



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

**CO-ORDINATED SCIENCES**

**0654/12**

Paper 1 Multiple Choice

**October/November 2015**

**45 minutes**

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



**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.**

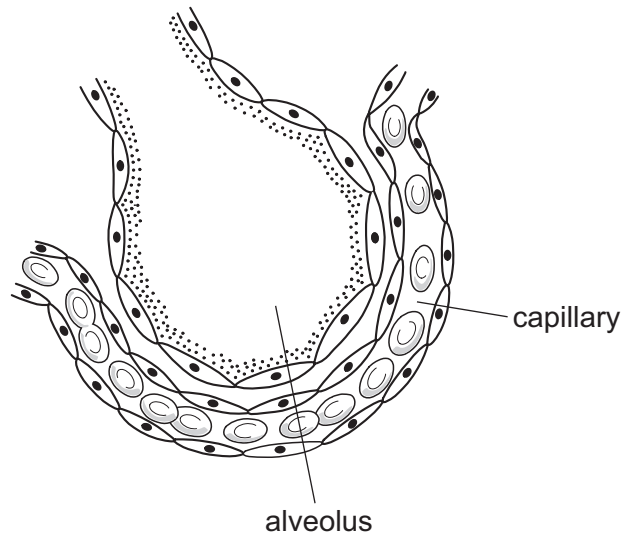
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.  
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**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.  
A copy of the Periodic Table is printed on page 20.  
Electronic calculators may be used.

This document consists of **20** printed pages.

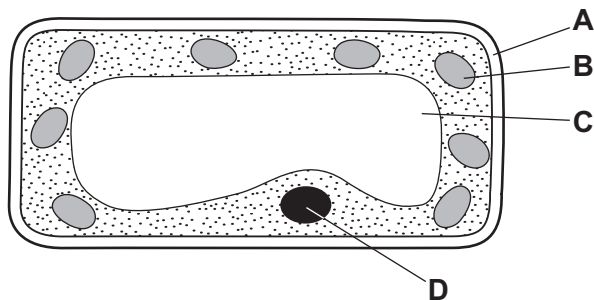
- 1 Which statement about the characteristics of living organisms is correct?
- A Excretion is the breakdown of molecules to release energy.
  - B Nutrition is the removal of excess substances, toxic materials and waste products.
  - C Respiration is the taking in of organic substances and mineral ions.
  - D Sensitivity is the ability to detect and respond to changes in the environment.
- 2 The diagram shows an alveolus and surrounding capillary.



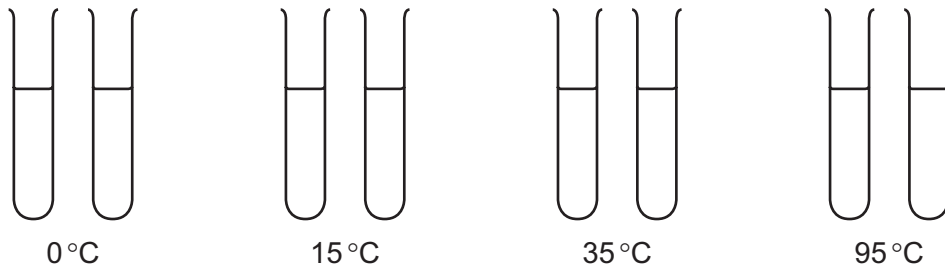
Why does oxygen move from the alveolus to the capillary?

- A Carbon dioxide molecules move from the capillary to the alveolus.
  - B Inspiration increases the pressure in the lung.
  - C The oxygen is absorbed by osmosis into the blood.
  - D There is an oxygen concentration gradient in this direction.
- 3 The diagram shows a plant cell.

Which labelled feature would also be found in an animal cell?



- 4 Eight test-tubes each containing a starch-saliva mixture are set up at four different temperatures.



For each temperature, one test-tube is tested with iodine solution after 15 minutes, and the other after 30 minutes.

The results are shown in the table.

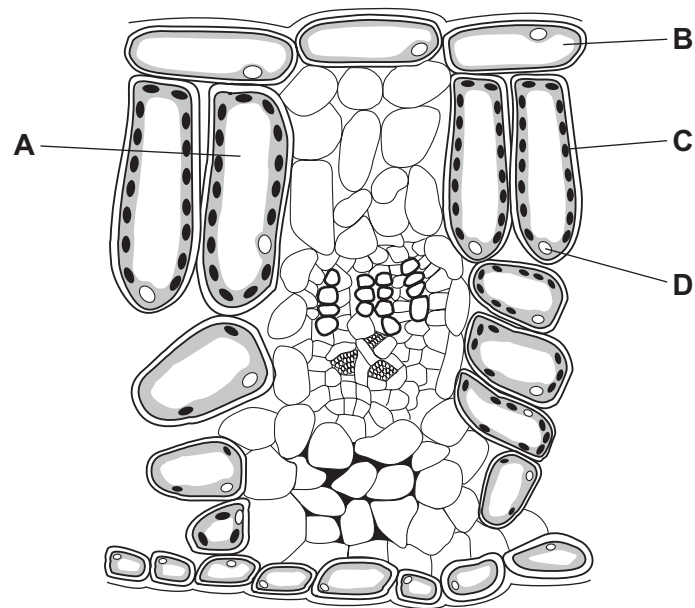
temperature /°C	colour with iodine solution	
	15 minutes	30 minutes
0	blue-black	blue-black
15	blue-black	brown
35	brown	brown
95	blue-black	blue-black

What do the results suggest?

