Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **May/June 2019**

45 minutes

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

4755032796

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.

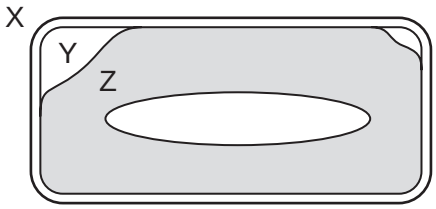
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
Electronic calculators may be used.

IB19 06_0654_23/3RP

1 Which characteristic of living organisms is correctly matched to the description?

	characteristic	description
A	excretion	the removal from organisms of the waste products of metabolism
B	nutrition	the chemical reactions in cells that break down nutrient molecules and release energy for metabolism
C	respiration	the taking in of materials for energy, growth and development
D	sensitivity	the action by an organism or part of an organism causing a change of position or place

2 The diagram shows a cell starting to plasmolyse.



In which direction is osmosis occurring?

A X to Y

B Y to X

C Y to Z

D Z to Y

3 Which chemical element is found in proteins, but **not** in carbohydrates or fats?

A carbon

B hydrogen

C oxygen

D nitrogen

4 Which statement about enzyme action is correct?

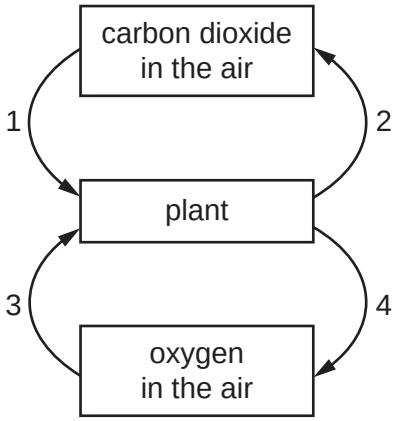
A The active site of the enzyme is complementary to the product and a substrate is formed.

B The active site of the substrate is complementary to the enzyme and a product is formed.

C The active site of the product is complementary to the enzyme and a substrate is formed.

D The active site of the enzyme is complementary to the substrate and a product is formed.

5 Which two arrows represent photosynthesis?



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

6 What is deficient in the diet when growing bones become soft and deformed?

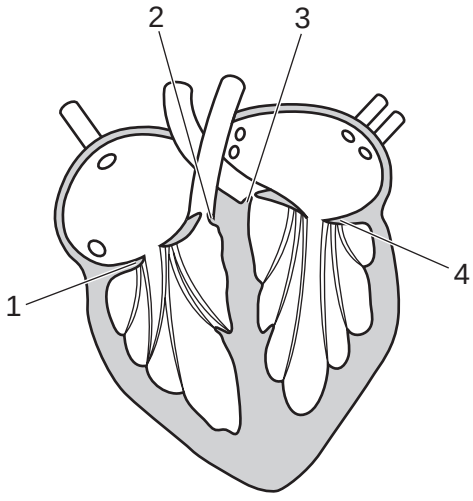
A iron

B protein

C vitamin C

D vitamin D

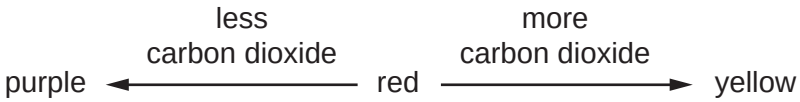
7 The diagram shows a section through the heart.



When ventricles contract, which valves open and which valves close?

	open	close
A	1 and 3	2 and 4
B	1 and 4	2 and 3
C	2 and 3	1 and 4
D	2 and 4	1 and 3

8 Hydrogencarbonate indicator changes colour with different concentrations of carbon dioxide.



A pond contains both plants and animals. Samples of pond water are taken during a sunny day and again during the night. Each sample is tested with hydrogencarbonate indicator.

What would be the results of these tests?

	day sample	night sample
A	purple	yellow
B	red	purple
C	red	red
D	yellow	purple

9 What occurs when our eyes look from a near object in dim light to a distant object in bright light?

A Pupils constrict and lenses become thinner.

