Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **October/November 2024**

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 **20** pages. Any blank pages are indicated.

1 Soya seeds contain a lot of protein and are often fed to farm animals.

Which characteristic of living things will benefit from the soya seeds?

A excretion

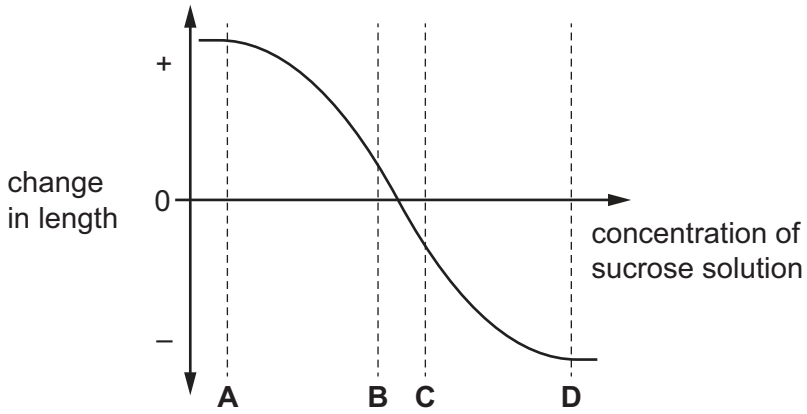
B growth

C movement

D sensitivity

2 Pieces of potato of the same length were placed in sucrose solutions of different concentrations. Their length was measured again after two hours.

At which sucrose concentration were the pieces of potato most flaccid?



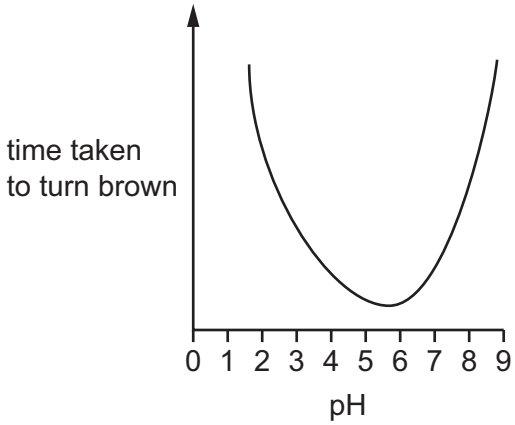
3 Four different foods labelled **A**, **B**, **C** and **D** are tested to find out which nutrients they contain.

Which food contains both starch and protein but **no** reducing sugar?

	final colour with Benedict's solution	final colour with biuret solution	final colour with iodine solution
A	blue	blue	orange
B	blue	purple	blue-black
C	red	blue	orange
D	red	purple	blue-black

4 When the phenol molecules in apples are exposed to air, they react with oxygen and the fruit turns brown. This is an enzyme-controlled reaction.

The graph shows the effect of pH on the time taken for pieces of apple to turn brown.



Which statements are correct?

