



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

**CO-ORDINATED SCIENCES**

**0654/12**

Paper 1 Multiple Choice

**October/November 2016**

**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**.

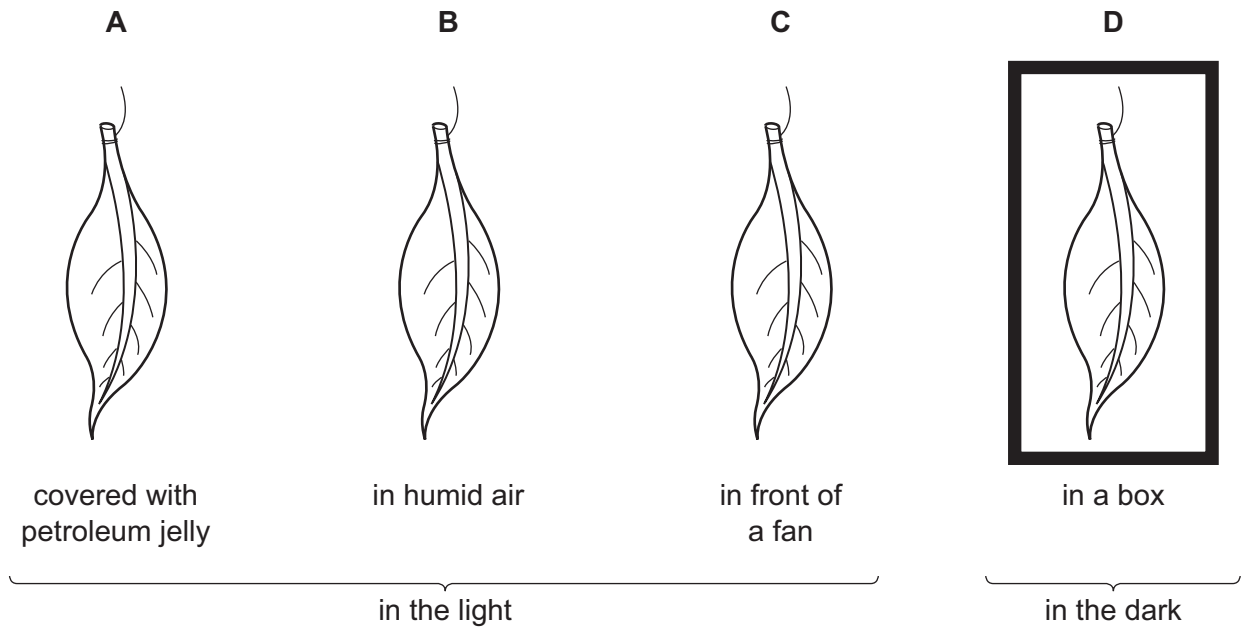
Electronic calculators may be used.

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

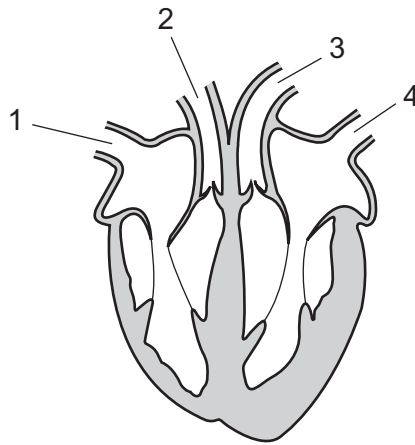
- 1 What is respiration?
- A breakdown of food by enzymes in the alimentary canal
  - B breathing to supply oxygen to cells
  - C release of carbon dioxide from cells
  - D release of energy for body activities
- 2 In some animals, their internal temperature varies with that of their surroundings.  
Why does the metabolic activity of these animals slow down when it is cold?
- A Enzyme activity is slow.
  - B Heart rate drops.
  - C The blood freezes.
  - D The absorption of food is slow.
- 3 What are the products when oil is digested?
- A amino acids and glycerol
  - B fats and amino acids
  - C fatty acids and glycerol
  - D fatty acids and sugars
- 4 Why is calcium needed in the diet?
- A to make carbohydrates
  - B to make teeth
  - C to make enzymes
  - D to make protein

- 5 Four leaves of similar size are taken from the same tree and weighed. Each is then treated as shown.

Which leaf loses mass fastest?