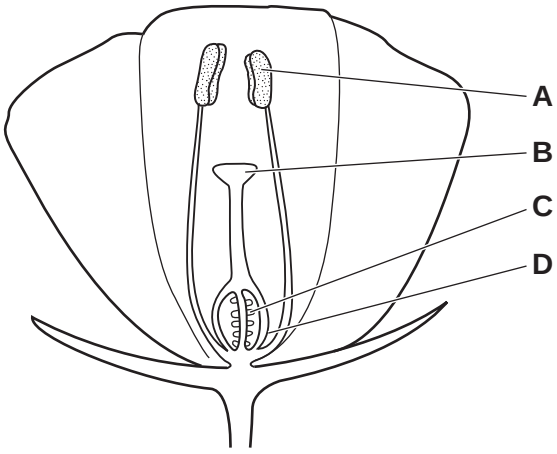
B Pupils constrict and lenses become fatter.

C Pupils dilate and lenses become thinner.

D Pupils dilate and lenses become fatter.

10 The diagram shows a section through an insect-pollinated flower.

When pollination occurs, where must the pollen grains reach?



11 Which human characteristic is **not** influenced by the environment?

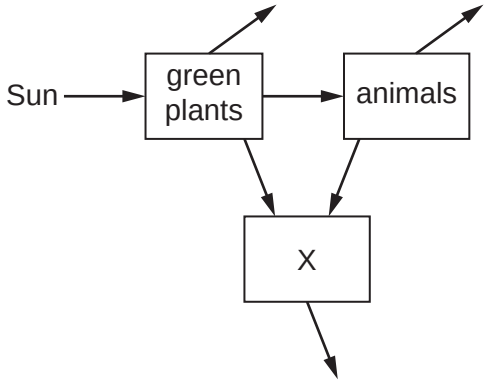
A blood group

B height

C shoe size

D weight

12 The diagram shows the energy flow in an ecosystem.



Which group of organisms is X?

A carnivores

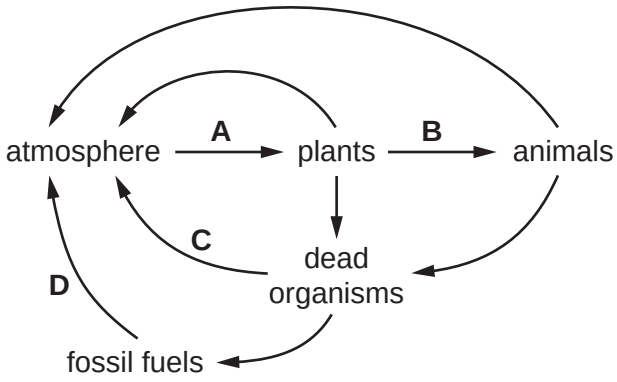
B decomposers

C herbivores

D producers

13 The diagram shows the carbon cycle.

Which process represents decomposition?



14 Which method is used to assess the purity of an unknown solid substance?

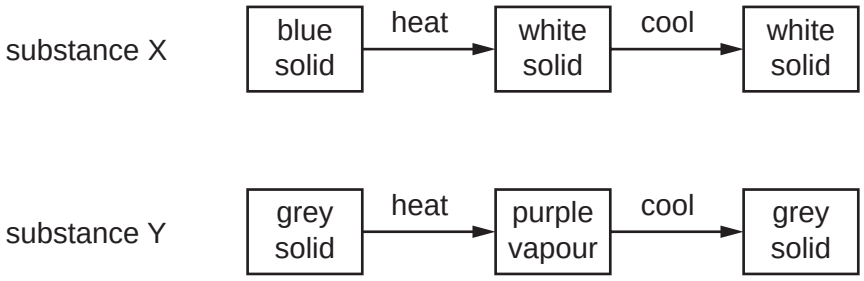
A Measure its density.

B Measure its electrical conductivity.

C Measure its melting point.

D Measure its solubility in water.

15 Two substances, X and Y, are heated and then cooled. The observations are shown.



Which type of change occurs when X and Y are heated?

	X	Y
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

16 Diamond and graphite are different forms of the element carbon.

Graphite conducts electricity.

Which statement explains why diamond does **not** conduct electricity?

A All of the atoms in diamond are arranged tetrahedrally.

B All of the bond lengths in diamond are the same.

C All of the bonds in diamond are single bonds.

D All of the outer shell electrons in diamond are held in covalent bonds.

17 Sodium phosphate, Na_3PO_4, contains sodium ions, Na^+.

Aluminium sulfate, $Al_2(SO_4)_3$, contains sulfate ions, SO_4^{2-}.

What is the formula of aluminium phosphate?

A $AlPO_4$ **B** $Al(PO_4)_2$ **C** $Al_2(PO_4)_3$ **D** $Al_3(PO_4)_2$

18 When concentrated aqueous sodium chloride is electrolysed, the remaining solution turns red litmus paper to blue.

Which substance causes this colour change?