1 The optimum pH for this enzyme is between 5 and 6.

2 As the pH increases from 3 to 5, the phenol molecules and the enzyme move faster.

3 As the pH becomes higher than 6, the shape of the active site changes.

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

5 What causes plant leaves to turn yellow?

A a lack of magnesium in the soil

B a lack of starch in the leaves

C a reduction in the rate of photosynthesis

D a reduction in the rate of respiration

6 Which component of a balanced diet is needed to prevent constipation?

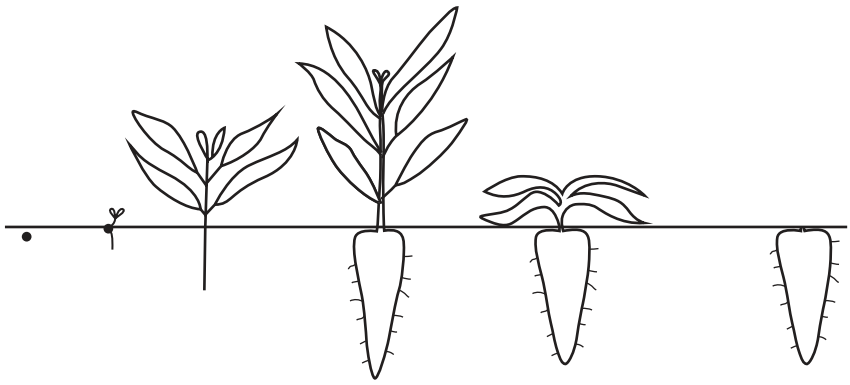
A carbohydrate

B fat

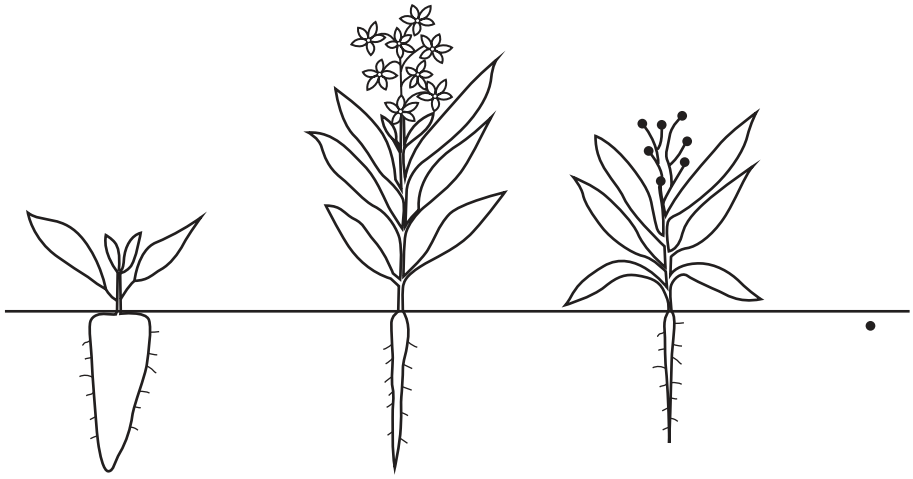
C protein

D fibre

7 The diagram shows the life cycle of a plant that takes two years to grow from a seed and produce new seeds.



year 1 spring summer autumn winter



year 2 spring summer autumn winter

Which row about the large root in year 1 and in year 2 is correct?

	in year 1 the root acts as a	in year 2 the root acts as a
A	sink	sink
B	sink	source
C	source	sink
D	source	source

8 Which equation shows the metabolic process used in bread making?

A carbon dioxide + water → glucose + oxygen

B glucose + oxygen → carbon dioxide + water

C glucose → ethanol + carbon dioxide

D glucose → lactic acid

9 What are examples of involuntary actions?

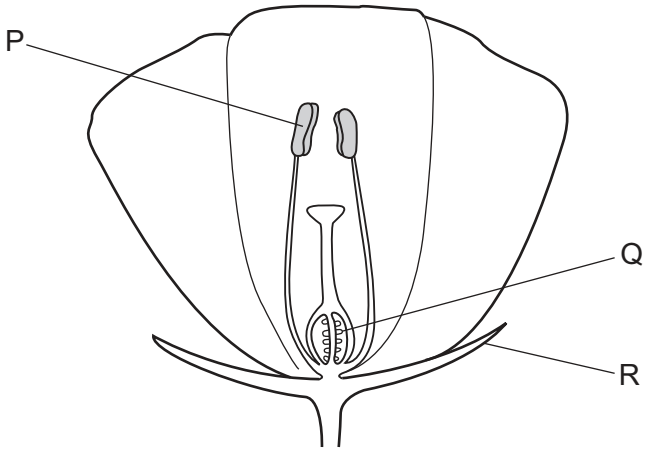
1 widening of the pupil in dim light

2 increasing the pulse rate during exercise

3 contracting muscles to pick up a pencil

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

10 The diagram shows a flower.



Which row names the structures labelled P, Q and R?

	P	Q	R
A	anther	ovary	sepal
B	anther	style	carpel
C	filament	ovary	carpel
D	filament	style	sepal

11 The boxes show the steps involved in artificial selection of an animal species.

identify offspring with desirable features	mate a male and a female with desirable features	mate male and female offspring with desirable features	humans select animals with desirable features
1	2	3	4

Which sequence of steps is correct?

