?

- A The carbon dioxide and water content of the soil decreases.
- B The concentration of amino acids in the soil decreases.
- C The acidity of the soil decreases.
- D The nitrogen, potassium and phosphorus content of the soil decreases.

36 Eve and Clare both have jobs that involve making cakes.

They talk about the ingredients they use.



Eve

I bake cakes to sell in my own local shop. I use all natural, fresh ingredients.

I bake cakes to sell in supermarkets. I add antioxidants and preservatives to my cakes.



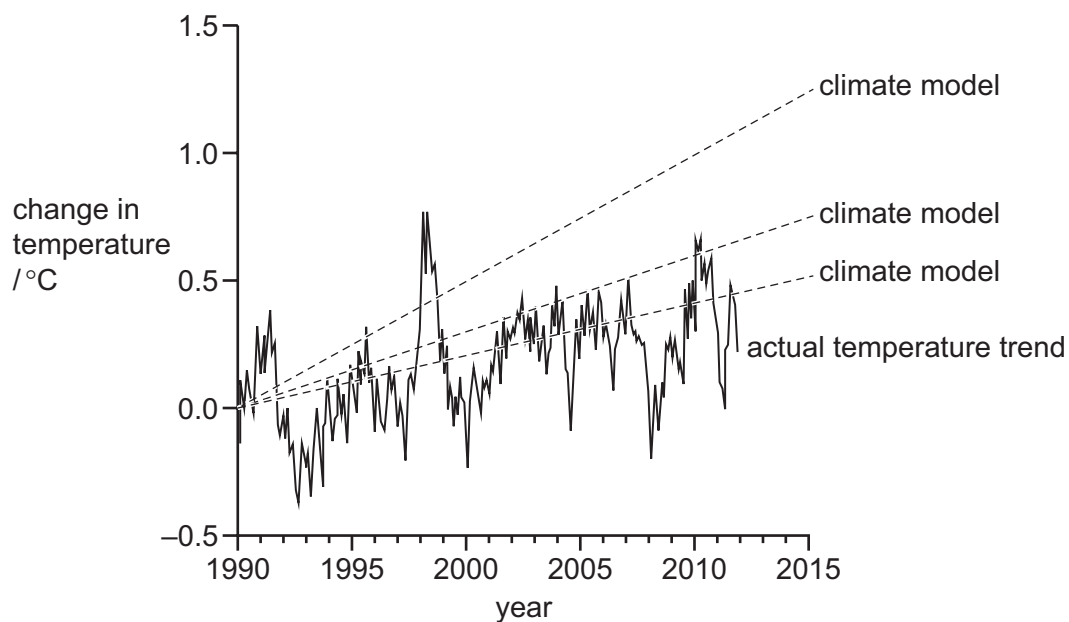
Clare

Why do Eve and Clare need to use different ingredients?

- A By law, food sold in supermarkets must contain artificial additives.
- B Cakes sold locally do not need to be transported or stored for long periods.
- C Supermarket cakes need to contain more additives because they always contain more sugar and fat.
- D Supermarkets do not use natural ingredients in their foods.

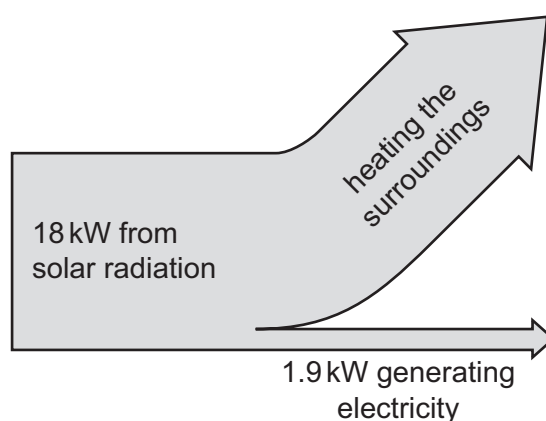
- 37 In 1988 three climate models used predictions about human activities to calculate possible changes in world climate.

The graph shows the three predictions and the actual temperature trend.



Which statement is correct?

- A** The actual temperature increase has always been lower than any of the climate models.
- B** The overall trends shown by the climate models are similar to the actual temperature trend.
- C** The actual temperature shows a steady increase every year.
- D** The models prove that human activities are causing global warming.
- 38 The Sankey diagram shows energy transfers in a solar panel.



What is the energy efficiency of the solar panel?

- A** 1.9% **B** 11% **C** 18% **D** 89%

39 The Earth's atmosphere contains a thin ozone layer.

Two students are discussing the ozone layer.

student 1 The ozone layer absorbs ultraviolet radiation and protects animals living on the Earth from the harmful effects of ultraviolet radiation.

student 2 The ozone layer produces electromagnetic radiation and this causes the greenhouse effect.

Which students are correct?

- A** Both students are correct.
 - B** Both students are incorrect.
 - C** Only student 1 is correct.
 - D** Only student 2 is correct.
- 40** What is meant by the ALARA principle?
- A** Any activity with a risk should be completely avoided.
 - B** It is important to know the chance of a risk occurring and the consequences if it did.
 - C** Nothing is risk-free, but it is important to keep any risk as low as possible.
 - D** There is a difference between actual risk and perceived risk.

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