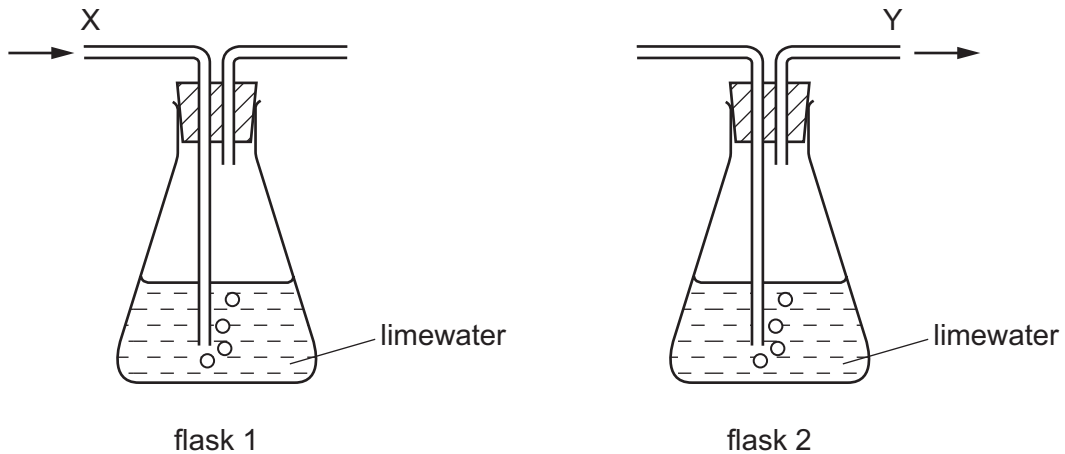
- 6 The diagram shows a section through the human heart.



Which two blood vessels are arteries?

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

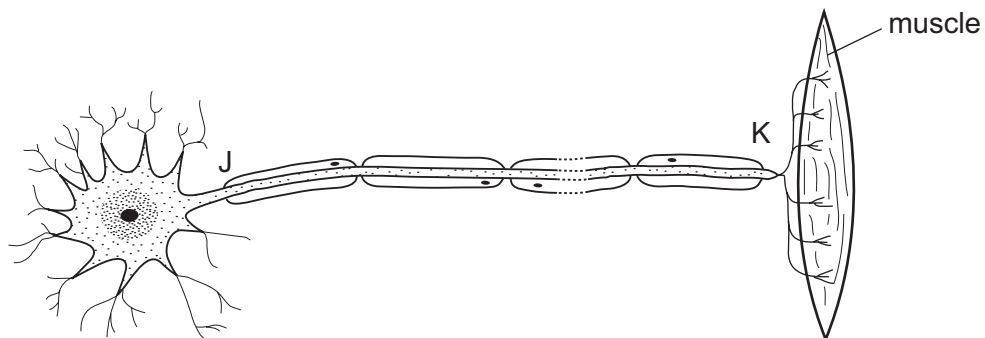
- 7 Two flasks are set up as shown. A student breathes out through tube X of flask 1. Another student breathes in through tube Y of flask 2.



The students obtain different results.

Which process in the student's body causes this?

- A absorption
  - B assimilation
  - C digestion
  - D respiration
- 8 The diagram shows a neurone and associated structures.



What type of neurone is shown and in which direction do impulses travel?

	type of neurone	direction of impulse
<b>A</b>	motor	J to K
<b>B</b>	motor	K to J
<b>C</b>	sensory	J to K
<b>D</b>	sensory	K to J

9 What are the effects of adrenaline?

	blood glucose concentration	pulse rate
<b>A</b>	decreases	decreases
<b>B</b>	decreases	increases
<b>C</b>	increases	decreases
<b>D</b>	increases	increases

10 How many chromosomes are there in a zygote of an animal?

- A half as many as in the egg
- B same number as in the egg
- C same number as in the sperm
- D twice as many as in the sperm

11 Which structure protects a flower when it is in bud?

- A petal
- B sepal
- C stamen
- D stigma

12 The diagram shows a food chain.

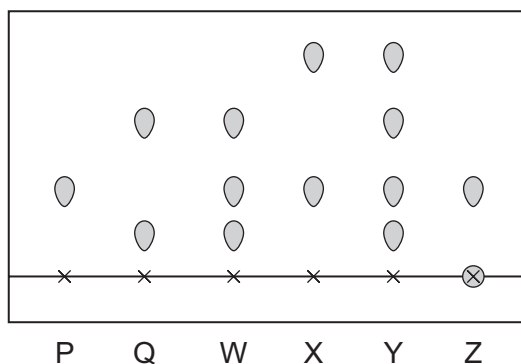
Which organisms pass the greatest amount of energy along the food chain?



13 What is an undesirable effect of deforestation?

- A It increases the oxygen concentration of the atmosphere.
- B It leads to erosion and loss of soil.
- C It makes land available for agriculture.
- D It pollutes the air with methane.