A 2 → 1 → 4 → 3

B 2 → 4 → 3 → 1

C 4 → 3 → 2 → 1

D 4 → 2 → 1 → 3

12 Which statement about all food chains is correct?

A All the carnivores are producers.

B All the consumers are carnivores.

C All the herbivores are consumers.

D All the producers are herbivores.

13 The release of fertiliser into rivers and lakes causes eutrophication which can lead to the death of fish.

What causes the fish to die?

A Decreased photosynthesis by producers reduces the carbon dioxide.

B Increased photosynthesis by producers reduces the oxygen.

C Increased decomposition reduces the carbon dioxide.

D Increased decomposition reduces the oxygen.

14 The numbers of protons, neutrons and electrons in four particles are shown.

particle	number of protons	number of neutrons	number of electrons
W	20	20	20
X	19	20	19
Y	20	22	18
Z	21	24	21

Which two particles are isotopes of the same element?

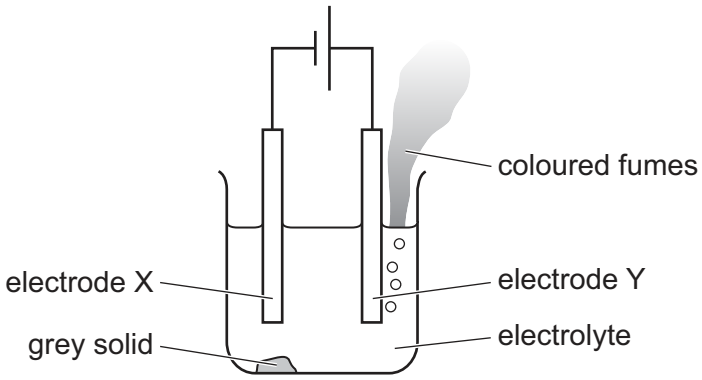
A W and X **B** W and Y **C** X and Y **D** Y and Z

15 A sample of methane has mass 16.0 g at r.t.p. and contains the Avogadro number of molecules.

What is the volume of 4.0 g of methane at r.t.p.?

A 4.0 dm^3 **B** 6.0 dm^3 **C** 16 dm^3 **D** 24 dm^3

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



Which statement about this experiment is correct?

A Electrode X is positively charged.

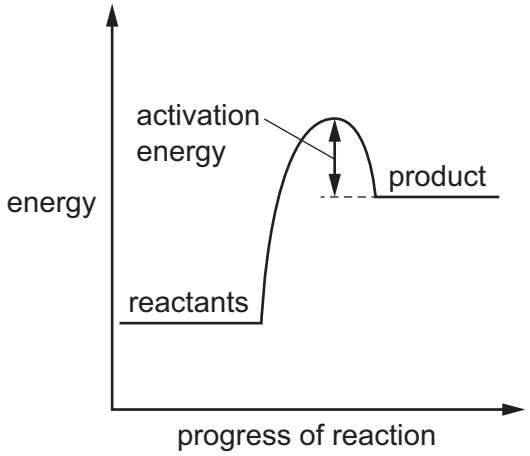
B The coloured fumes are produced at the negative electrode.

C The electrolyte is lead(II) bromide.

D The grey solid is lead(II) bromide.

