Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **May/June 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 **16** pages.

[Turn over

1 Which processes are examples of excretion?

	release of energy from food	release of oxygen from photosynthesis
A	✗	✗
B	✗	✓
C	✓	✗
D	✓	✓

key

✓ = yes

✗ = no

2 What are all living organisms made from?

A cells

B eggs

C mesophyll

D sperm

3 Analysis of a large food molecule shows that it contains the elements carbon, hydrogen and oxygen only.

Which food groups could this molecule be from?

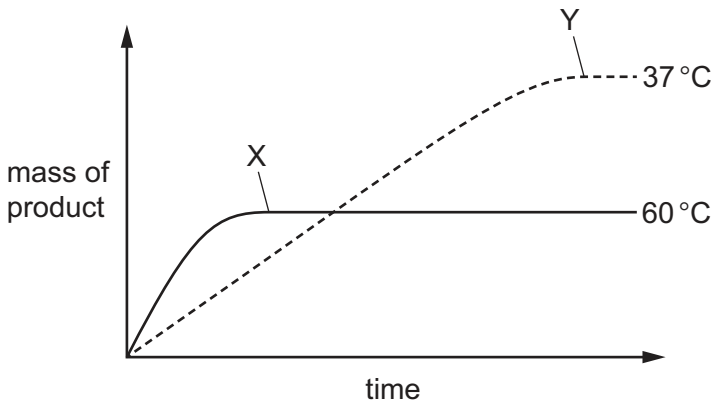
A carbohydrates and fats only

B carbohydrates and proteins only

C fats and proteins only

D carbohydrates, fats and proteins

4 The graph shows the mass of product produced by an enzyme-controlled reaction over time when the reaction mixture is placed separately at 37 °C and at 60 °C. The starting concentration of the substrate and the concentration of the enzyme used are kept constant.



What can be concluded from the graph?

A At point X on the graph, the enzyme has run out of substrate.

B The enzyme denatures at point Y on the graph.

C The reaction mixture has a higher kinetic energy at 37 °C.

D The reaction mixture has a higher initial rate of reaction when placed at 60 °C.

5 How many molecules of carbon dioxide are needed to produce six molecules of glucose?

A 1 **B** 2 **C** 3 **D** 36

6 A student investigates the effect of size of gelatine cubes on the rate of digestion by protease.

The student places a cube of gelatine with a volume of 8 cm^3 into a beaker of protease. The time taken for the cube to be digested is recorded.

A second 8 cm^3 cube of gelatine is cut up into eight 1 cm^3 cubes to represent mechanical digestion and the experiment is repeated.

The results are shown.

gelatine	time taken to digest the gelatine / minutes
one 8 cm^3 cube	320
eight 1 cm^3 cubes	80

Which statements are correct?

1 Cutting up the 8 cm^3 cube increases the surface area exposed to the enzyme.

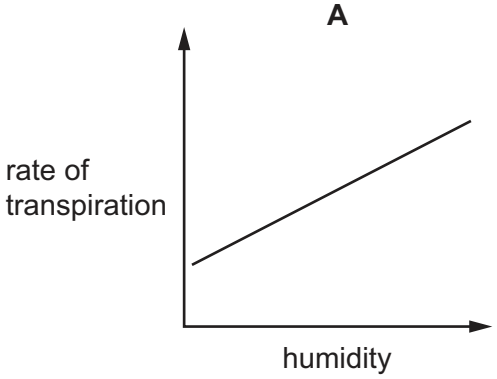
2 Chemical digestion cannot occur unless mechanical digestion also occurs.

3 Mechanical digestion increases the rate of chemical digestion.

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

7 Which graph shows the effect of humidity on the rate of transpiration?

A



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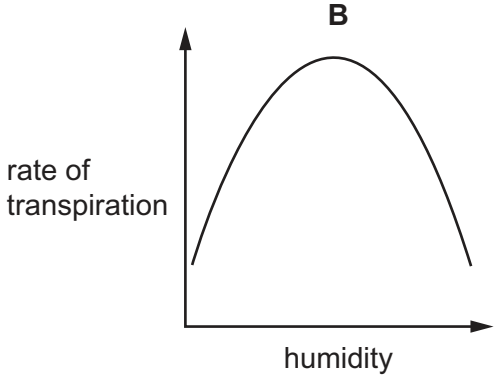