14 Which dye, W, X, Y or Z, is a mixture of **only** dyes P and Q?

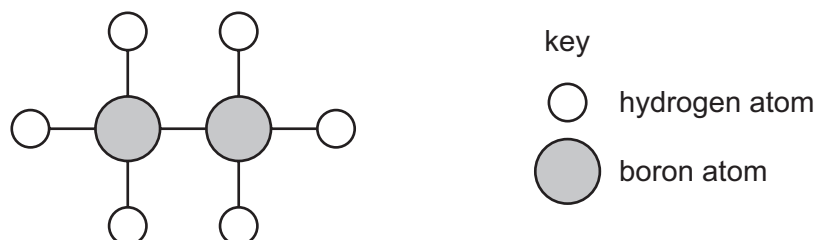


- A** W                      **B** X                      **C** Y                      **D** Z

15 Which process is **not** a chemical change?

- A** the distillation of petroleum  
**B** the electrolysis of molten lead bromide  
**C** the rusting of iron  
**D** the thermal decomposition of calcium carbonate

16 A model of a molecule is shown.



Which row shows the formula of this molecule and describes the type of bonding between the atoms?

	formula	bonding
<b>A</b>	$2\text{BH}_3$	covalent
<b>B</b>	$2\text{BH}_3$	ionic
<b>C</b>	$\text{B}_2\text{H}_6$	covalent
<b>D</b>	$\text{B}_2\text{H}_6$	ionic

- 17 Which row describes the observations at the inert electrodes during the electrolysis of aqueous copper chloride?

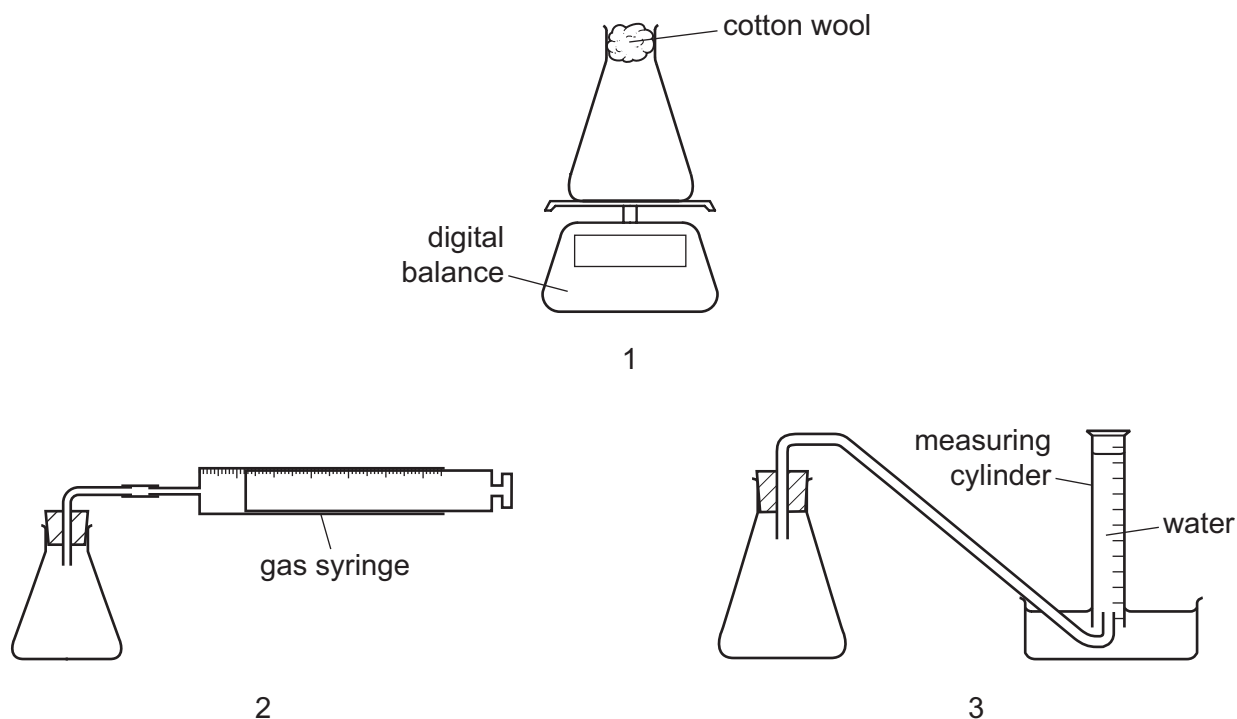
	at the positive electrode	at the negative electrode
<b>A</b>	a colourless gas is given off	a pink solid appears
<b>B</b>	a pale green gas is given off	a pink solid appears
<b>C</b>	a pink solid appears	a colourless gas is given off
<b>D</b>	a pink solid appears	a pale green gas is given off

- 18 Which type of reaction and which temperature change take place when an acid reacts with an alkali?

	type of reaction	temperature change
<b>A</b>	endothermic	decrease
<b>B</b>	endothermic	increase
<b>C</b>	exothermic	decrease
<b>D</b>	exothermic	increase

- 19 Solid calcium carbonate reacts with dilute hydrochloric acid to produce aqueous calcium chloride, carbon dioxide and water.