17 Which energy level diagram shows the activation energy for an exothermic reaction?

A



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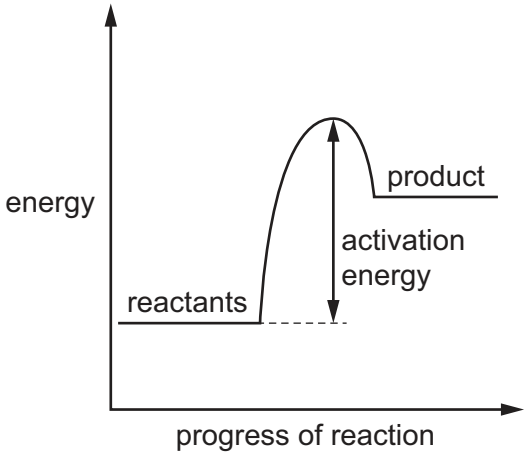
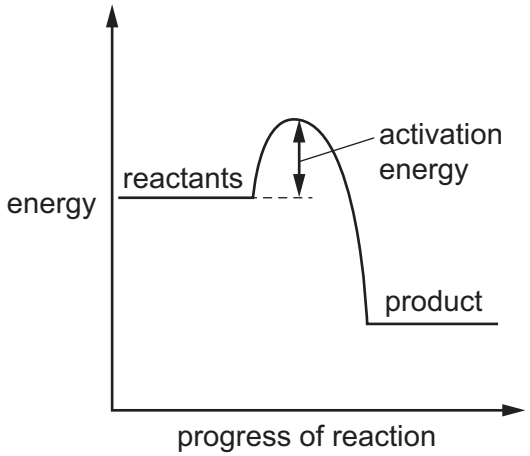
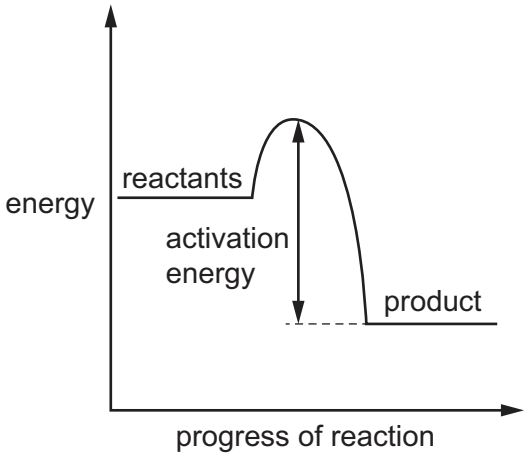


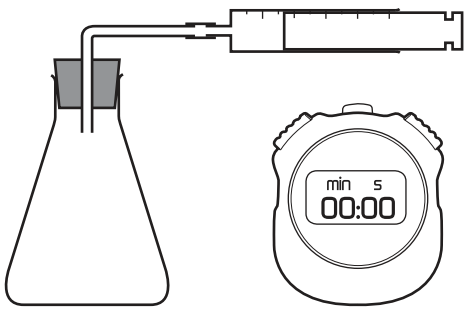
C



D



18 The apparatus used to determine the rate of a chemical reaction is shown.



For which reaction is the rate determined using this apparatus?

A $CaCO_3 \rightarrow CaO + CO_2$

B $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

C $MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$

D $Cl_2 + 2NaBr \rightarrow Br_2 + 2NaCl$

19 The equation for the reaction between magnesium and zinc sulfate is shown.

$$Mg + ZnSO_4 \rightarrow Zn + MgSO_4$$

What happens to magnesium in this reaction?

A It is oxidised because it gains electrons.

B It is oxidised because it loses electrons.

C It is reduced because it gains electrons.

D It is reduced because it loses electrons.

20 Cobalt(II) chloride, cobalt(II) nitrate, and cobalt(II) sulfate are soluble in water.

Cobalt(II) oxide and cobalt(II) carbonate are insoluble in water.

Which method can be used to prepare a sample of solid cobalt(II) sulfate?

A Mix aqueous sodium sulfate and aqueous cobalt(II) nitrate, then filter.

B Mix excess aqueous sulfuric acid and aqueous cobalt(II) chloride, then filter and evaporate the filtrate.

C Mix dilute sulfuric acid and an excess of cobalt(II) oxide, then distil.

D Mix dilute sulfuric acid and an excess of cobalt(II) carbonate, then filter and evaporate the filtrate.

21 What is warmed with a salt to test for ammonium ions?

A aqueous barium chloride

B aqueous litmus

C aqueous silver nitrate

D aqueous sodium hydroxide

22 Which statement about the halogens is **not** correct?

A Bromine is darker in colour than iodine.

B Iodine is solid at room temperature.

C They all have seven electrons in their outer shell.

D They all form diatomic molecules.

23 Which statement describes a typical transition element?

A It has a high melting point, high density and forms a coloured salt.

B It has a high melting point, low density and forms a white salt.

C It has a low melting point, low density and forms a coloured salt.

D It has a low melting point, high density and forms a white salt.

24 When iron is galvanised, it is coated with a layer of zinc.

Which statements about galvanising are correct?