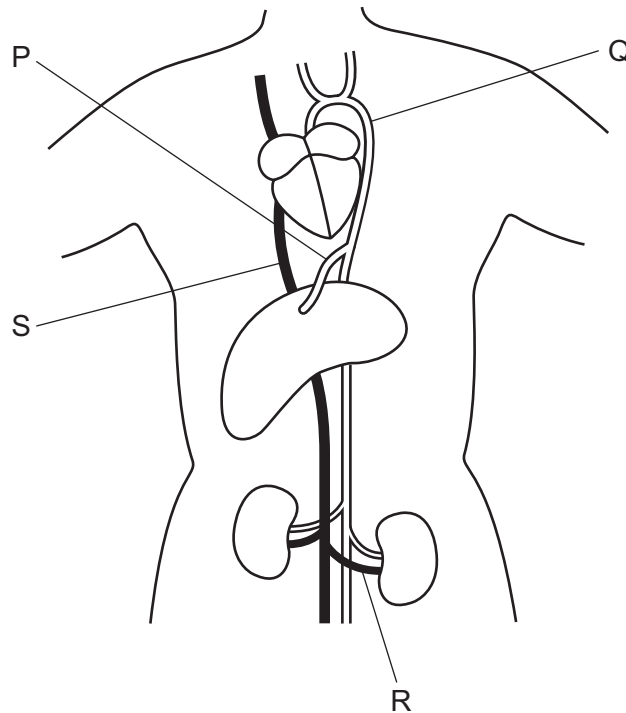
- A** The enzyme in saliva is inactive at 95°C.
- B** The enzyme in saliva is slow to work at 35°C.
- C** The enzyme in saliva works equally well at 15°C and 35°C.
- D** The enzyme in saliva works faster at higher temperatures.

5 The diagram shows a section through a leaf.

Where are carbohydrates made?



6 The diagram shows the heart, liver and kidneys with connecting blood vessels.



What are the labelled blood vessels?

	aorta	hepatic artery	vena cava	renal vein
<b>A</b>	Q	P	S	R
<b>B</b>	Q	R	S	P
<b>C</b>	S	P	Q	R
<b>D</b>	S	R	Q	P

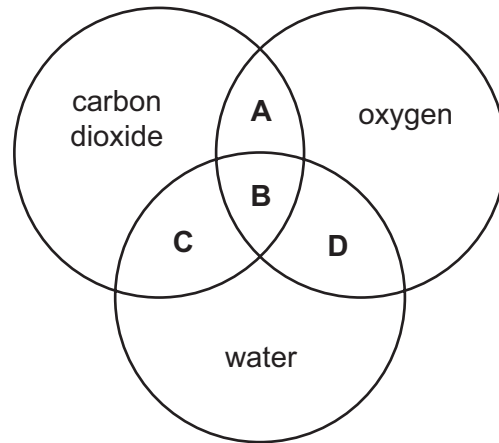
7 Which part of the alimentary canal is in the form of a coiled tube?

- A oesophagus
- B pancreas
- C rectum
- D small intestine

8 In a full set of adult human teeth, there will be the **smallest** number of

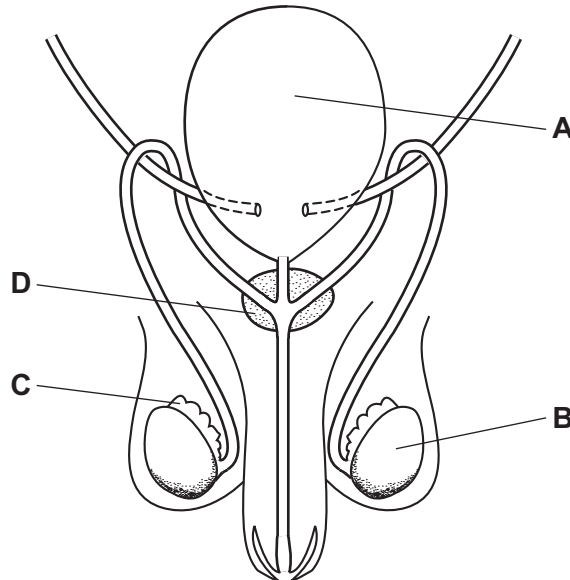
- A canines.
- B incisors.
- C molars.
- D premolars.

9 Which area represents the substances produced in aerobic respiration?



10 The diagram shows the male reproductive system.

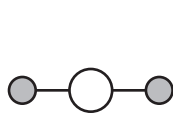
Which structure produces the hormones that control adolescence?