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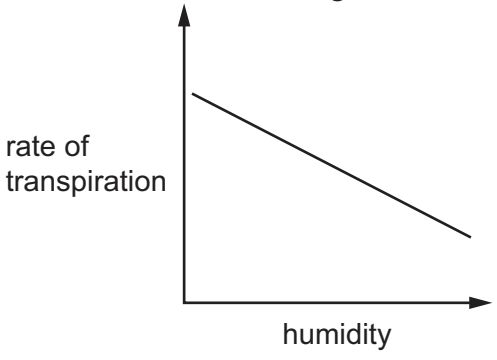

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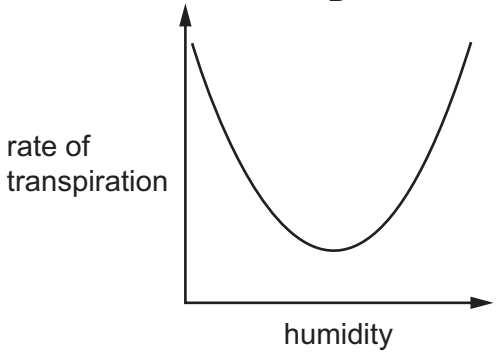
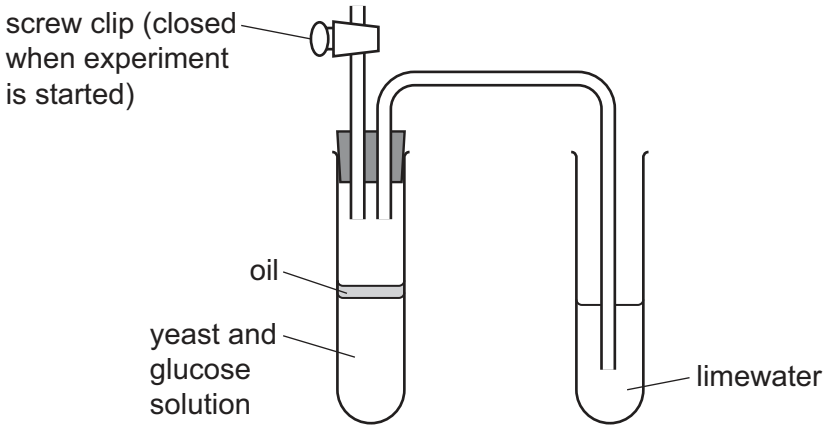


8 A student places a mixture of yeast and glucose in a boiling tube, as shown in the diagram.

They cover the mixture with a layer of oil.

A delivery tube is used to bubble gas produced by the yeast through limewater.

After 10 minutes, the limewater is milky.



Why does the limewater go milky?

A The yeast produces carbon dioxide by anaerobic respiration.

B The yeast produces lactic acid by anaerobic respiration.

C The yeast produces carbon dioxide by photosynthesis.

D The yeast produces oxygen by aerobic respiration.

9 A person touches a hot object and pulls their hand away. This is a reflex action.

What is the pathway for the reflex action?

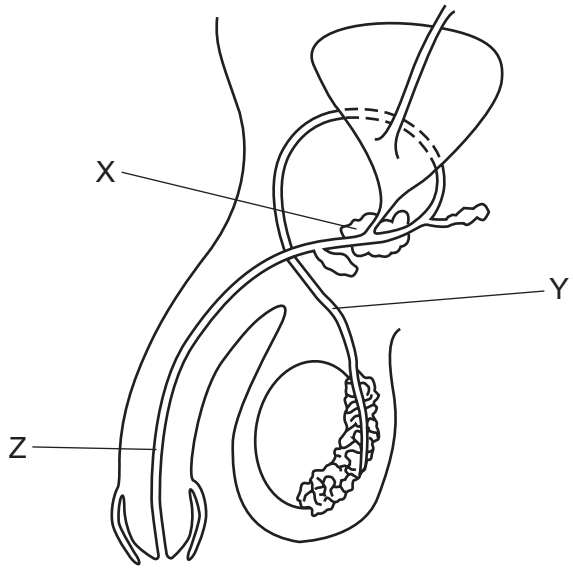
A stimulus → motor neurone → relay neurone → sensory neurone → response