1 Zinc has a greater tendency to form positive ions than iron.

2 Zinc prevents iron from rusting by sacrificial protection.

3 Iron is more reactive than zinc.

4 Zinc acts as a barrier method of rust prevention if scratched.

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

25 Which three elements do most fertilisers contain?

A Na, C, P **B** Na, P, K **C** K, C, N **D** K, P, N

26 Which reaction that occurs in the Contact process requires the use of a vanadium(V) oxide catalyst?

A $S + O_2 \rightarrow SO_2$

B $2SO_2 + O_2 \rightarrow 2SO_3$

C $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

D $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

27 Reactants for three chemical processes are listed.

1 ethene + steam

2 ethene + hydrogen

3 ethene forming poly(ethene)

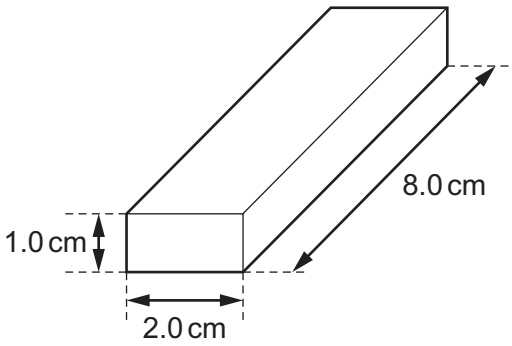
Which processes form saturated hydrocarbons?

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

28 The diagrams show four solid blocks of equal mass.

Which block is made from the **least** dense material?

A



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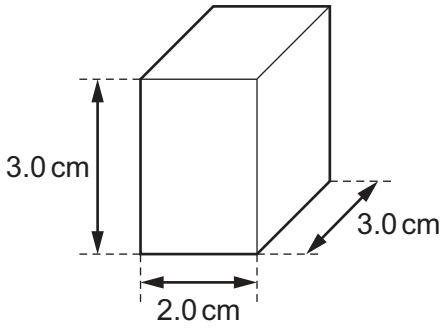

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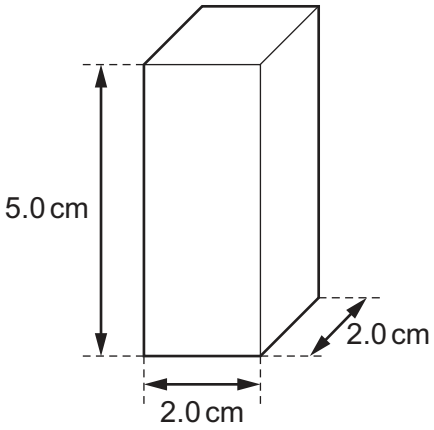

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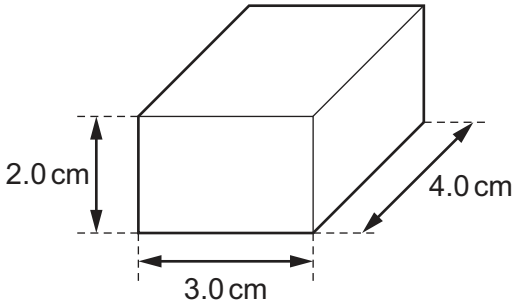
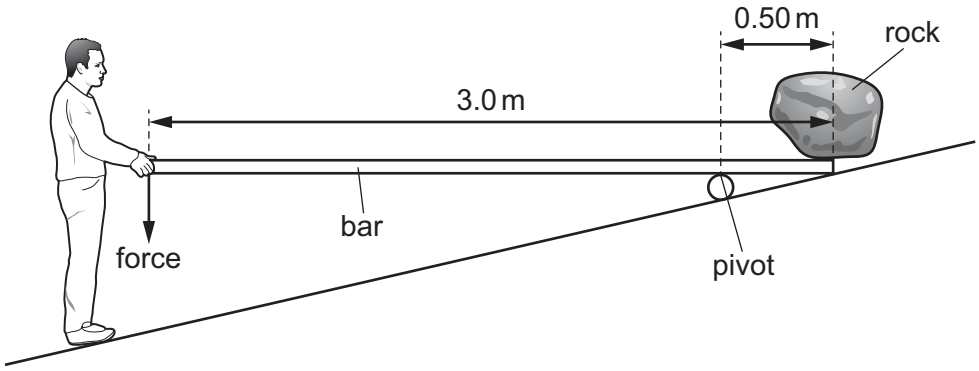


29 A person uses a bar that is 3.0 m long to lift a rock of weight 900 N off the ground. There is a pivot under the bar at 0.50 m from the rock.

