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CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **May/June 2026**

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 or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m / s^2).

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.

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1 A plant is placed in front of a light source. After 24 hours, all of the plant's leaves face the light.

Which characteristics are displayed by this plant?

1 a permanent increase in size and dry mass

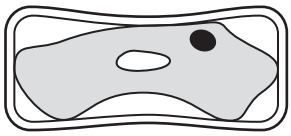
2 an action by part of an organism that causes a change of position

3 the ability to detect stimuli in the internal or external environment

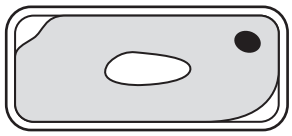
A 1 and 2 **B** 1 only **C** 2 and 3 **D** 3 only

2 Which cell is most flaccid?

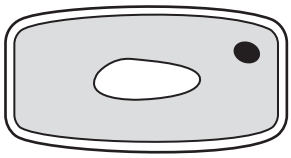
A



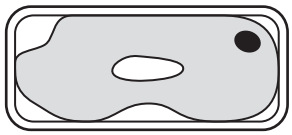
B



C



D



3 Which molecule is made from glucose?

A amylase

B fat

C glycogen

D protein

4 Which statement explains why enzyme activity stops at high temperatures?

A The enzyme's active site changes shape so the product **cannot** fit.

B The enzyme's active site changes shape so the substrate **cannot** fit.

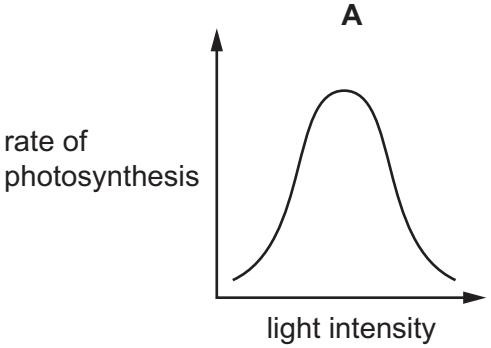
C The molecules are moving more quickly and so enzyme and substrate are less likely to collide.

D The molecules are moving more slowly and so enzyme and substrate are more likely to collide.

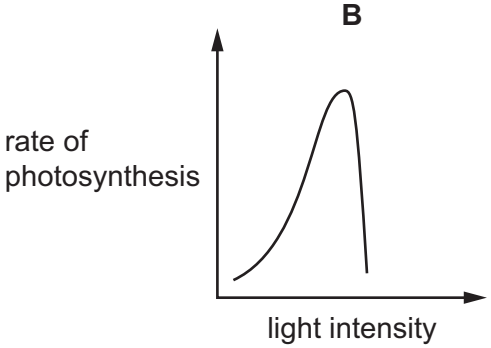
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5 Which graph shows the effect of increasing light intensity on the rate of photosynthesis?

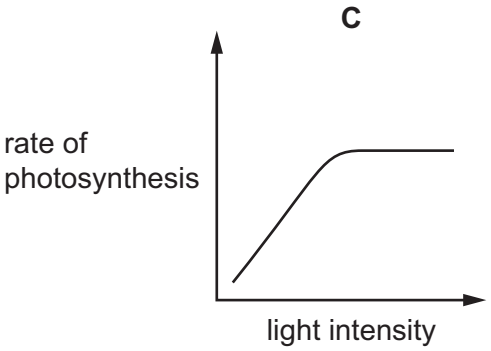
A



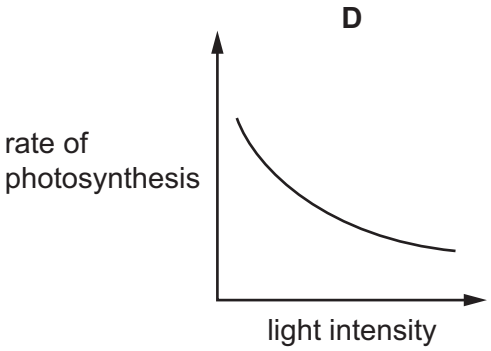
B



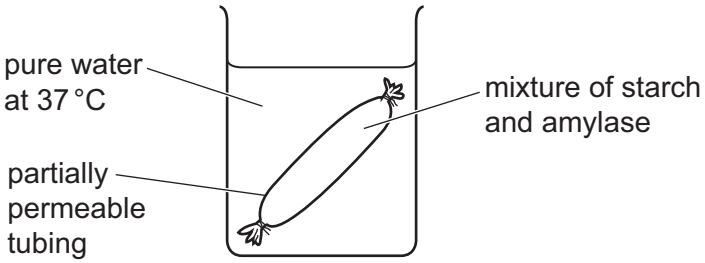
C



D



6 Some partially permeable tubing contains a mixture of starch and amylase. The tubing is placed in a beaker of pure water at 37 °C.