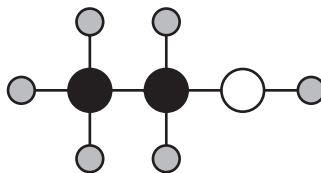
11 What is the effect of adrenaline?

	blood glucose concentration	rate of heart beat
<b>A</b>	decrease	decrease
<b>B</b>	decrease	increase
<b>C</b>	increase	decrease
<b>D</b>	increase	increase

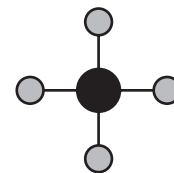
- 12 Which chemical supplies carnivores with energy and plays a part in the carbon cycle?
- A carbon dioxide  
 B fibre (roughage)  
 C glucose  
 D water
- 13 What is an effect of increased methane in the atmosphere?
- A a decrease in soil erosion  
 B an increase in new plant species  
 C the cooling of the Earth's atmosphere  
 D the melting of the polar ice caps
- 14 The structures of some substances are shown.



water



ethanol



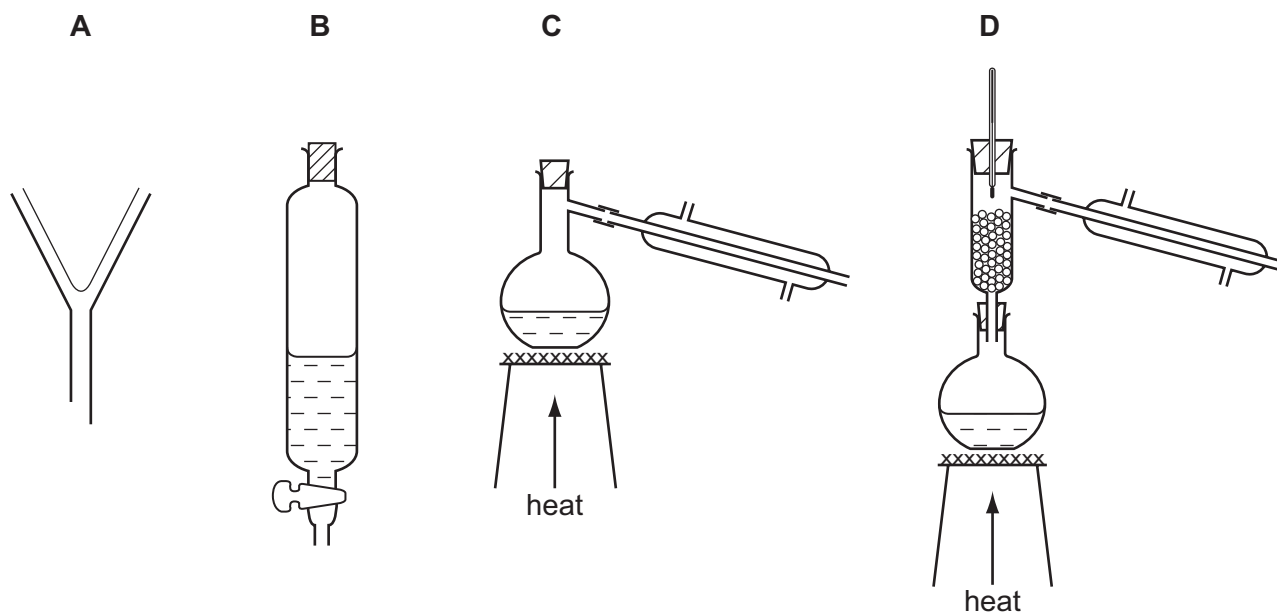
methane

Which row shows the total number of different elements and the total number of atoms in the three structures?

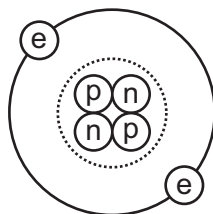
	total number of different elements	total number of atoms
<b>A</b>	3	9
<b>B</b>	3	17
<b>C</b>	7	9
<b>D</b>	7	17

15 Hexane and octane are liquid hydrocarbons that mix together.

Which method is used to separate a mixture of these two liquids?



16 The diagram shows a helium atom.



Which particles in the helium atom have approximately the same mass?

- A electron and proton only
- B electron and neutron only
- C proton and neutron only
- D electron, proton and neutron

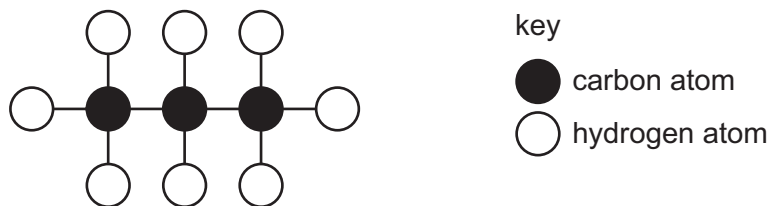
17 Which changes are chemical changes?

- 1 conversion of steam to liquid water
- 2 cracking of alkanes
- 3 fractional distillation of petroleum
- 4 strongly heating calcium carbonate

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



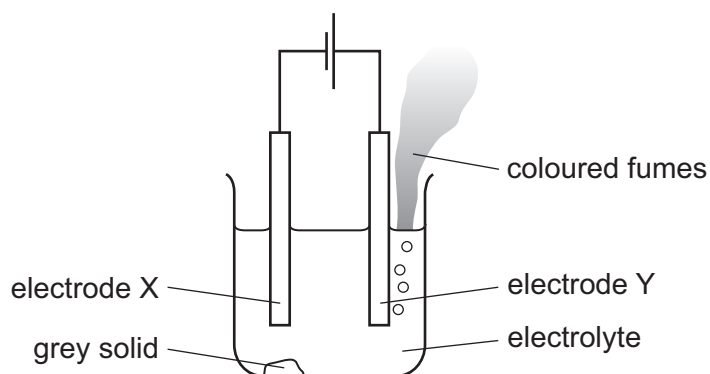
18 The diagram shows a molecule of propane.