A chlorine

B hydrogen

C hydrochloric acid

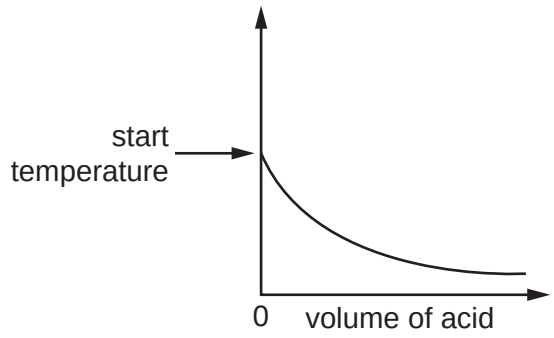
D sodium hydroxide

19 An acid is added to an alkali until the final solution is **just** neutral.

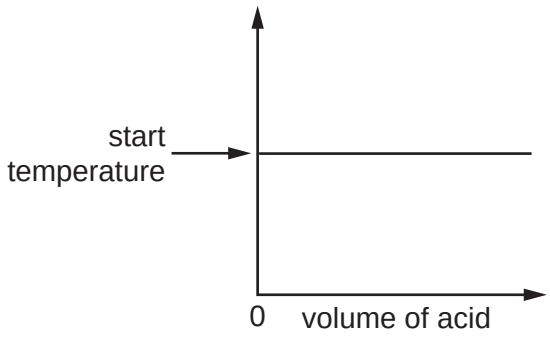
The reaction is exothermic.

Which graph shows how the temperature changes as the acid is being added to the alkali?

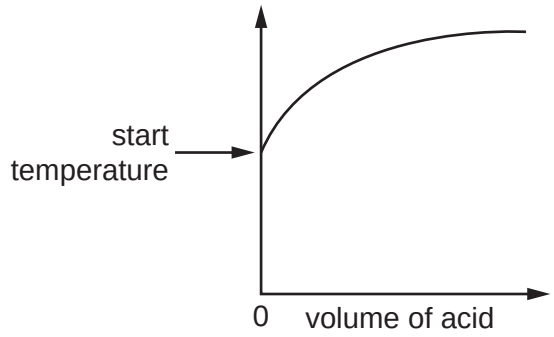
A



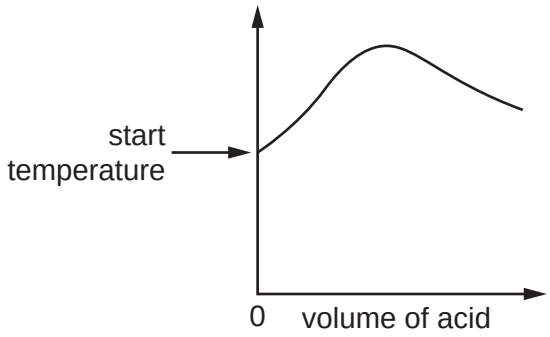
B



C



D



20 Which row describes the effect of increasing temperature on collisions between particles in a chemical reaction?

	frequency of collisions	number of collisions with energy greater than activation energy
A	increases	increases
B	increases	remains constant
C	remains constant	increases
D	remains constant	remains constant

21 Which statement about redox reactions is correct?

A Oxidising agents are oxidised.

B Oxidising agents lose electrons.

C Reducing agents accept electrons.

D Reduction is the gain of electrons.

22 Four oxides, W, X, Y and Z, are added separately to an acid and to an alkali.

The results are shown.

	W	X	Y	Z
acid	no reaction	reaction	reaction	no reaction
alkali	reaction	no reaction	reaction	no reaction

Which statements about these oxides are correct?

1 Y is neutral and Z is amphoteric.

2 W is acidic and X is basic.

3 W is basic and X is neutral.

4 Y is amphoteric and Z is neutral.

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

23 Hydrochloric acid and sodium hydroxide neutralise each other to form water and sodium chloride.

Which method is used to make the solution crystallise?

A chromatography

B evaporation

C filtration

D fractional distillation

24 Francium and astatine are at the bottom of Group I and Group VII respectively.

Which statement is correct?

A Astatine is the least reactive element in Group VII.

B Astatine is the most volatile element in Group VII.

C Francium has the highest melting point in Group I.

D Francium has the lowest density in Group I.