After 30 minutes, the contents of the tubing and the beaker both contain reducing sugar.

Which statement explains these observations?

A The starch has been physically broken down into insoluble glucose.

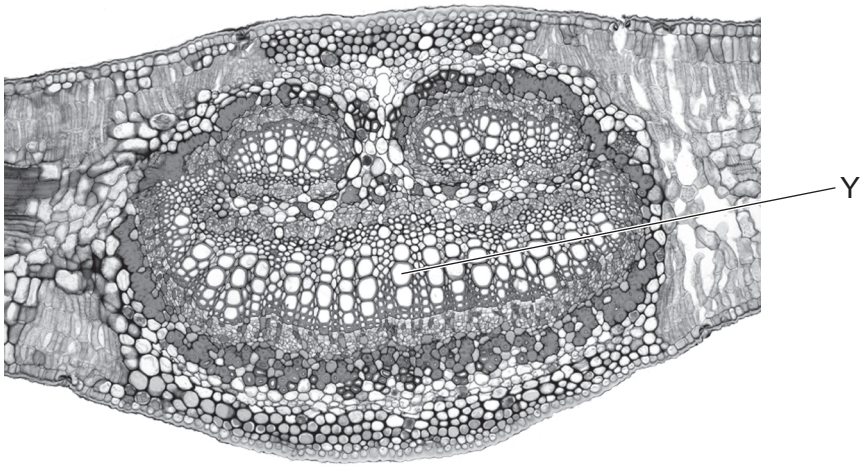
B The starch has been physically broken down into soluble glucose.

C The starch has been chemically broken down into insoluble glucose.

D The starch has been chemically broken down into soluble glucose.

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7 The light micrograph shows a cross-section through part of a leaf.



What is the name and contents of structure Y?

A phloem containing sucrose

B phloem containing water

C xylem containing sucrose

D xylem containing water

8 Which statement about capillaries is correct?

A They connect arteries to the heart.

B The walls are one cell thick to give a short diffusion distance.

C They have muscles to push blood towards the heart.

D They have valves to prevent the backflow of blood.

9 Which statement describes why antibodies are specific?

A Antibodies have a part that is a complementary shape to the antigen.

B Antibodies have an active site that is the same shape as the antigen.

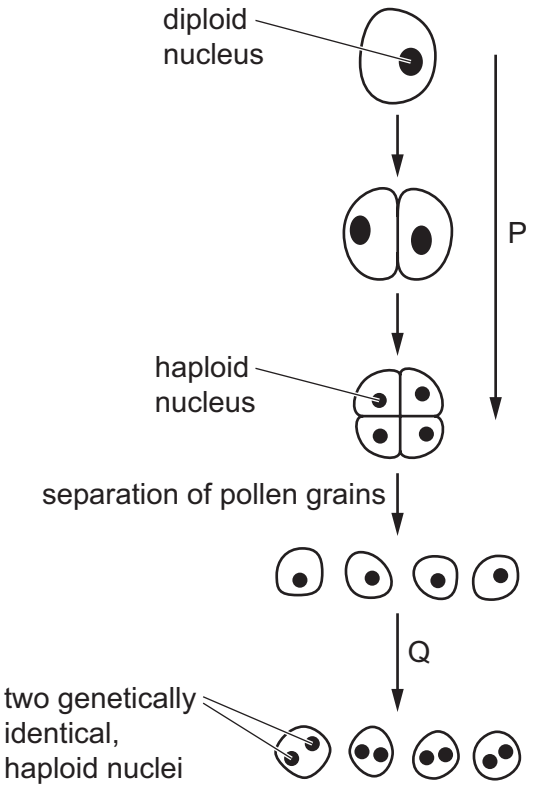
C Antigens have an active site that fits the shape of the antibody.