What is the formula of propane and to which homologous series does propane belong?

	formula	homologous series
<b>A</b>	$C_3H_6$	alkane
<b>B</b>	$C_3H_6$	alkene
<b>C</b>	$C_3H_8$	alkane
<b>D</b>	$C_3H_8$	alkene

19 The diagram shows the electrolysis of lead(II) bromide using inert electrodes.



Which statement about this experiment is correct?

- A** Electrode X is positively charged.
- B** The coloured fumes are produced at the negative electrode.
- C** The electrolyte is lead(II) bromide.
- D** The grey solid is lead(II) bromide.

20 Lime is manufactured by heating limestone.

Lime is used to control the acidity of soil.

Which types of chemical change occur in these two reactions?

	heating limestone	controlling acidity
<b>A</b>	endothermic	oxidation
<b>B</b>	endothermic	neutralisation
<b>C</b>	exothermic	oxidation
<b>D</b>	exothermic	neutralisation

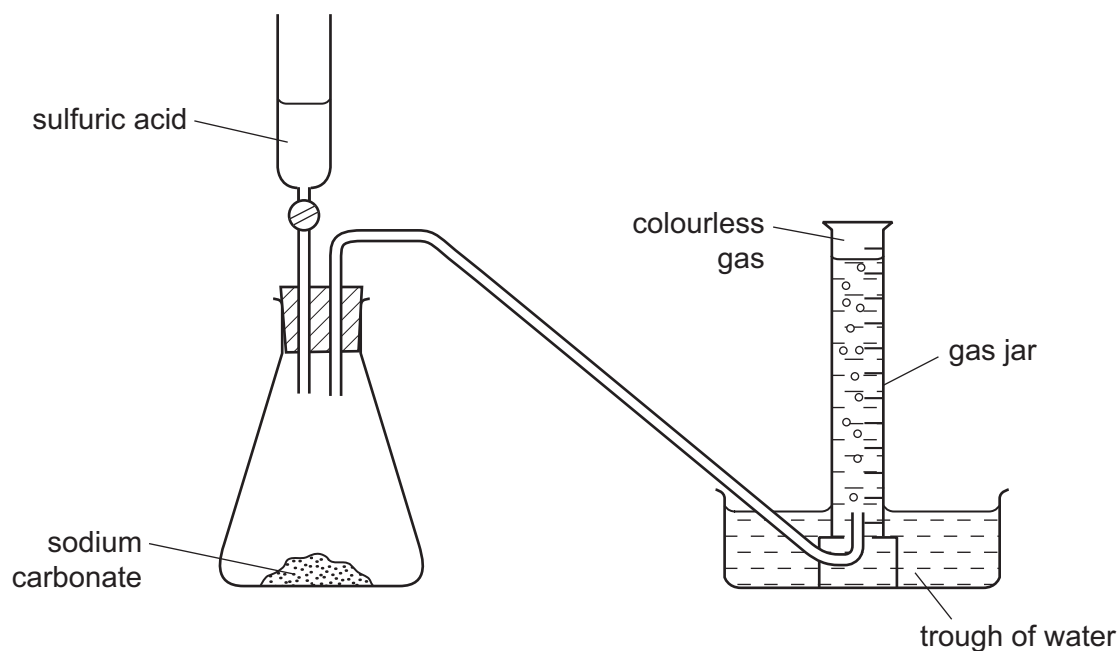
21 Nitrogen from the air is used to manufacture ammonia.



Why is a catalyst used in this reaction?

- A** Nitrogen from the air is not pure.
- B** Nitrogen is a gas at room temperature.
- C** Nitrogen is a non-metallic element.
- D** Nitrogen is not very reactive.

22 Sulfuric acid and sodium carbonate react and release a colourless gas.



What is the gas?

- A carbon dioxide
- B hydrogen
- C hydrogen sulfide
- D sulfur dioxide

23 Which test and result identify aqueous ammonium ions?

	test	result
<b>A</b>	add aqueous sodium hydroxide	blue precipitate
<b>B</b>	add aqueous sodium hydroxide	white precipitate
<b>C</b>	heat with aqueous sodium hydroxide	gas evolved turns damp red litmus paper blue
<b>D</b>	heat with aqueous sodium hydroxide and aluminium powder	gas evolved turns damp blue litmus paper red

24 An element is a solid at room temperature and does **not** conduct electricity.

What is the proton number of this element?

- A 11
- B 19
- C 35
- D 53

25 Metal X is extracted from its ore by heating the ore with carbon.

Which statement explains why carbon is used?

- A Carbon is a non-metal.
- B Carbon is more reactive than X.
- C Carbon reacts with oxygen in the air.
- D X is more reactive than carbon.

