Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **February/March 2023**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

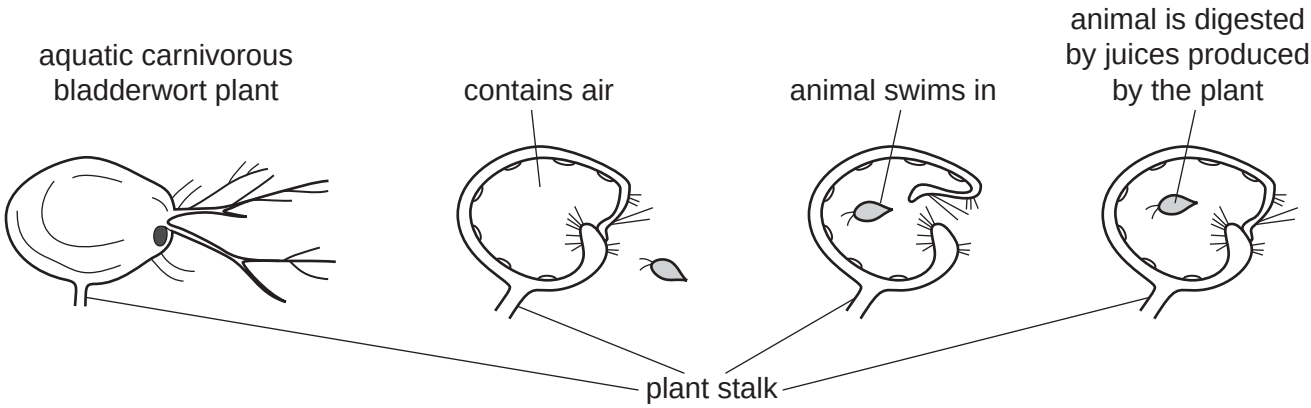
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages.

[Turn over

1 The diagram shows how an aquatic carnivorous bladderwort plant reacts to tiny aquatic organisms that swim by.



Which characteristics of living organisms are shown by this plant?

A excretion and growth

B growth and sensitivity

C nutrition and excretion

D nutrition and sensitivity

2 Which description for the process of osmosis is correct?

A Osmosis is the movement of water molecules from a region of high water potential across a fully permeable membrane to a region of lower water potential.

B Osmosis is the movement of water molecules from a region of low water potential across a partially permeable membrane to a region of high water potential.

C Osmosis is the movement of water molecules from a region of high water potential across a partially permeable membrane to a region of lower water potential.

D Osmosis is the movement of water molecules from a region of low water potential across a fully permeable membrane to a region of high water potential.

3 Tests are carried out on a colourless liquid. The results are shown.

test	resultant colour
biuret	purple
ethanol emulsion	white
iodine	brown

Which food groups does the liquid contain?

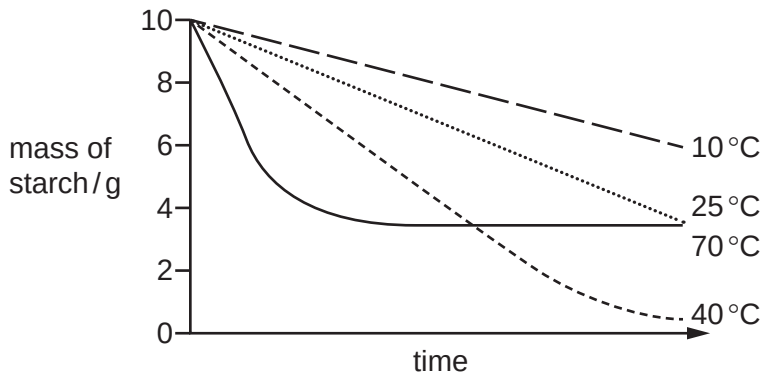
A protein and fat

B protein and starch

C reducing sugar and fat

D starch and fat

4 The graph shows the rate at which 10 g of starch is broken down by amylase at four different temperatures.



At which temperature does amylase work best to break down starch?