B stimulus → relay neurone → motor neurone → sensory neurone → response

C stimulus → sensory neurone → relay neurone → motor neurone → response

D stimulus → sensory neurone → motor neurone → relay neurone → response

10 The diagram shows the human male reproductive system.



Which row identifies structures X, Y and Z?

	urethra	sperm duct	prostate gland
A	X	Y	Z
B	X	Z	Y
C	Z	X	Y
D	Z	Y	X

11 Which row about the nucleus of human cells is correct?

	description of nucleus	number of chromosomes	example of cell
A	diploid	23	gamete
B	diploid	46	body
C	haploid	23	body
D	haploid	46	gamete

12 What is an ecosystem?

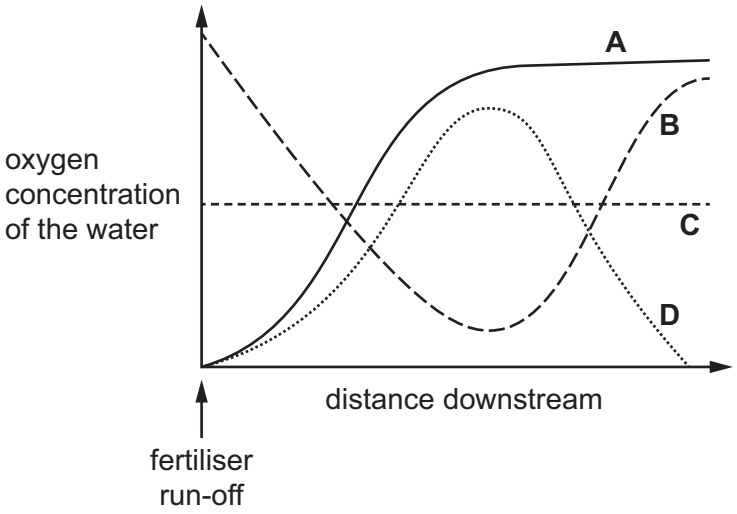
A a chart showing the flow of energy from one organism to another

B a diagram giving the energy level of an organism in its environment

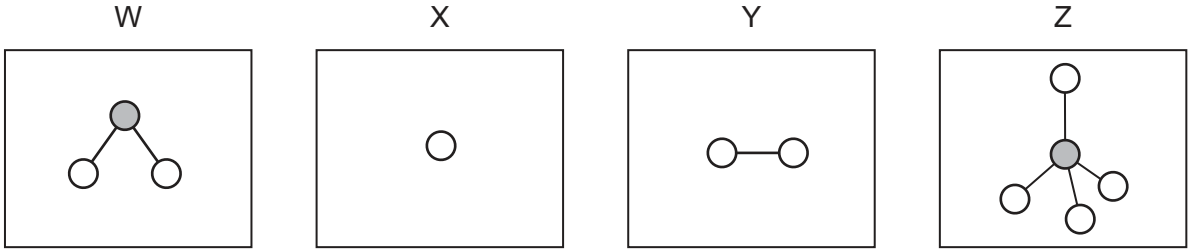
C a network of interconnected food chains

D a unit containing all of the organisms and their environment

13 Which line shows how the oxygen concentration of the water changes after excess fertiliser has entered a stream?



14 W, X, Y and Z are diagrams representing atoms and molecules.



Which statement is correct?

A W and Z are molecules and X and Y are atoms.

B W, X and Z are molecules and Y is an atom.

C W, Y and Z are molecules and X is an atom.

D X, Y and Z are molecules and W is an atom.

15 Which row describes the properties of a covalent compound?

	volatility	electrical conductivity when molten
A	high	none
B	high	high
C	low	none
D	low	high

16 The equation for the reaction of sodium with water is shown.

$$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$$

Which mass of sodium produces 30 cm^3 of hydrogen?

A 0.0288 g **B** 0.0575 g **C** 28.8 g **D** 57.5 g

17 Aqueous copper(II) sulfate is electrolysed using carbon electrodes.

What is the ionic half-equation for the reaction at the cathode?