26 Which chemical is used to reduce the acidity of soil?

- A ammonium nitrate
- B calcium oxide
- C magnesium sulfate
- D potassium chloride

27 Poly(ethene) is made from ethene.

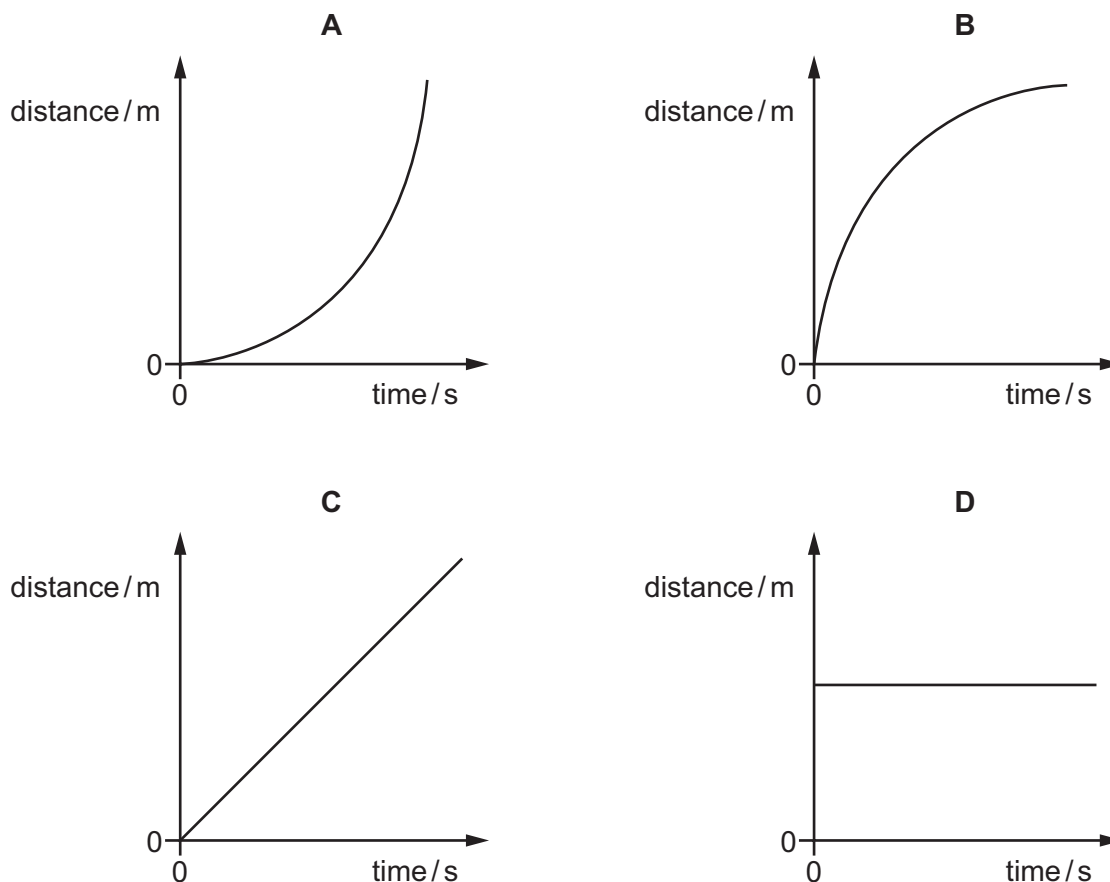
Ethene molecules are known as .....1..... and join together in a process known as .....2..... polymerisation.

Which words correctly complete gaps 1 and 2?

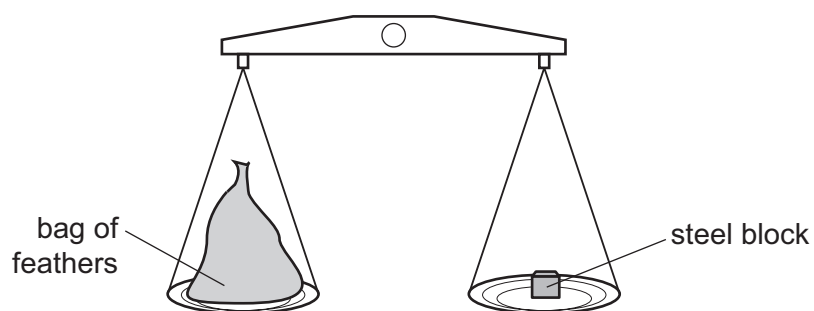
	1	2
A	monomers	addition
B	monomers	neutralisation
C	polymers	addition
D	polymers	neutralisation

28 The following are distance/time graphs.

Which graph shows an object moving at constant speed?



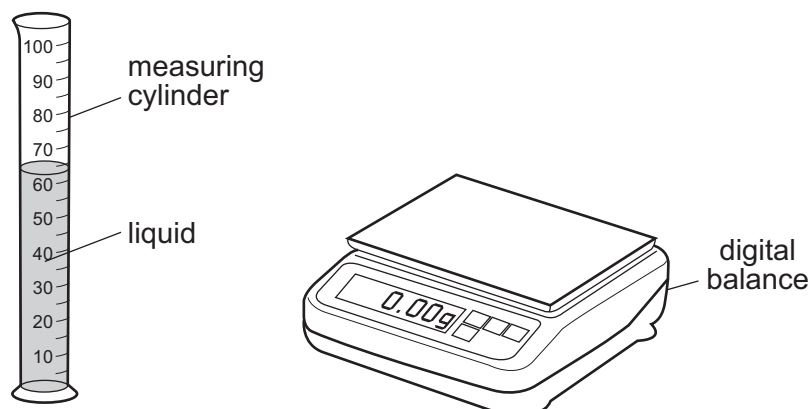
29 A large bag of feathers and a steel block balance each other on some scales.



What does this show about the masses and the weights of the bag of feathers and the steel block?