Which apparatus can be used with a stopwatch to measure the speed of this reaction?



- A** 1, 2 and 3      **B** 1 and 2 only      **C** 1 and 3 only      **D** 2 and 3 only

- 20 Copper sulfate is made when copper carbonate is added to dilute sulfuric acid.

The copper carbonate is added until no more carbon dioxide is given off.

The mixture is .....1..... to remove excess copper carbonate.

The resulting solution is then .....2..... to decrease the volume.

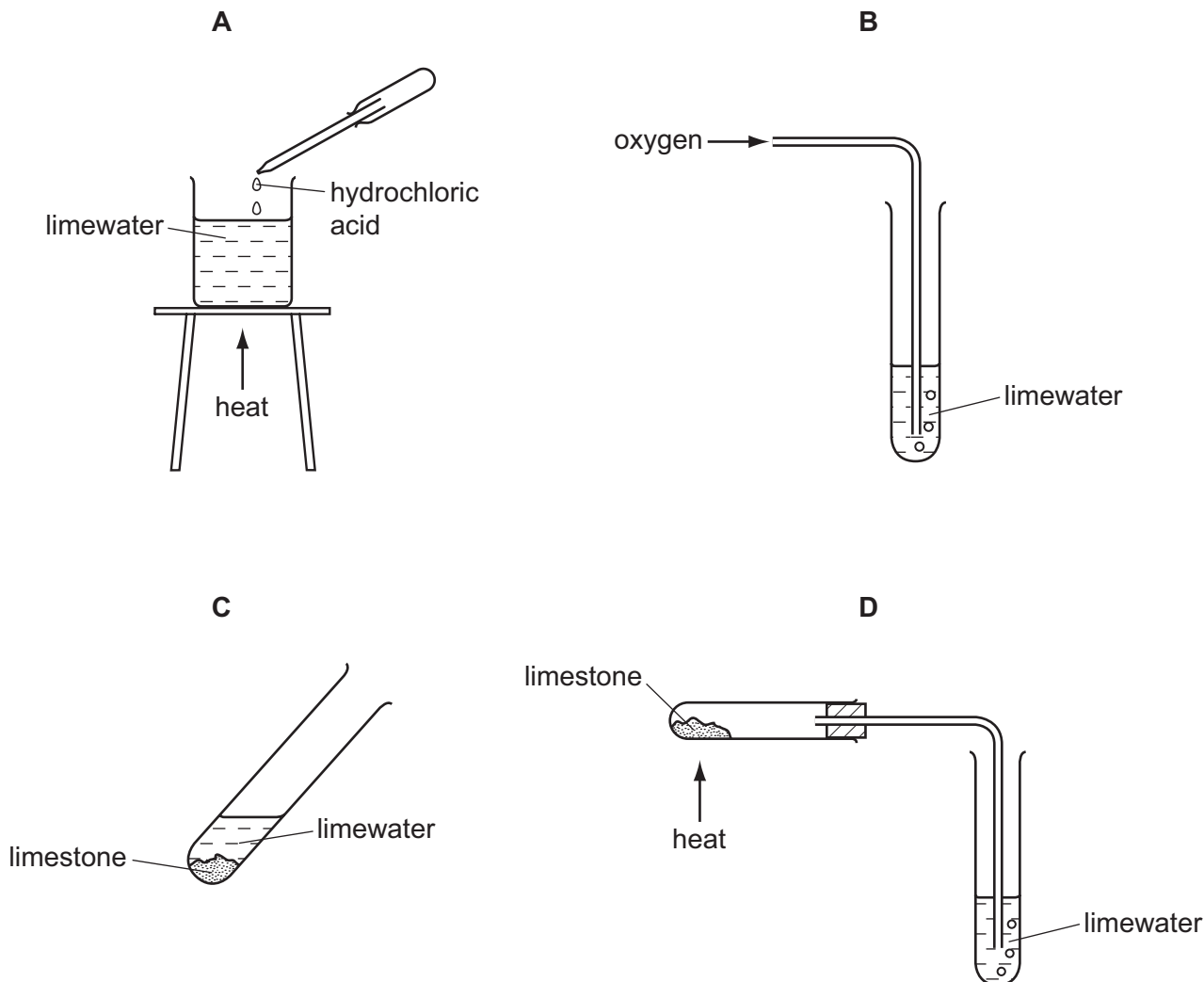
This solution is then .....3..... to allow the formation of pure copper sulfate crystals.