25 Which row describes the properties of a metal that is used to make aircraft parts?

	density	strength	resistance to corrosion
A	high	high	low
B	high	low	high
C	low	high	high
D	low	low	low

26 When dilute sulfuric acid is added to a metal carbonate, gas M is produced.

What is M?

A ammonia

B carbon dioxide

C hydrogen

D sulfur dioxide

27 Which statement about all of the members of a homologous series is correct?

A They have similar chemical properties.

B They have the same physical properties.

C They have the same molecular formula.

D They have the same number of carbon atoms.

28 A spring that obeys Hooke's law has an unstretched length of 5.0 cm. A load of weight 0.50 N is hung from the spring and the length of the spring becomes 10.0 cm.

The load is replaced with a new load and the length of the spring becomes 15.0 cm.

The spring has not passed its limit of proportionality.

What is the weight of the new load?

A 0.50 N **B** 0.75 N **C** 1.0 N **D** 1.5 N

29 A chair of weight 40 N rests on four legs. Each leg has an area of contact with the floor of 10 cm^2.

What is the pressure on the floor due to the chair?

A 1.0 N/cm^2 **B** 4.0 N/cm^2 **C** 400 N/cm^2 **D** 40 000 N/cm^2

30 An object X with mass 2.0 kg is moving with a speed of 4.0 m/s.

Which object has kinetic energy equal to that of object X?

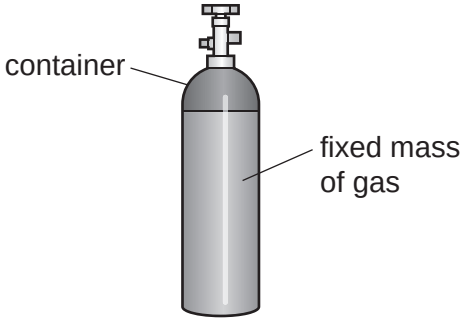
	mass of object / kg	$\frac{\text{speed of object}}{\text{m/s}}$
A	0.50	16
B	1.0	8.0
C	8.0	2.0
D	16	1.0

31 A car engine transfers 80 000 kJ of energy in 5.0 minutes.

What is the output power of the engine?

A 267 kW **B** 400 kW **C** 16 000 kW **D** 24 000 kW

32 A fixed mass of gas is trapped in a container of constant volume.



The gas is now heated.

How does the pressure of the gas change and how does the speed of the gas molecules change?

	pressure of gas	speed of molecules
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 Diagram 1 represents a wave.

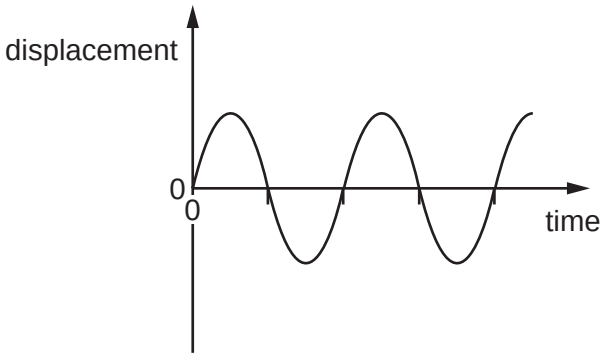
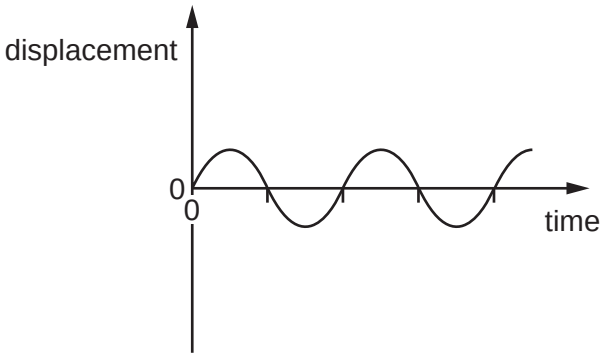


diagram 1

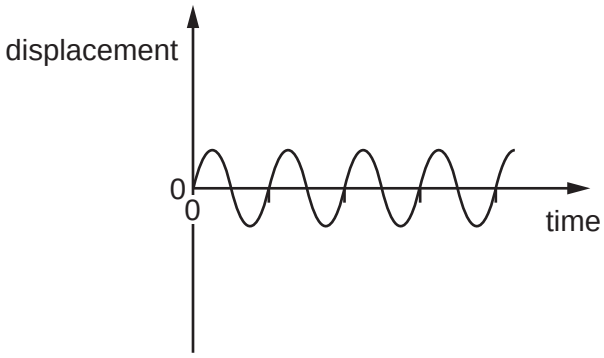
Which diagram represents a wave with twice the frequency and half the amplitude of the wave in diagram 1?