- A The masses are equal and the weights are equal.
- B The masses are equal, but the weights are different.
- C The masses are different and the weights are different.
- D The weights are equal, but the masses might be different.

30 A student pours liquid into a measuring cylinder.



The student records the volume of the liquid from the scale on the measuring cylinder. He then puts the measuring cylinder containing the liquid on a balance and records the mass.

What else needs to be measured before the density of the liquid can be calculated?

- A the depth of the liquid in the measuring cylinder
- B the mass of the empty measuring cylinder
- C the temperature of the liquid in the measuring cylinder
- D the volume of the empty measuring cylinder

31 Electricity can be obtained from different energy resources.

Which energy resource is used to obtain electricity without producing heat to boil water?

- A coal
- B gas
- C hydroelectric
- D nuclear

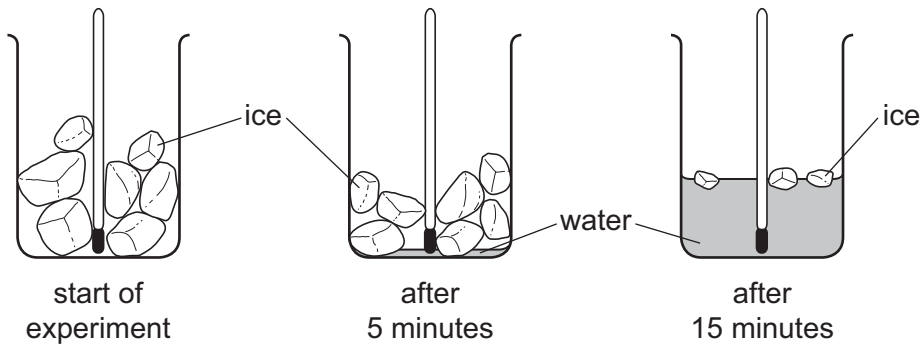
32 Evaporation occurs when molecules escape from a liquid surface into the air above it. During this process the temperature of the liquid falls.

Why does the temperature of the liquid fall?

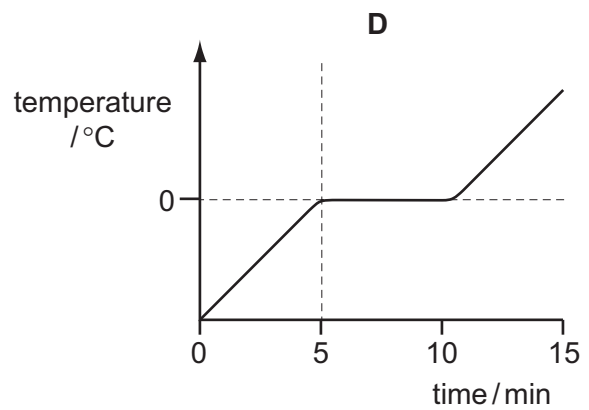
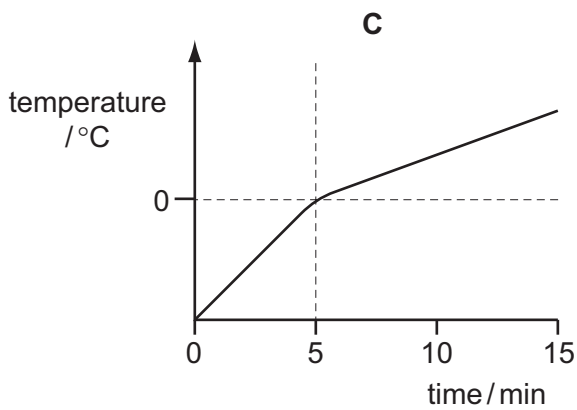
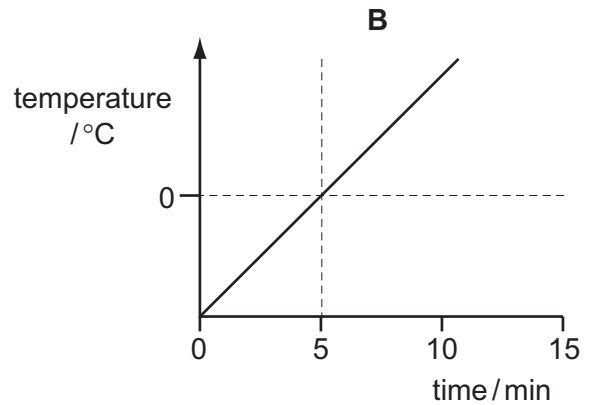
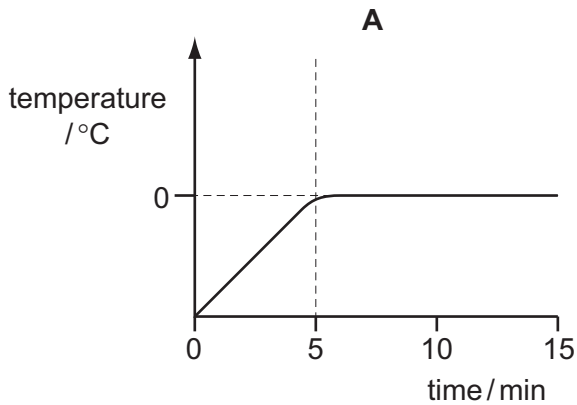
- A The molecules in the vapour expand because the pressure is less.
- B The molecules left in the liquid have more space to move around.
- C The molecules move more slowly when they escape into the air.
- D The molecules with the highest energies escape into the air.