A 10 °C **B** 25 °C **C** 40 °C **D** 70 °C

5 Why are nitrate ions necessary for plant growth?

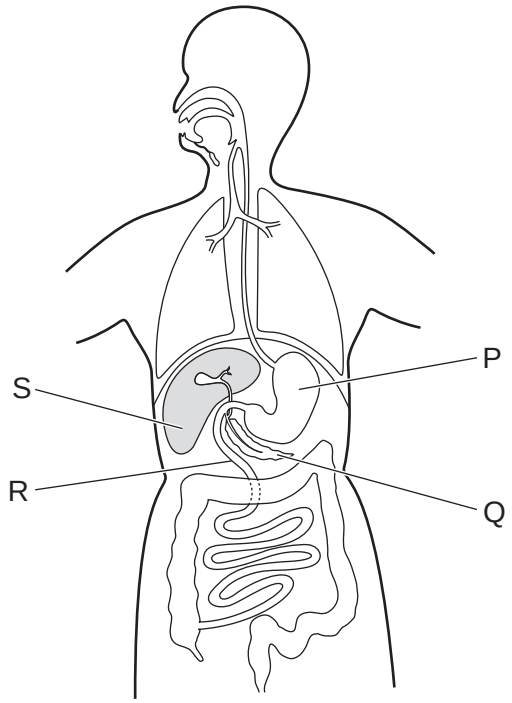
A They are essential for producing starch.

B They are found in the chloroplasts.

C They are part of the cell sap.

D They are used in making amino acids.

6 The diagram shows the human alimentary canal.

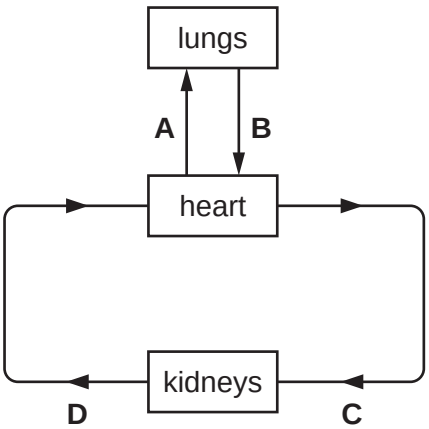


In which labelled organs are large insoluble molecules broken down into small soluble molecules?

A P and R **B** R and S **C** S and Q **D** Q and P

7 The arrows in the diagram represent blood vessels.

Which vessel is the pulmonary vein?



8 What is the word equation for anaerobic respiration in yeast?

A glucose → alcohol + carbon dioxide

B glucose → carbon dioxide + water

C glucose → lactic acid

D glucose + oxygen → carbon dioxide + water

9 Which statement explains how the iris responds to an increase in light intensity?

A The circular muscles contract and radial muscles relax causing the pupil to decrease in size.

B The circular muscles relax and radial muscles contract causing the pupil to decrease in size.

C The circular muscles contract and radial muscles relax causing the pupil to increase in size.

D The circular muscles relax and radial muscles contract causing the pupil to increase in size.

10 Which statement about reproduction is correct?

A In asexual reproduction, a diploid offspring is formed after fusion of haploid gametes.

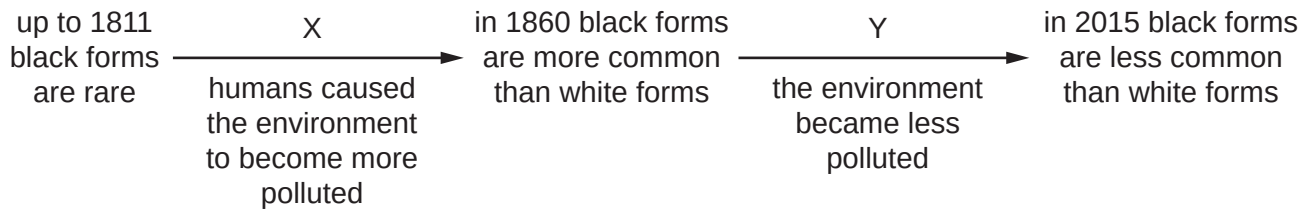
B In asexual reproduction, a haploid offspring is formed after fusion of diploid gametes.

C In sexual reproduction, a diploid offspring is formed after fusion of haploid gametes.

D In sexual reproduction, a haploid offspring is formed after fusion of diploid gametes.

11 In one area, two forms of peppered moth exist. One form is pale white with a black and grey pattern. The other form is completely black.