The scales are the same in all the diagrams.

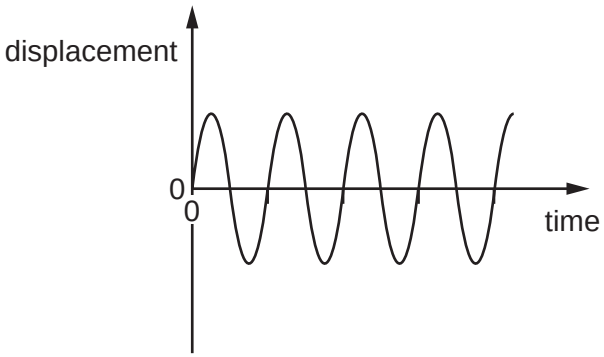
A



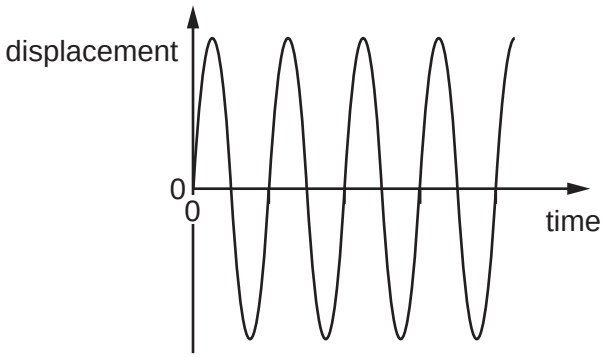
B



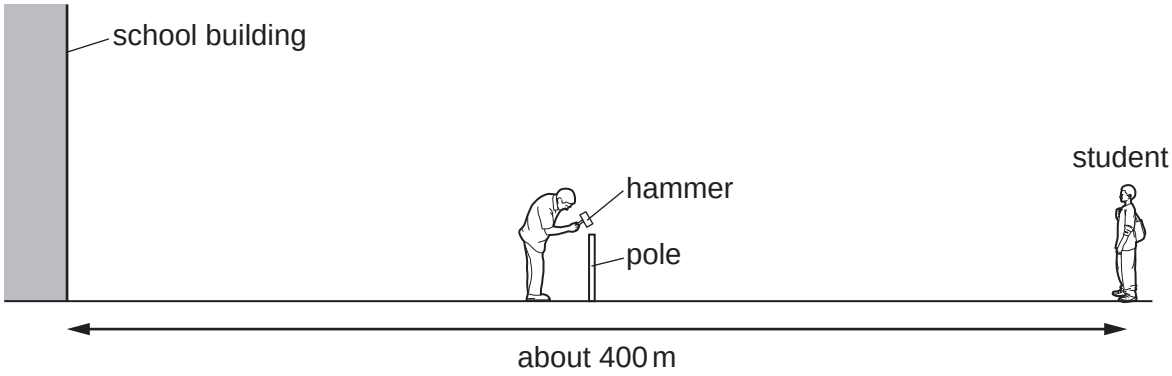
C



D



34 A sports field is next to a large school building. A student at the far side of the sports field 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
A	sound of hammer hitting pole	sound of pole hitting hammer
B	sound reaching the student's left ear	sound reaching the student's right ear
C	sound reaching student directly	sound reflected back from school building
D	sound reflected back from school building	sound reaching student directly

35 An atom of an isotope of strontium (Sr) has a proton number of 38 and contains 52 neutrons.

What is the nuclide notation for this isotope?