33 A beaker containing ice and a thermometer is left in a warm room for 15 minutes.

There is no liquid water in the beaker until 5 minutes have passed. After 15 minutes some ice is still visible.



Which graph shows how the thermometer reading changes?

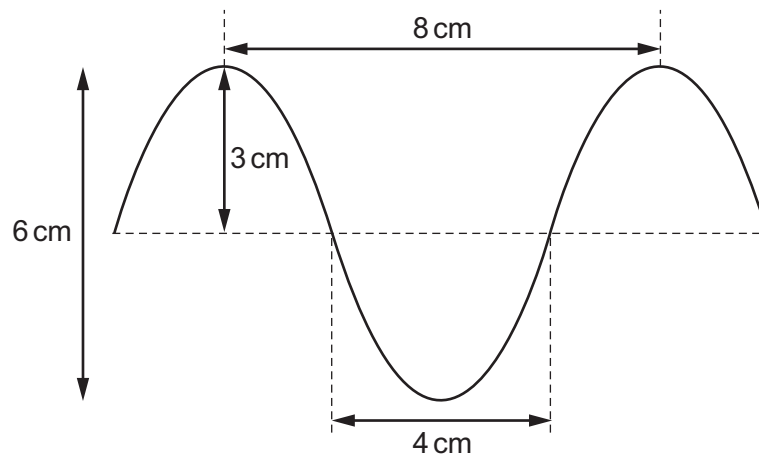


- 34 Hot liquid in a vacuum flask cools extremely slowly. This is because some methods of heat transfer do not take place in a vacuum.

Which methods do **not** take place in a vacuum?

- A conduction and convection only
- B conduction and radiation only
- C convection and radiation only
- D conduction, convection and radiation

- 35 The diagram shows a wave.



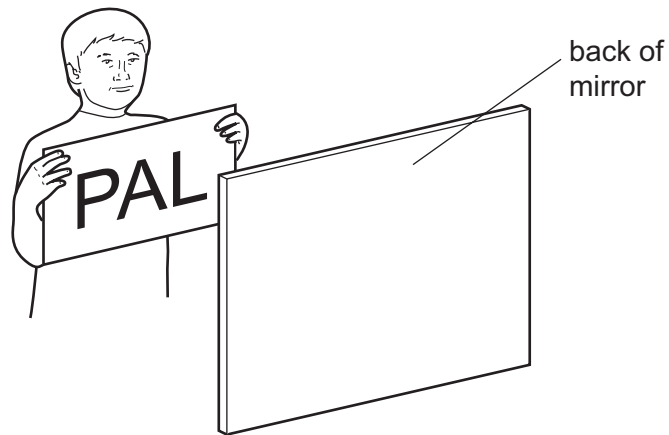
What are the amplitude and the wavelength of this wave?

	amplitude / cm	wavelength / cm
<b>A</b>	3	4
<b>B</b>	3	8
<b>C</b>	6	4
<b>D</b>	6	8

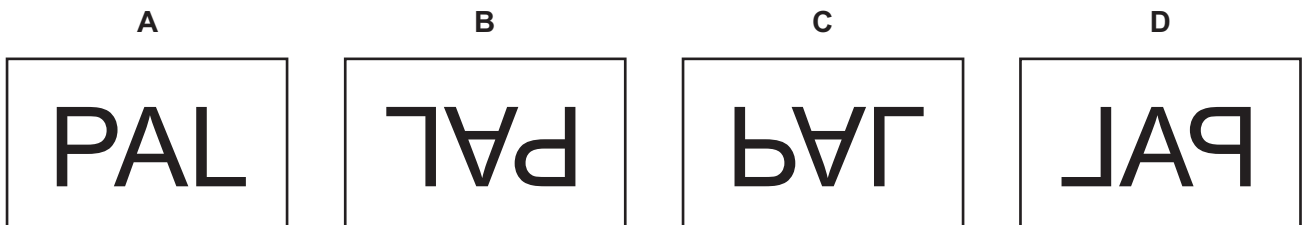


36 A piece of paper has 'PAL' written on it.

A student holds the paper in front of a plane mirror.



What does the student see?



37 The horn on a ship is sounded. The captain hears an echo from a cliff 4.0 s later.

The speed of sound is 340 m/s.