Which words complete gaps 1, 2 and 3?

	1	2	3
<b>A</b>	boiled	heated	left to cool
<b>B</b>	filtered	cooled	left to cool
<b>C</b>	filtered	heated	evaporated to dryness
<b>D</b>	filtered	heated	left to cool



21 In which experiment does limewater become milky?



22 Which statement about lithium, sodium and potassium is **not** correct?

- A They are in the same group of the Periodic Table.
- B They are in the same period of the Periodic Table.
- C They float on water.
- D They react with water to give a flammable gas.

23 The properties of some substances are listed.

- 1 act as catalysts
- 2 have high melting points
- 3 form acidic oxides
- 4 form coloured compounds

What are the properties of transition metals?

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

24 Five metals are reacted with cold water and with dilute hydrochloric acid.

Some of the results are shown.

	cold water	dilute hydrochloric acid
calcium	rapid reaction	no observable change a few bubbles of gas many bubbles of gas
copper		
iron		
magnesium	a few bubbles of gas	
sodium	violent reaction	

What is the order of reactivity, from most to least reactive?

- A** copper → calcium → magnesium → iron → sodium  
**B** copper → iron → magnesium → calcium → sodium  
**C** sodium → calcium → magnesium → iron → copper  
**D** sodium → iron → magnesium → calcium → copper

25 Which conditions are required for rusting?

- A** air only  
**B** air and water  
**C** salt and water  
**D** water only

26 What is used to reduce the acidity of soil?

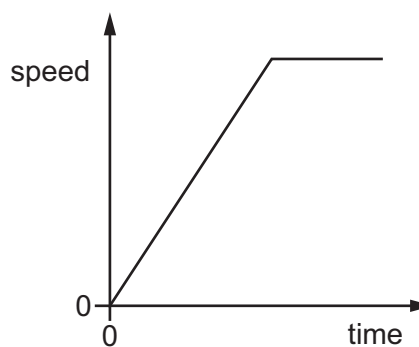
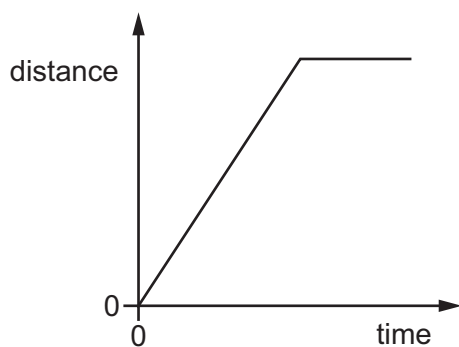
- A** fertiliser  
**B** lime  
**C** magnesium ions  
**D** sand

27 Poly(ethene) is made from ethene by the process of addition polymerisation.

Which word describes ethene in this process?

- A fuel
- B monomer
- C polymer
- D solvent

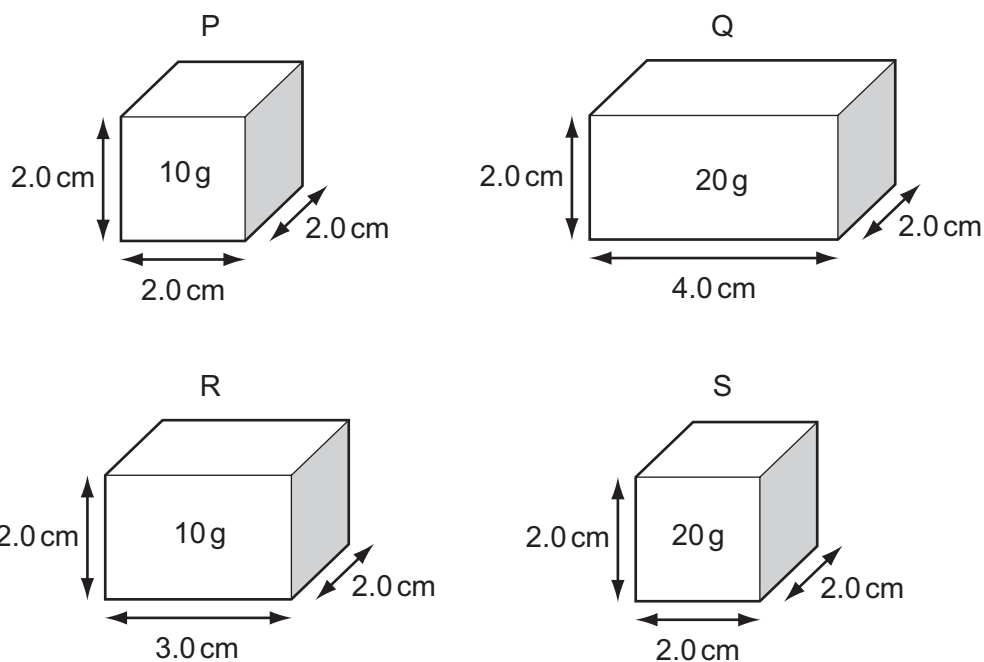
28 The diagram shows two graphs. Graph 1 is a distance/time graph. Graph 2 is a speed/time graph.