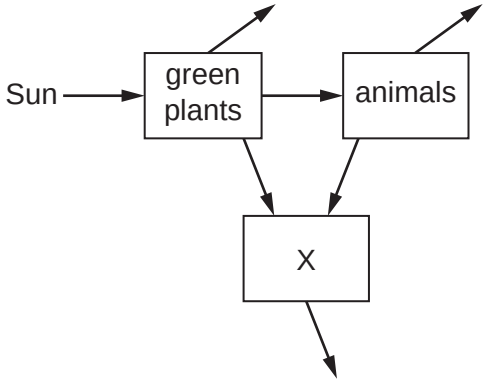
The diagram shows the changes in colour that have occurred in the peppered moth over a period of more than 200 years.



Which row shows what happened?

	caused the black forms to first appear	process X	process Y
A	adaptation	artificial selection	artificial selection
B	adaptation	natural selection	natural selection
C	mutation	artificial selection	artificial selection
D	mutation	natural selection	natural selection

12 The diagram shows the energy flow in part of an ecosystem.



Which group of organisms is X?

A carnivores

B decomposers

C herbivores

D producers

13 What is the correct sequence of events that occur during eutrophication following an increase of nitrate ions in water?

1 increased aerobic respiration by decomposers

2 death of producers

3 rapid growth of producer organisms

4 death of animals due to lack of oxygen

A $4 \rightarrow 2 \rightarrow 3 \rightarrow 1$

B $3 \rightarrow 2 \rightarrow 1 \rightarrow 4$

C $3 \rightarrow 1 \rightarrow 2 \rightarrow 4$

D $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

14 A student adds excess copper oxide powder to warm dilute sulfuric acid.

Aqueous copper sulfate is formed.

Which method is used to remove the unreacted copper oxide?

A chromatography

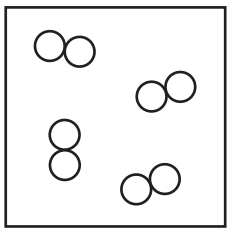
B crystallisation

C distillation

D filtration

15 Which diagram represents molecules of a compound?

A



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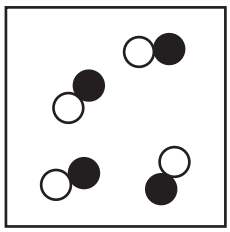

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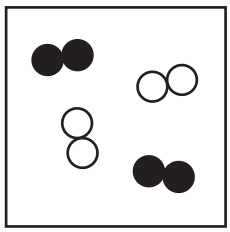

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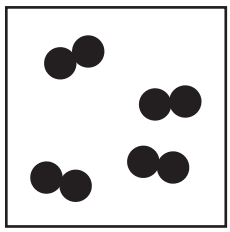


16 Which statements about the mole are correct?

1 One mole of ^{12}C contains twice as many atoms as one mole of ^{24}Mg.

2 One mole of ^{12}C has a mass of 12 g.

3 One mole of C contains Avogadro's number of atoms.

4 One mole of oxygen gas at room temperature and pressure occupies 32 dm^3.

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

17 Dilute aqueous potassium chloride is electrolysed using inert electrodes.

Which substance is produced at the cathode?

A chlorine

B hydrogen

C oxygen

D potassium

18 Which process is exothermic?

A boiling water

B cracking a long chain alkane

C decomposition of limestone

D identification of hydrogen using a lighted splint

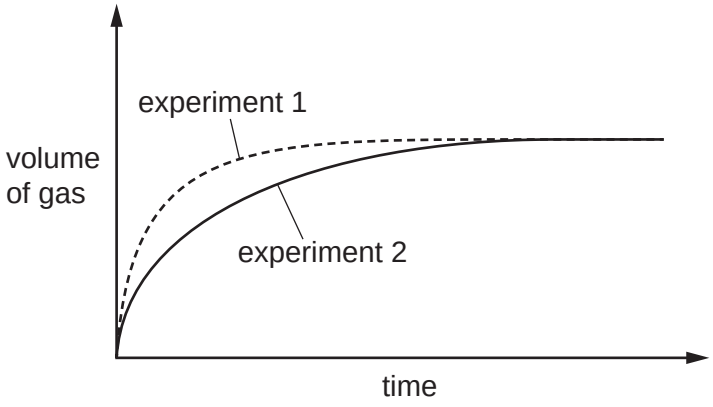
19 Dilute hydrochloric acid reacts with calcium carbonate. The equation for the reaction is shown.

$$2HCl + CaCO_3 \rightarrow CaCl_2 + H_2O + CO_2$$

The effect of concentration of the acid on the rate of this reaction is investigated.