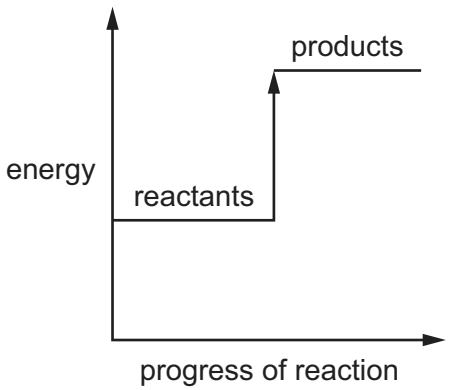
A $Cu^{2+} + 2e^- \rightarrow Cu$

B $2H^+ + 2e^- \rightarrow H_2$

C $Cu \rightarrow Cu^{2+} + 2e^-$

D $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$

18 The energy level diagram for a reaction is shown.



The diagram represents an .....1..... reaction. Heat is .....2..... during this reaction.

Which words complete gaps 1 and 2?

	1	2
A	endothermic	given out
B	endothermic	taken in
C	exothermic	given out
D	exothermic	taken in

19 In which equation is the underlined substance acting as an oxidising agent?

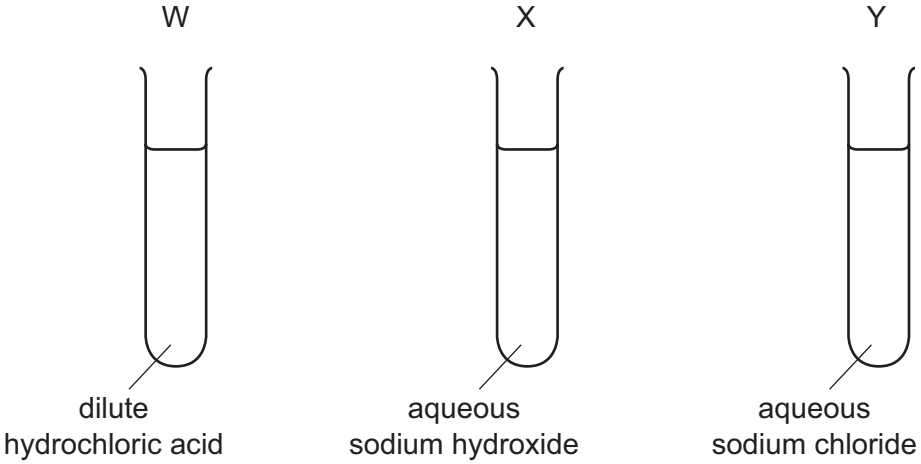
A $AgNO_3 + \underline{NaCl} \rightarrow AgCl + NaNO_3$

B $Cl_2 + \underline{2KBr} \rightarrow Br_2 + 2KCl$

C $Fe_2O_3 + \underline{3CO} \rightarrow 2Fe + 3CO_2$

D $H_2 + \underline{PbO} \rightarrow Pb + H_2O$

20 Universal indicator solution is added to test-tubes W, X and Y.



What are the colours of the universal indicator?

	in test-tube W	in test-tube X	in test-tube Y
A	green	red	purple
B	purple	green	red
C	red	green	purple
D	red	purple	green

21 Copper is a transition element.

Which row shows two properties of copper?

	property 1	property 2
A	high melting point	forms coloured compounds
B	high melting point	forms white compounds
C	low melting point	forms coloured compounds
D	low melting point	forms white compounds

22 Metal X reacts with aqueous metal Y^{2+} ions.

The ionic equation for the reaction is shown.

$$X + Y^{2+} \rightarrow X^{2+} + Y$$

What are metals X and Y?

	X	Y
A	copper	iron
B	copper	zinc
C	zinc	copper
D	aluminium	iron

23 Ammonia is displaced from its salts by reaction with substance Z.

Which row identifies substance Z and the test for ammonia?

	substance Z	test for ammonia
A	hydrochloric acid	turns red litmus blue
B	hydrochloric acid	turns blue litmus red
C	sodium hydroxide	turns red litmus blue
D	sodium hydroxide	turns blue litmus red

24 Four equations are listed.

1 $H_2S_2O_7 + H_2O \rightarrow H_2SO_4 + SO_3 + H_2O$

2 $2S + 3O_2 \rightarrow 2SO_3$

3 $H_2SO_4 + SO_3 \rightarrow H_2S_2O_7$

4 $2SO_2 + O_2 \rightarrow 2SO_3$

Which equations represent reactions that are involved in the Contact process?