D Antigens and antibodies are the same shape.

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10 The diagram shows how pollen grains are produced.

Mature pollen grains contain two haploid nuclei.



Which row identifies the types of cell division shown at stages P and Q?

	P	Q
A	meiosis	meiosis
B	meiosis	mitosis
C	mitosis	meiosis
D	mitosis	mitosis

11 Which statement explains why the overuse of antibiotics increases the risk of resistant bacteria developing?

A Bacteria are more likely to become immune to antibiotics if antibiotics are used more often.

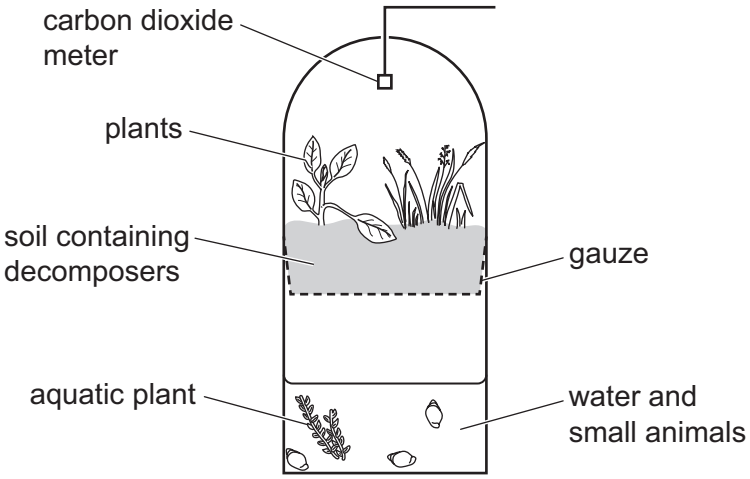
B Non-resistant bacteria are more likely to reproduce when antibiotics are used more often.

C Increased use of antibiotics causes bacteria to develop a mutation for resistance.

D Increased use of antibiotics kills non-resistant bacteria, reducing competition for resources for resistant bacteria.

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12 Some students investigate the carbon cycle using a sealed bottle garden. The bottle garden contains a meter to measure carbon dioxide gas.



After two weeks, the carbon dioxide concentration in the bottle garden increases.

What causes this increase in carbon dioxide concentration?

1 decomposition

2 photosynthesis

3 respiration

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

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13 The photograph shows an endangered animal called a Sunda pangolin.



Which row shows methods to help conserve the Sunda pangolin?

	captive breeding programmes	education of people	protecting the habitat
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

14 Which elements react to form an ionic compound?

A carbon and hydrogen

B fluorine and potassium

C chlorine and hydrogen

D hydrogen and nitrogen

15 Which statement explains why diamonds are used to make cutting tools?

A Diamond is a giant covalent structure.

B Diamond is a pure substance made only from carbon atoms.

C The carbon atoms in diamond are arranged in layers.

D The carbon atoms in diamond are held together by strong covalent bonds.

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16 Which sample of gas contains the most molecules?

A 2 g of hydrogen, H_2

B 48 g of oxygen, O_2

C 56 g of nitrogen, N_2

D 64 g of sulfur dioxide, SO_2

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

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

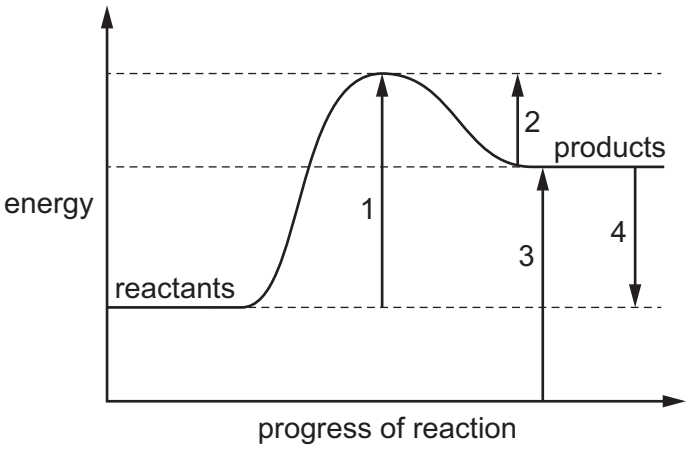
A $2H^+(aq) + 2e^- \rightarrow H_2(g)$

B $4OH^-(aq) \rightarrow O_2(g) + 2H_2O(l) + 4e^-$

C $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$

D $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

18 Which statement describes the effect of a catalyst on an energy change shown in the reaction pathway diagram?



A A catalyst decreases the energy change labelled 1.