The volume of gas produced over time is measured for two different concentrations of the acid.

The results for experiments 1 and 2 are shown.



Which row shows the reaction that has the higher rate of reaction and explains why?

	higher rate	reason
A	experiment 1	the activation energy is lower in experiment 1
B	experiment 1	the collision frequency is greater in experiment 1
C	experiment 2	the activation energy is lower in experiment 1
D	experiment 2	the collision frequency is greater in experiment 1

20 In which equation is the <u>underlined</u> zinc an oxidising agent?

A $\underline{Zn} + Cl_2 \rightarrow ZnCl_2$

B $\underline{Zn} + 2H^+ \rightarrow Zn^{2+} + H_2$

C $\underline{Zn}^{2+} + Mg \rightarrow Zn + Mg^{2+}$

D $2\underline{Zn} + O_2 \rightarrow 2ZnO$

21 A student makes lists of acidic oxides and basic oxides.

acidic oxides	basic oxides
carbon dioxide	calcium oxide
potassium oxide	magnesium oxide
nitrogen dioxide	sodium oxide
phosphorus oxide	sulfur dioxide

Which oxides are **not** in the correct list?

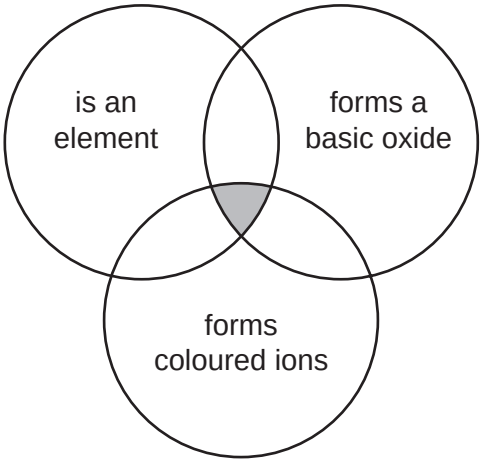
A carbon dioxide and sodium oxide

B potassium oxide and sulfur dioxide

C nitrogen dioxide and sulfur dioxide

D potassium oxide and calcium oxide

22 The diagram shows overlapping circles into which different chemical formulae can be placed.



Which formula can be placed in the shaded area because it has all three properties?

A Br_2 **B** CO **C** Cu **D** Na

23 Why are the elements in Group VIII of the Periodic Table unreactive?

A They are gaseous elements.

B They are monatomic elements.

C They have full inner shells of electrons.

D They have full outer shells of electrons.

24 Which metal **cannot** be extracted from its ore by heating with carbon?

A aluminium

B copper

C iron

D zinc

25 Four watch-glasses contain solid salts as shown.

blue copper(II) sulfate	white copper(II) sulfate	blue cobalt(II) chloride	pink cobalt(II) chloride

Water is added to each salt.

Which statement describes the salt solutions that form?

A They are blue or pink only.

B They are white or blue only.

C They are all pink.

D They are all blue.

26 Hydrocarbon X has two carbon atoms in each molecule. It does not decolourise bromine water.

Hydrocarbon Y has three carbon atoms in each molecule. It does decolourise bromine water.

What is the difference in the number of hydrogen atoms in the molecules of X and Y?

A 0 **B** 1 **C** 2 **D** 4

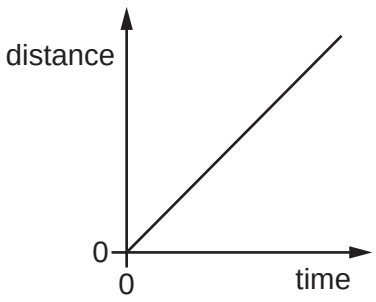
27 During fermentation, an organic liquid and a colourless gas are produced.

Which row identifies a use for the liquid and describes the result of a test on the colourless gas?