The person pushes vertically downwards on the other end of the bar from the rock, as shown.



Ignore the weight of the bar.

What is the minimum force needed to lift the rock off the ground?

A 150 N **B** 180 N **C** 4500 N **D** 5400 N

30 Which energy resource does **not** have the Sun as its source of energy?

A coal

B geothermal

C hydroelectric

D water waves

31 A sample of gas is sealed inside a container.

The volume of the container is slowly decreased. The temperature of the gas remains constant.

Which row describes and explains what happens to the pressure of the gas?

	description	explanation
A	pressure decreases	molecules collide with the container at lower speed
B	pressure decreases	molecules collide with the container less frequently
C	pressure increases	molecules collide with the container at greater speed
D	pressure increases	molecules collide with the container more frequently

32 There is a vacuum in the space between the Sun and the Earth.

How is thermal energy transferred from the Sun to the Earth?

A by conduction only

B by convection only

C by radiation only

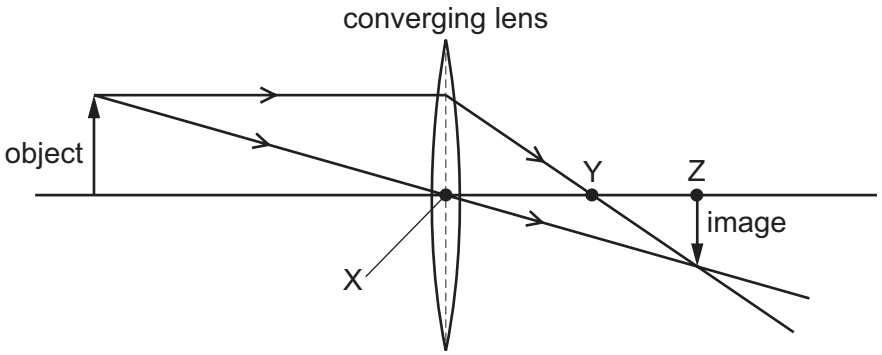
D by convection and radiation

33 A light wave travelling in air is refracted as it enters a glass block.

Which row shows the effect on the speed and the wavelength of the light wave as it enters the glass?

	speed	wavelength
A	decreases	decreases
B	decreases	no change
C	increases	increases
D	increases	no change

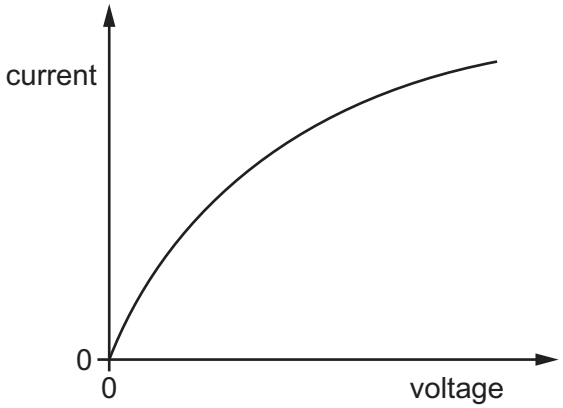
34 The diagram shows the formation of an image of an object by a converging lens. Three points are labelled X, Y and Z.



Which labelled point is a principal focus of the lens and which distance is the focal length?

	principal focus	focal length
A	Y	XY
B	Y	XZ
C	Z	XY
D	Z	XZ

35 The current–voltage characteristic for a filament lamp is shown.



As the current increases, what happens to the temperature of the lamp filament and what happens to the resistance of the lamp filament?