B A catalyst increases the energy change labelled 2.

C A catalyst decreases the energy change labelled 3.

D A catalyst increases the energy change labelled 4.

19 Which process is a physical change?

A Molecules of a single substance join together to make new molecules.

B Monomer molecules form a polymer.

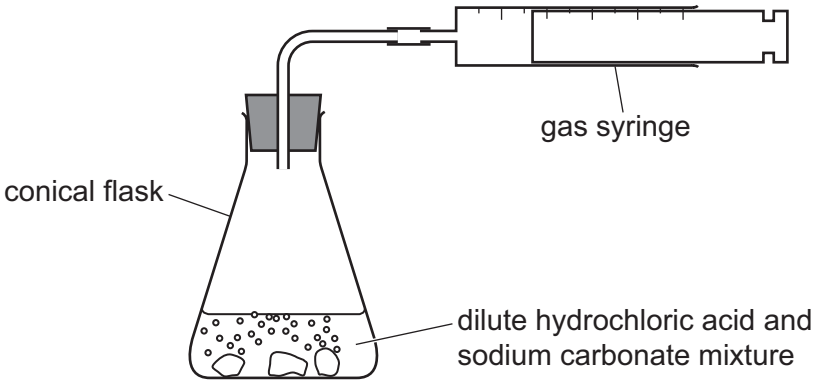
C Molecules of a substance separate from each other.

D Solid calcium carbonate decomposes to give carbon dioxide gas.

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20 When 50 cm^3 of dilute hydrochloric acid and excess solid sodium carbonate are mixed, they react to form carbon dioxide gas.

The gas is collected in a gas syringe as shown.



The experiment is repeated using 25 cm^3 of the same concentration of dilute hydrochloric acid.

Which statement about the second experiment compared to the first experiment is correct?

A It has the same initial rate of reaction and produces a lower volume of gas.

B It has the same initial rate of reaction and produces the same volume of gas.

C It has a lower initial rate of reaction and produces a lower volume of gas.

D It has a lower initial rate of reaction and produces the same volume of gas.

21 Which statement about methods involved in preparing and purifying salts is correct?

A Crystals of a pure salt are formed when a hot saturated solution of the salt is cooled.

B Fractional distillation is used to separate different salts from a mixture of salts.

C Hydrated copper(II) sulfate is prepared by heating aqueous copper(II) sulfate to dryness.

D Pure copper(II) chloride is formed by reacting copper(II) oxide with excess dilute hydrochloric acid.

22 Which row shows how the properties of the elements in Group I of the Periodic Table change going down the group?

	melting point	**density**
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

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23 Which statement about the halogens is correct?

A Chlorine is produced when aqueous iodine is added to aqueous sodium chloride.

B Iodine is produced when aqueous bromine is added to aqueous sodium iodide.

C The halogens become more reactive down the group.

D The halogens are coloured solid elements.

24 Hematite contains an oxide of iron.

Hematite is added to a blast furnace.

Which change happens in the blast furnace?

A FeO is reduced to Fe.

B FeO is reduced to Fe_2O_3.

C Fe_2O_3 is reduced to Fe.

D Fe_2O_3 is reduced to FeO.

25 Which row shows a chemical test for the presence of water?

	substance	colour change
A	anhydrous cobalt(II) chloride	pink to blue
B	anhydrous cobalt(II) chloride	white to blue
C	anhydrous copper(II) sulfate	pink to blue
D	anhydrous copper(II) sulfate	white to blue

26 What are the products of the complete combustion of ethanol?

A carbon dioxide + carbon monoxide + water

B carbon dioxide + hydrogen

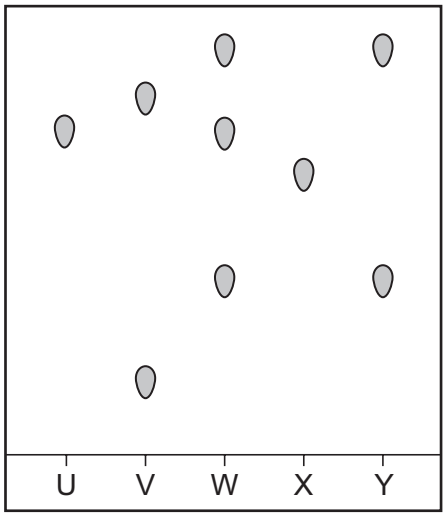
C carbon dioxide + water

D carbon monoxide + water

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27 Paper chromatography is used to separate mixtures of soluble coloured substances using a suitable solvent.