A $^{52}_{38}\mathrm{Sr}$ **B** $^{90}_{38}\mathrm{Sr}$ **C** $^{38}_{52}\mathrm{Sr}$ **D** $^{90}_{52}\mathrm{Sr}$

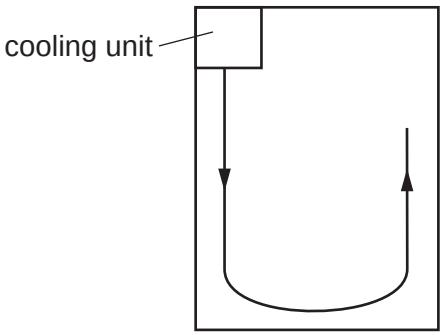
36 How does the resistance of a piece of wire depend on its cross-sectional area and on its length?

	cross-sectional area	length
A	directly proportional	directly proportional
B	directly proportional	inversely proportional
C	inversely proportional	directly proportional
D	inversely proportional	inversely proportional

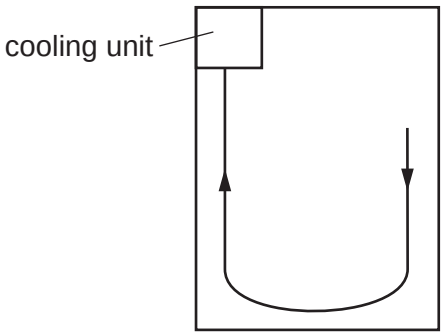
37 The cooling unit in a refrigerator is fitted at the top in the position shown in the diagrams.

Which diagram shows the convection current in the air in the refrigerator?

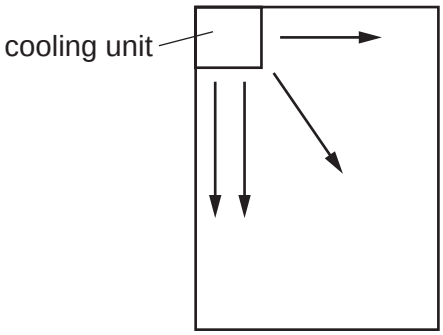
A



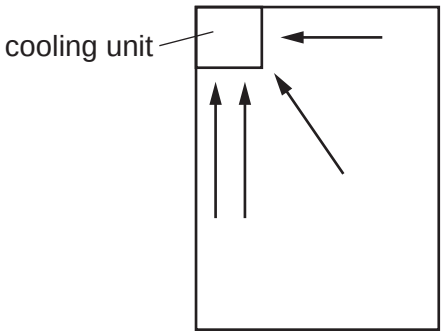
B



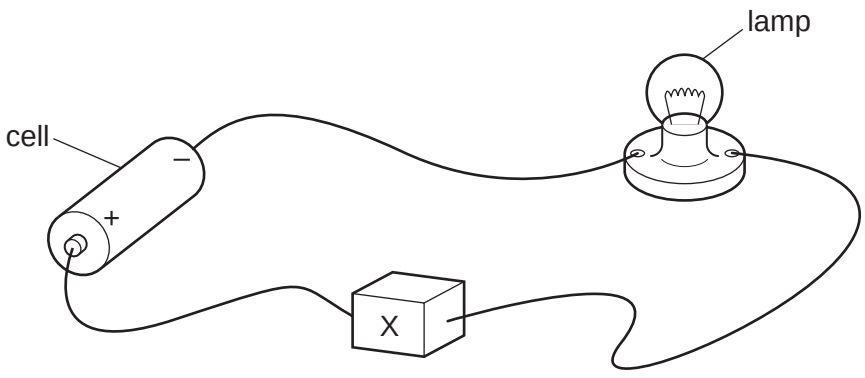
C



D



38 In the circuit, component X is used to control the brightness of the lamp.



What is component X?

A an ammeter

B a fixed resistor

C a fuse

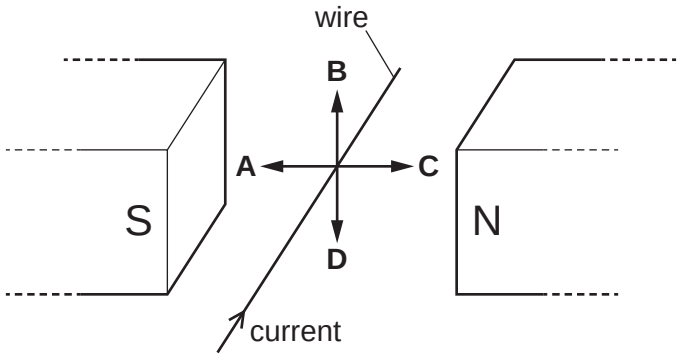
D a variable resistor

39 A current-carrying wire is placed between the poles of a magnet, as shown.

The current direction in the wire is shown.

A force is produced on the wire.

In which labelled direction does the force act?



40 Three types of ionising radiation enter a magnetic field at right angles.

Which types of radiation are deflected?

A α and β only **B** α and γ only **C** β and γ only **D** α, β and γ

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

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

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