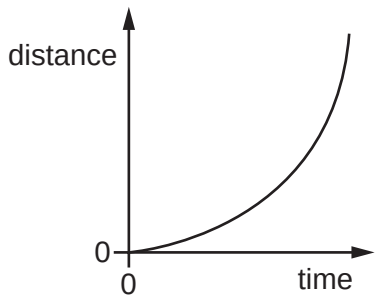
	use for the liquid	gas test result
A	monomer in addition polymerisation reactions	turns limewater milky
B	monomer in addition polymerisation reactions	relights glowing splint
C	solvent	turns limewater milky
D	solvent	relights glowing splint

28 Which diagram shows the distance–time graph for an object moving with constant speed?

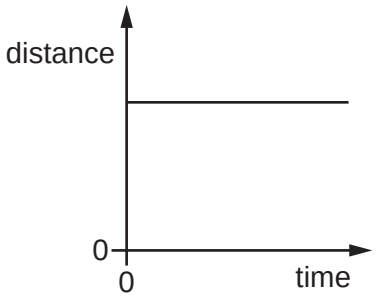
A



B



C



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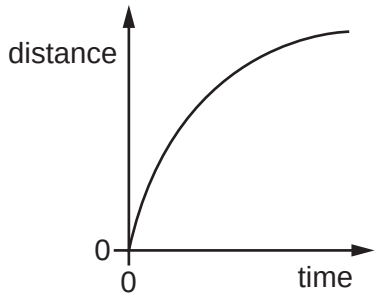
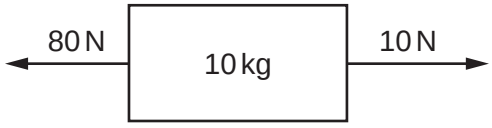


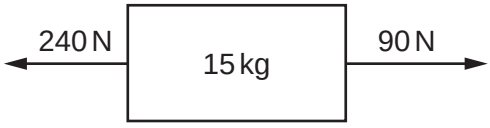
29 Four objects with different masses have different forces applied to them, as shown.

Which object has the greatest acceleration?

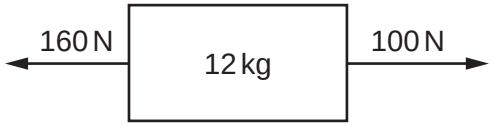
A



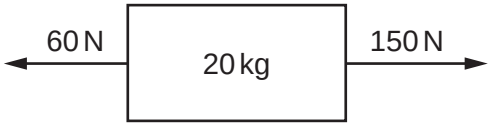
B



C



D



30 Which source of energy is non-renewable?

A chemical energy in a fossil fuel

B energy in tides

C geothermal energy

D wind energy

31 Some gas is put in a sealed metal container of constant volume.

The gas is now cooled.

What happens to the average speed of the gas molecules, and what happens to the pressure of the gas?

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

32 Four liquid-in-glass thermometers are made with different bulb sizes and different tube diameters.

Which thermometer is the most sensitive?

	bulb size	tube diameter
A	large	large
B	large	small
C	small	large
D	small	small

33 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?

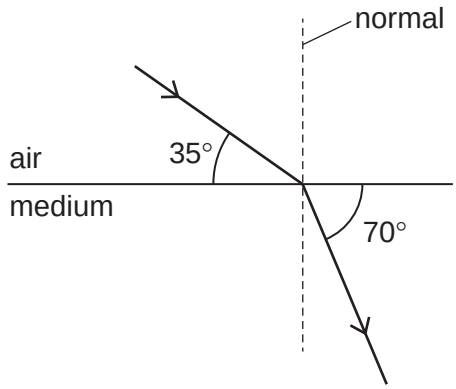
A the amplitude of the wave

B the frequency of the wave

C the speed of the wave

D the wavelength of the wave

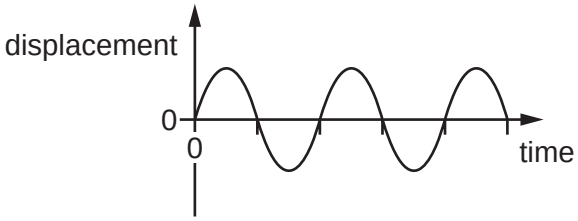
34 The diagram shows a ray of light passing from air into a transparent medium.



What is the refractive index of the medium?

A 0.50 **B** 0.61 **C** 2.4 **D** 2.8

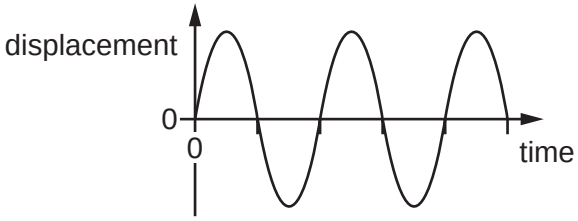
35 The diagram is a displacement–time graph for the molecules in air as a sound wave passes.