Which graphs represent a car that accelerates and then travels at a constant speed?

- A graph 1 and graph 2
- B graph 1 only
- C graph 2 only
- D neither graph 1 nor graph 2

- 29 Four rectangular blocks P, Q, R and S are shown. Each block is labelled with its dimensions and its mass.



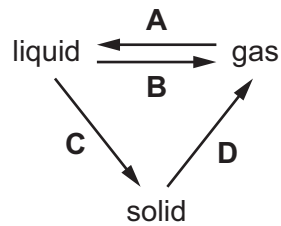
Which two blocks have the same density?

- A** P and Q      **B** P and R      **C** Q and R      **D** R and S
- 30 Which energy source is renewable?
- A** coal  
**B** natural gas  
**C** nuclear fission  
**D** wind
- 31 When a liquid evaporates, molecules escape from the surface.

Which row shows which molecules escape and the average energy of the remaining molecules?

	molecules escaping	average energy of remaining molecules
<b>A</b>	the less energetic molecules	decreases
<b>B</b>	the less energetic molecules	stays the same
<b>C</b>	the more energetic molecules	decreases
<b>D</b>	the more energetic molecules	stays the same

32 Which labelled arrow on the diagram represents condensation?



33 How is thermal energy transferred in a vacuum?

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

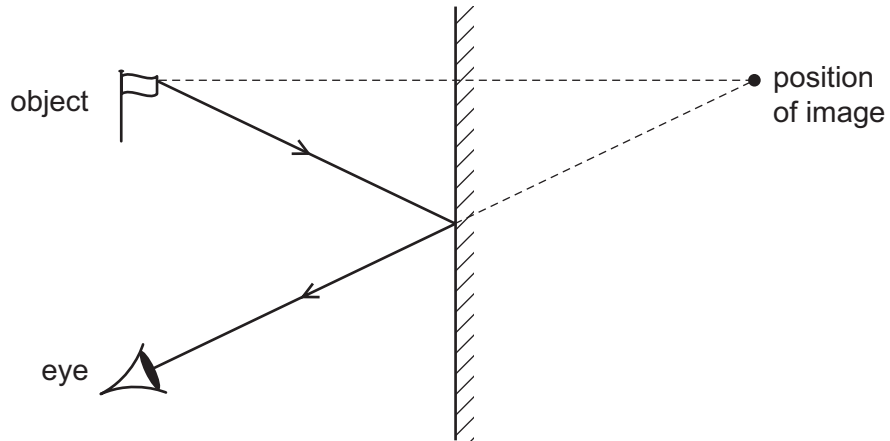
34 A water wave passes point Y.

A student counts how many wave crests pass point Y in 30 seconds.

Using **only** this information, what can the student calculate?

- A the amplitude of the wave
- B the frequency of the wave
- C the speed of the wave
- D the wavelength of the wave

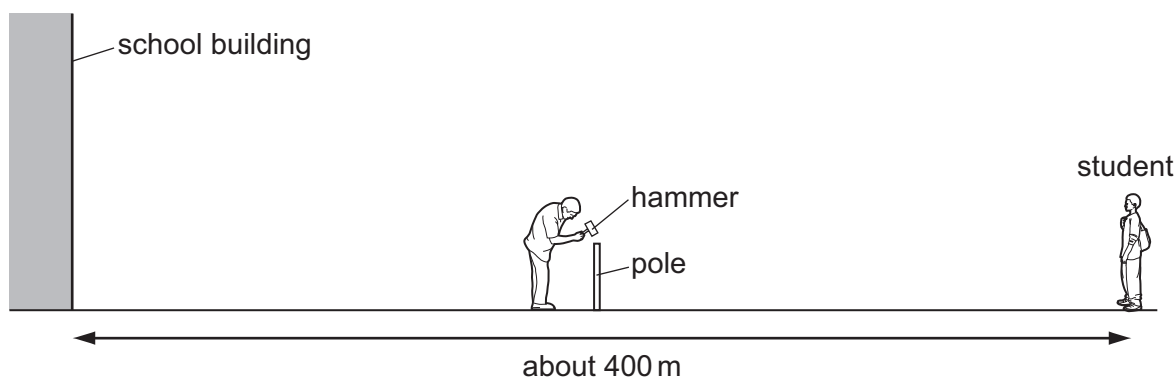
35 The image formed by a plane mirror is upright.