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

25 Which substance is produced by the thermal decomposition of limestone?

A calcium

B calcium carbonate

C calcium hydroxide

D calcium oxide

26 A gasoline fraction from the fractional distillation of petroleum includes compounds with the formulas C_6H_{14} and $C_{12}H_{26}$.

Which statements about these compounds are correct?

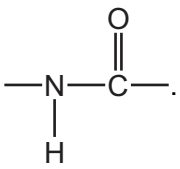
1 $C_{12}H_{26}$ has a higher boiling point than C_6H_{14}.

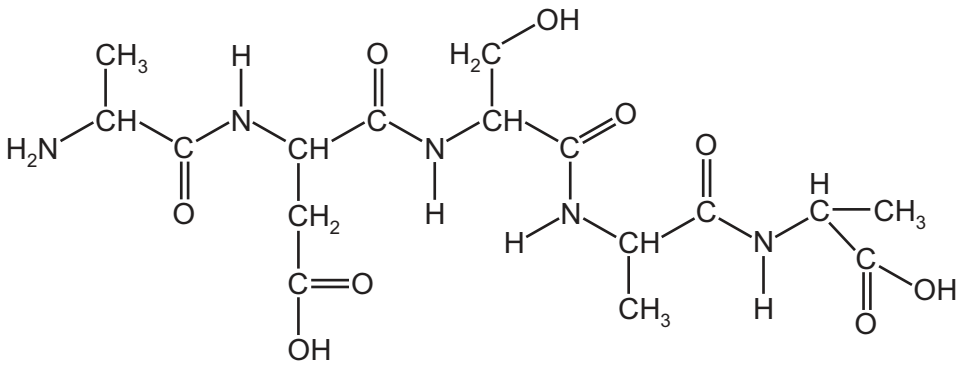
2 $C_{12}H_{26}$ has a lower relative molecular mass than C_6H_{14}.

3 C_6H_{14} and $C_{12}H_{26}$ are members of different homologous series.

4 C_6H_{14} and $C_{12}H_{26}$ both undergo complete combustion to form carbon dioxide and water.

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

27 The molecule shown contains some amide linkages,  .



How many amide linkages are present in this molecule?

A 4 **B** 5 **C** 6 **D** 9

28 A ball is moving at a speed of 3.0 m / s.

The ball now accelerates with a constant acceleration of 2.0 m / s^2 in the direction that it is moving.

What is the speed of the ball 5.0 s after it begins to accelerate?

A 10 m / s **B** 13 m / s **C** 17 m / s **D** 30 m / s

29 What is meant by the moment of a force?

A the speed of an object moved by a force

B the time taken for a force to move an object

C the turning effect of a force

D the work done by a force

30 A paralympic athlete of mass 70 kg uses a wheelchair of mass 10 kg in a race.

What is the kinetic energy of the athlete and wheelchair when they are moving at 6.0 m / s?

A 240 J **B** 480 J **C** 1440 J **D** 2880 J

31 The table shows four sources of energy used to generate electricity.

Which row about the energy source is correct?

	source	renewable	reliable at all times
A	coal	yes	no
B	nuclear fission	no	yes
C	tides	no	no
D	wind	yes	yes

32 Which region of the electromagnetic spectrum is often involved in heat transfer by radiation?

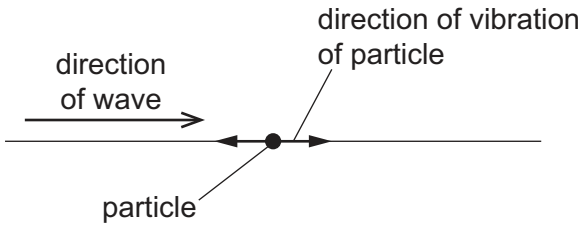
A infrared

B radio

C ultraviolet

D X-rays

33 The diagram shows the direction of a wave that passes a particle. The particle is made to vibrate by the wave. The direction of vibration of the particle is shown.



Which row states the type of wave that passes the particle and gives an example of this type of wave?

	type of wave	example
A	longitudinal	light
B	longitudinal	sound
C	transverse	light
D	transverse	sound

34 A plane mirror is fixed to a vertical wall and forms an image of an object.

What are the characteristics of the image?