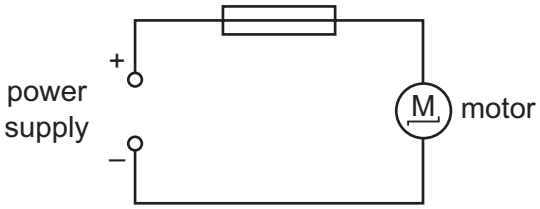
	temperature of lamp filament	resistance of lamp filament
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

36 A 12 Ω resistor is connected in parallel with a 6.0 Ω resistor.

What is the combined resistance of the two resistors?

A 0.25 Ω **B** 4.0 Ω **C** 9.0 Ω **D** 18 Ω

37 An electric motor is connected to a power supply by insulated wires. The circuit is protected by a fuse, but the wires become hot.



Which change prevents the wires from becoming so hot?

A Connect a second identical fuse in the circuit.

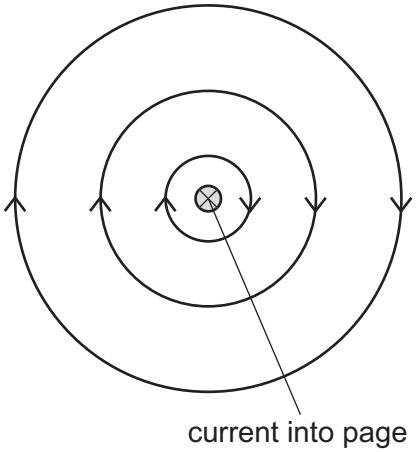
B Use a fuse with a higher current rating.

C Use thicker connecting wires.

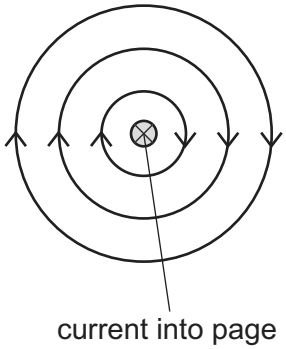
D Use thicker insulation on the connecting wires.

38 Which diagram shows the pattern and the direction of the magnetic field around a straight wire carrying a current into the page?

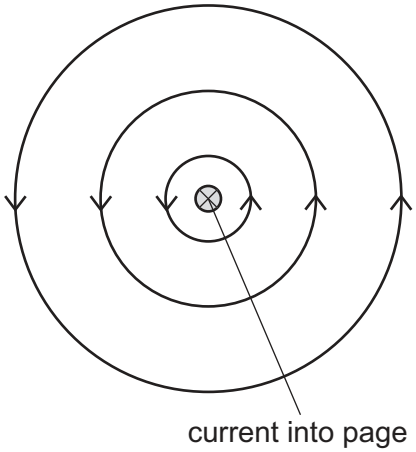
A



B



C



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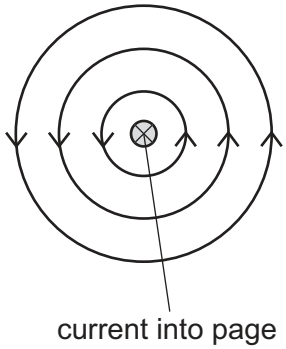


39 What is the purpose of the slip rings in an alternating current (a.c.) generator?

A to allow each end of the coil to contact each carbon brush alternately

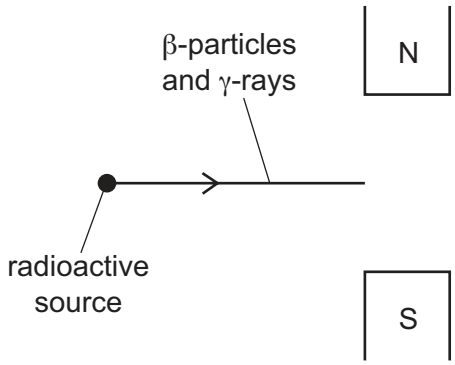
B to allow each end of the coil to remain in contact with the same carbon brush at all times

C to maintain a constant voltage in the output circuit while the coil is rotating

D to remain stationary while the coil rotates between them

40 A radioactive source emits beta (β)-particles and gamma (γ)-rays.

Both types of radiation enter the magnetic field between the poles of a magnet, as shown.



In which direction does each type of radiation travel after entering the magnetic field?

	β-particles	γ-rays
A	into the page	into the page
B	into the page	straight on
C	out of the page	into the page
D	out of the page	straight on

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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.).