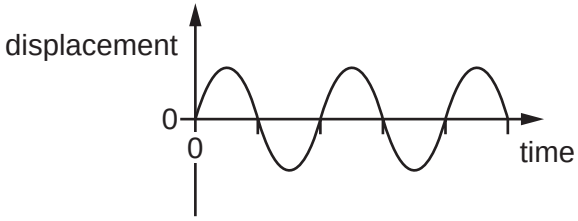
The graphs below are drawn to the same scale.

Which graph represents a quieter sound with a higher pitch?

A



B



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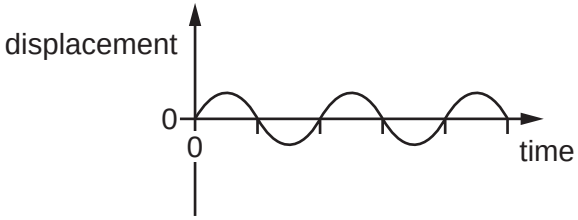

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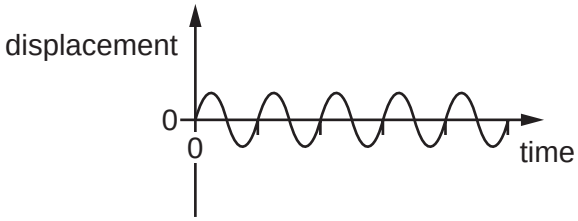


36 A wire of length l and cross-sectional area X has resistance R.

Which wire has resistance $4R$?

	length of wire	cross-sectional area of wire
A	$2l$	$2X$
B	$2l$	$\frac{1}{2}X$
C	$\frac{1}{2}l$	$2X$
D	$\frac{1}{2}l$	$\frac{1}{2}X$

37 There is a current of 3.0 A in a resistor. The potential difference across the resistor is 3.0 V.

How much electrical energy is transferred to other forms in 3.0 minutes?

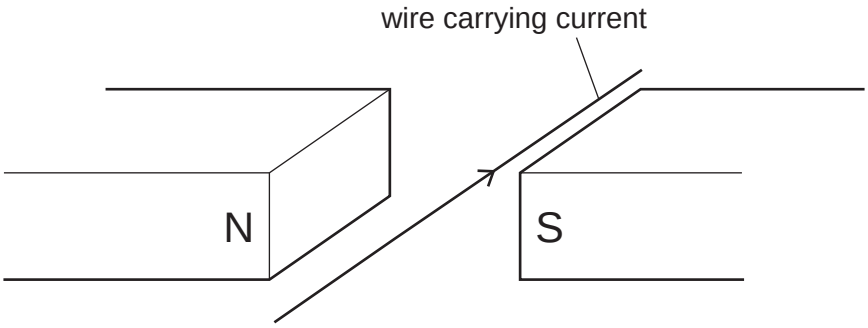
A 3.0 J **B** 9.0 J **C** 540 J **D** 1620 J

38 The current in an electric heater is 10 A when in normal use. The heater circuit contains a fuse.

What is the purpose of the fuse and what is a suitable rating for the fuse?

	purpose of fuse	suitable fuse rating / A
A	maintains a constant current	9
B	maintains a constant current	13
C	protects the circuit from the effects of overheating	9
D	protects the circuit from the effects of overheating	13

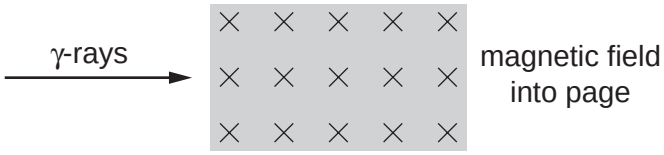
39 The diagram shows a wire carrying a current. The direction of the current is shown by the arrow. The wire lies in the magnetic field between two magnetic poles.



What is the direction of the magnetic field and what is the direction of the force on the wire?

	magnetic field	force on wire
A	to the left	downwards
B	to the left	upwards
C	to the right	downwards
D	to the right	upwards

40 The diagram shows γ-rays travelling in the direction shown. They enter a magnetic field that is directed into the page.



In which direction are the γ-rays deflected by the magnetic field, if at all?

A They are deflected out of the page.

B They are deflected towards the bottom of the page.

C They are deflected towards the top of the page.

D They are not deflected.

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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).