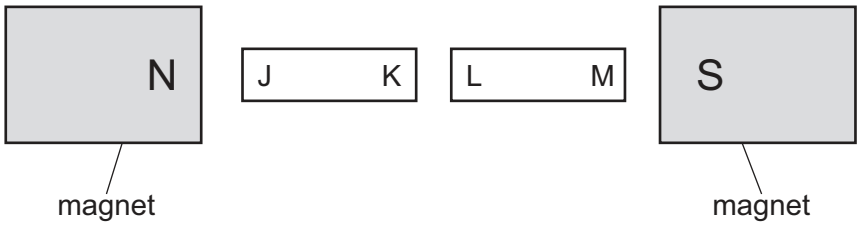
A enlarged and upright

B enlarged and inverted

C same size as the object and upright

D same size as the object and inverted

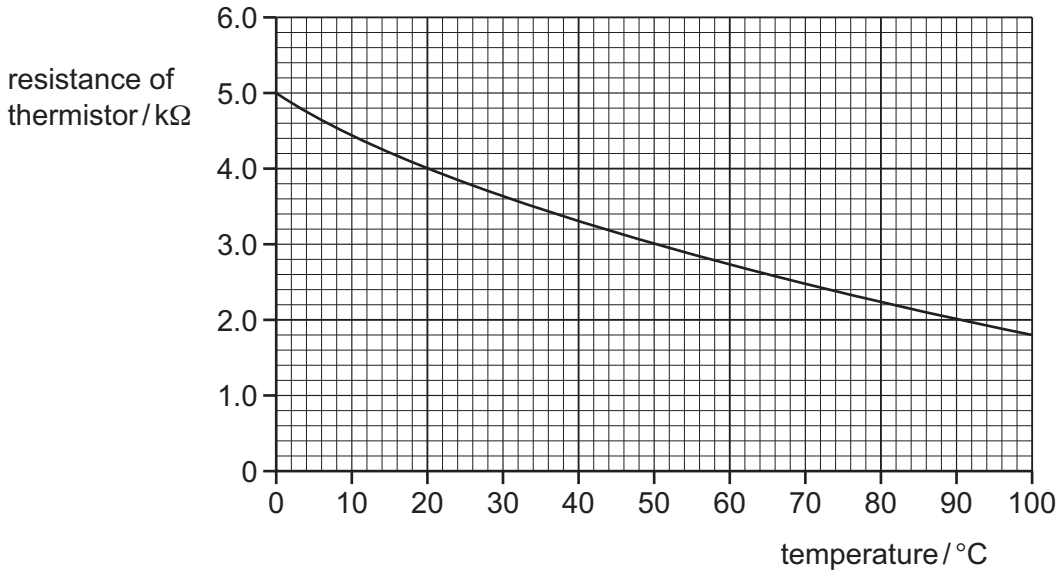
35 The diagram shows two soft-iron rods JK and LM placed between the poles of two magnets.



Which row shows the poles induced in the soft-iron rods?

	at J	at K	at L	at M
A	N	N	S	S
B	N	S	N	S
C	S	S	N	N
D	S	N	S	N

36 The graph shows how the resistance of a thermistor changes with temperature.



There is a potential difference (p.d.) of 6.0 V across the thermistor.

What is the current in the thermistor when it is at a temperature of 50 °C?

A 0.0020 A **B** 0.50 A **C** 2.0 A **D** 500 A

37 A kettle is connected to a 230 V mains supply. The current in the kettle is 10 A.

How much energy is transferred in 3.0 minutes?

A 12.8 J **B** 767 J **C** 6900 J **D** 414 000 J

38 What is the function of a fuse in a circuit?

A It decreases the resistance of the circuit.

B It ensures a constant current in the circuit.

C It ensures a constant resistance in the circuit.

D It prevents the cables from overheating.

39 What is the purpose of the commutator in a direct current (d.c.) motor?

A It reverses the direction of the current in the coil every half turn.

B It reverses the direction of rotation of the coil every complete turn.

C It reverses the direction of rotation of the coil every half turn.

D It reverses the magnetic field due to the permanent magnet every complete turn.

40 A uranium nucleus decays by emitting an alpha (α)-particle. The nuclide equation shows this decay.

$$^{X}_{92}\text{U} \rightarrow {}^{234}_{Y}\text{Th} + \alpha\text{-particle}$$

What are the numbers *X* and *Y*?

	X	*Y*
A	234	90
B	234	92
C	238	90
D	238	92

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.).