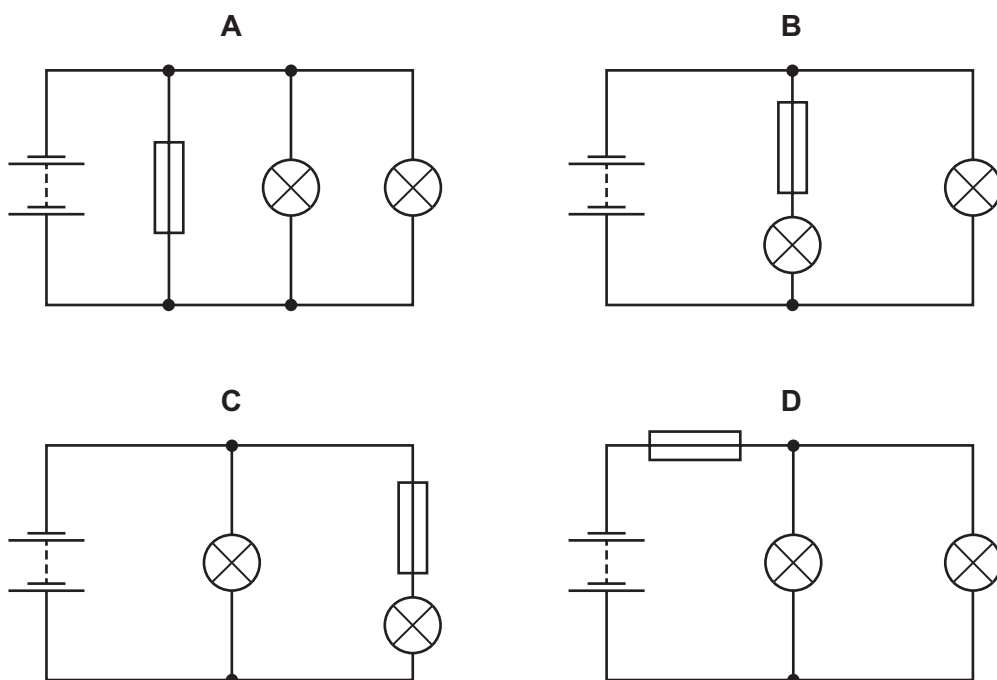
How far away is the cliff?

- A 170 m              B 340 m              C 680 m              D 1360 m

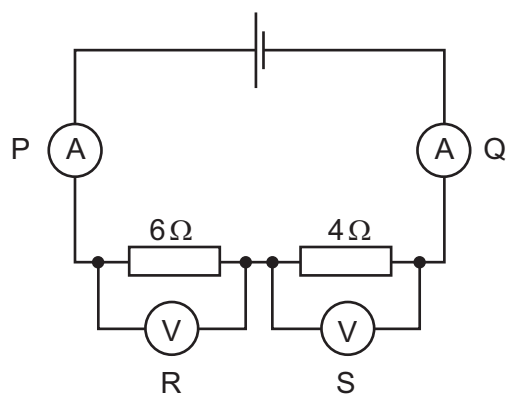
38 A student constructs four circuits, each containing a fuse.

The fuse blows in one circuit and both lamps in the circuit go out.

In which circuit does the fuse blow and both lamps go out?



39 The diagram shows a series circuit that includes two ammeters P and Q and two voltmeters R and S.



How do the readings on the meters in the circuit compare?

	reading on ammeter P	reading on voltmeter R
<b>A</b>	equal to reading on ammeter Q	greater than reading on voltmeter S
<b>B</b>	equal to reading on ammeter Q	less than reading on voltmeter S
<b>C</b>	greater than reading on ammeter Q	greater than reading on voltmeter S
<b>D</b>	greater than reading on ammeter Q	less than reading on voltmeter S

40 The table compares an atom of carbon-13 and an atom of nitrogen-14.

	carbon-13	nitrogen-14
nucleon number $A$	6	7
proton number $Z$	13	14

A neutral atom of carbon-13 and a neutral atom of nitrogen-14 have the same number of

- A electrons.
- B ions.
- C neutrons.
- D protons.

**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																					
I	II	III	IV	V	VI	VII	0																
		1 <b>H</b> Hydrogen 1							4 <b>He</b> Helium 2														
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4							20 <b>Ne</b> Neon 10															
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulfur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18																
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36																
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	101 <b>Ru</b> Ruthenium 44	106 <b>Pd</b> Palladium 46	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	122 <b>Sb</b> Antimony 51	131 <b>Xe</b> Xenon 54																
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	190 <b>Os</b> Osmium 76	195 <b>Pt</b> Platinum 78	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	209 <b>Pb</b> Lead 82	222 <b>Rn</b> Radon 86																
223 <b>Fr</b> Francium 87	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89																					
*58-71 Lanthanoid series																							
†90-103 Actinoid series																							
<table style="width: 100%; border: none;"> <tr> <td style="border: 1px solid black; padding: 2px;">a</td> <td style="border: 1px solid black; padding: 2px;"><b>X</b></td> <td style="border: none; padding: 2px;">a = relative atomic mass</td> </tr> <tr> <td style="border: none; padding: 2px;">Key</td> <td style="border: none; padding: 2px;">b</td> <td style="border: none; padding: 2px;">X = atomic symbol</td> </tr> <tr> <td style="border: none; padding: 2px;"></td> <td style="border: none; padding: 2px;"></td> <td style="border: none; padding: 2px;">b = proton (atomic) number</td> </tr> </table>													a	<b>X</b>	a = relative atomic mass	Key	b	X = atomic symbol			b = proton (atomic) number		
a	<b>X</b>	a = relative atomic mass																					
Key	b	X = atomic symbol																					
		b = proton (atomic) number																					
140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	147 <b>Pm</b> Promethium 61	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71	232 <b>Th</b> Thorium 90	231 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	243 <b>Am</b> Americium 95	247 <b>Cm</b> Curium 96	251 <b>Cf</b> Californium 98	252 <b>Es</b> Einsteinium 99	257 <b>Fm</b> Fermium 100	258 <b>Md</b> Mendelevium 101	259 <b>No</b> Nobelium 102	260 <b>Lr</b> Lawrencium 103

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).