What are the other characteristics of the image?

	magnified (larger than the object)	virtual
<b>A</b>	no	no
<b>B</b>	no	yes
<b>C</b>	yes	no
<b>D</b>	yes	yes

- 36 A sports field is next to a large school building. At the far side of the sports field, a student sees a groundsman hit a pole with a hammer.

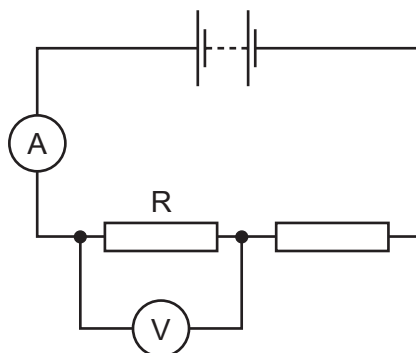


After the hammer hits the pole, the student hears two bangs.

Why does the student hear two bangs?

	first bang caused by	second bang caused by
<b>A</b>	sound of hammer hitting pole	sound of pole hitting hammer
<b>B</b>	sound reaching the student's left ear	sound reaching the student's right ear
<b>C</b>	sound reaching student directly	sound reflected back from school building
<b>D</b>	sound due to an echo from school building	sound reaching student directly

- 37 The circuit shows a battery connected to two resistors in series.



The reading on the ammeter is 2.0 A and the reading on the voltmeter is 8.0 V.

What is the resistance of resistor R?

- A** 0.25  $\Omega$       **B** 4.0  $\Omega$       **C** 10  $\Omega$       **D** 16  $\Omega$

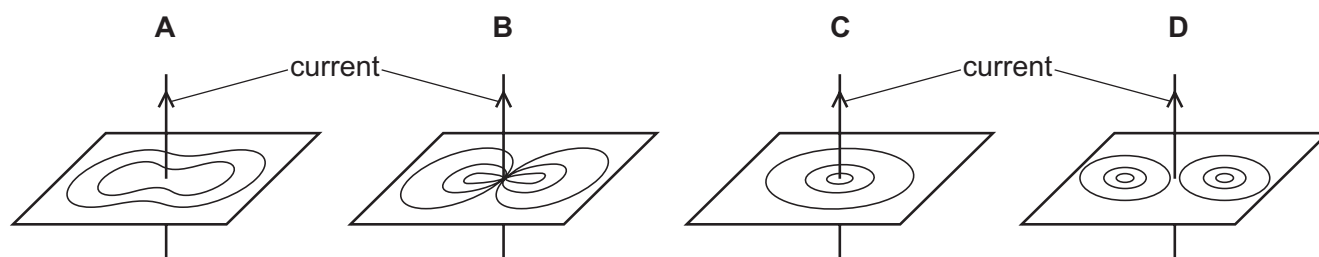
38 The cables in a circuit can safely carry a maximum current of 4 A.

A 3 A fuse and a 5 A fuse are available for protection.

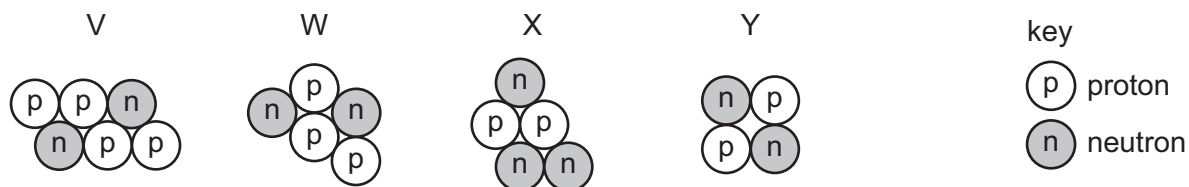
What is the purpose of the fuse and which fuse is suitable?

	purpose	suitable fuse
<b>A</b>	to prevent cables overheating	3 A
<b>B</b>	to prevent cables overheating	5 A
<b>C</b>	to prevent electric shock	3 A
<b>D</b>	to prevent electric shock	5 A

39 Which diagram shows the magnetic field pattern around a straight wire carrying a current?



40 The diagrams represent the nuclei of four different atoms V, W, X and Y.



Which two diagrams represent isotopes of the same element?

- A** V and W      **B** W and X      **C** X and Y      **D** Y and V







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## The Periodic Table of Elements

Group																											
I	II											III	IV	V	VI	VII	VIII										
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <b>Key</b>                      atomic number                      atomic symbol                      name                      relative atomic mass                 </div>											1 <b>H</b> hydrogen 1																2 <b>He</b> helium 4
											3 <b>Li</b> lithium 7	4 <b>Be</b> beryllium 9											5 <b>B</b> boron 11	6 <b>C</b> carbon 12	7 <b>N</b> nitrogen 14	8 <b>O</b> oxygen 16	9 <b>F</b> fluorine 19
11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24											13 <b>Al</b> aluminium 27	14 <b>Si</b> silicon 28	15 <b>P</b> phosphorus 31	16 <b>S</b> sulfur 32	17 <b>Cl</b> chlorine 35.5	18 <b>Ar</b> argon 40										
19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	21 <b>Sc</b> scandium 45	22 <b>Ti</b> titanium 48	23 <b>V</b> vanadium 51	24 <b>Cr</b> chromium 52	25 <b>Mn</b> manganese 55	26 <b>Fe</b> iron 56	27 <b>Co</b> cobalt 59	28 <b>Ni</b> nickel 59	29 <b>Cu</b> copper 64	30 <b>Zn</b> zinc 65	31 <b>Ga</b> gallium 70	32 <b>Ge</b> germanium 73	33 <b>As</b> arsenic 75	34 <b>Se</b> selenium 79	35 <b>Br</b> bromine 80	36 <b>Kr</b> krypton 84										
37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	39 <b>Y</b> yttrium 89	40 <b>Zr</b> zirconium 91	41 <b>Nb</b> niobium 93	42 <b>Mo</b> molybdenum 96	43 <b>Tc</b> technetium –	44 <b>Ru</b> ruthenium 101	45 <b>Rh</b> rhodium 103	46 <b>Pd</b> palladium 106	47 <b>Ag</b> silver 108	48 <b>Cd</b> cadmium 112	49 <b>In</b> indium 115	50 <b>Sn</b> tin 119	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	53 <b>I</b> iodine 127	54 <b>Xe</b> xenon 131										
55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	57–71 lanthanoids	72 <b>Hf</b> hafnium 178	73 <b>Ta</b> tantalum 181	74 <b>W</b> tungsten 184	75 <b>Re</b> rhenium 186	76 <b>Os</b> osmium 190	77 <b>Ir</b> iridium 192	78 <b>Pt</b> platinum 195	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	81 <b>Tl</b> thallium 204	82 <b>Pb</b> lead 207	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium –	85 <b>At</b> astatine –	86 <b>Rn</b> radon –										
87 <b>Fr</b> francium –	88 <b>Ra</b> radium –	89–103 actinoids	104 <b>Rf</b> rutherfordium –	105 <b>Db</b> dubnium –	106 <b>Sg</b> seaborgium –	107 <b>Bh</b> bohrium –	108 <b>Hs</b> hassium –	109 <b>Mt</b> meitnerium –	110 <b>Ds</b> darmstadtium –	111 <b>Rg</b> roentgenium –	112 <b>Cn</b> copernicium –		114 <b>Fl</b> flerovium –		116 <b>Lv</b> livermorium –												

lanthanoids	57 <b>La</b> lanthanum 139	58 <b>Ce</b> cerium 140	59 <b>Pr</b> praseodymium 141	60 <b>Nd</b> neodymium 144	61 <b>Pm</b> promethium –	62 <b>Sm</b> samarium 150	63 <b>Eu</b> europium 152	64 <b>Gd</b> gadolinium 157	65 <b>Tb</b> terbium 159	66 <b>Dy</b> dysprosium 163	67 <b>Ho</b> holmium 165	68 <b>Er</b> erbium 167	69 <b>Tm</b> thulium 169	70 <b>Yb</b> ytterbium 173	71 <b>Lu</b> lutetium 175
actinoids	89 <b>Ac</b> actinium –	90 <b>Th</b> thorium 232	91 <b>Pa</b> protactinium 231	92 <b>U</b> uranium 238	93 <b>Np</b> neptunium –	94 <b>Pu</b> plutonium –	95 <b>Am</b> americium –	96 <b>Cm</b> curium –	97 <b>Bk</b> berkelium –	98 <b>Cf</b> californium –	99 <b>Es</b> einsteinium –	100 <b>Fm</b> fermium –	101 <b>Md</b> mendelevium –	102 <b>No</b> nobelium –	103 <b>Lr</b> lawrencium –

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