The diagram shows the results of paper chromatography of five substances U, V, W, X and Y.



Which statement is correct?

A All five substances are mixtures.

B There are four pure substances.

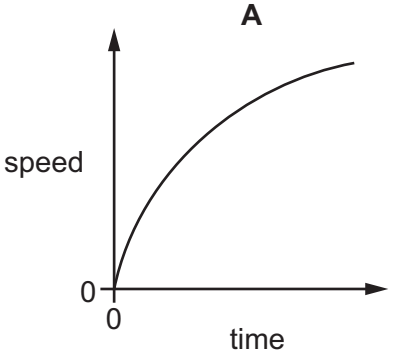
C W and Y are the same substance.

D W is a mixture of U and Y.

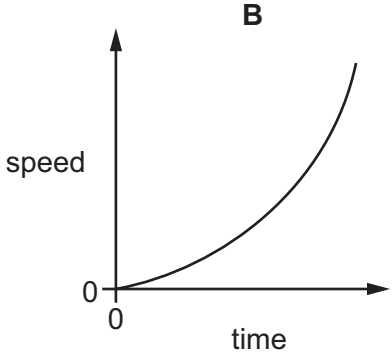
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28 Which speed–time graph shows the motion of an object in free fall with **no** air resistance?

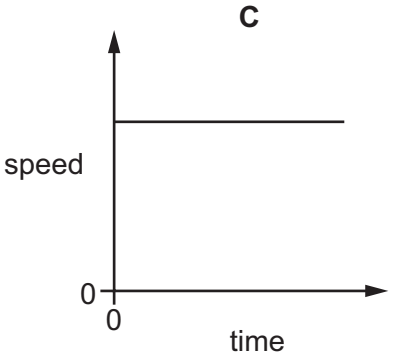
A



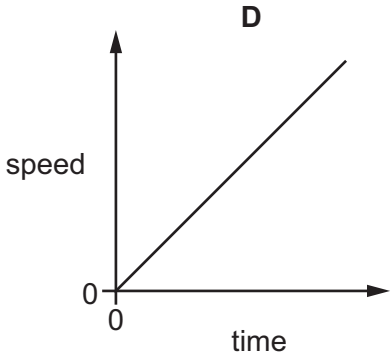
B



C

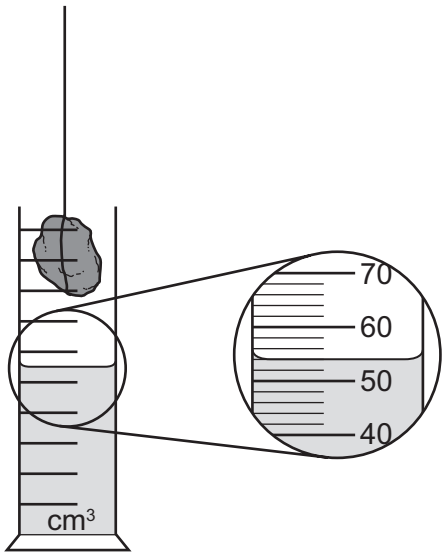


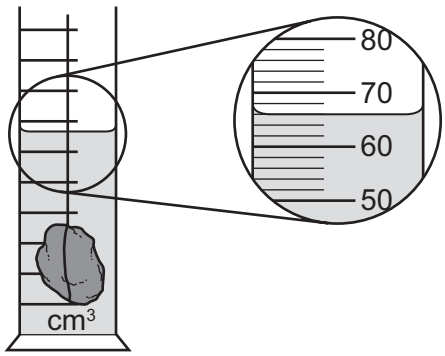
D



29 The volume of an irregularly shaped piece of copper is measured using a measuring cylinder and water.

The diagrams show the readings on the measuring cylinder.





The density of copper is 8.9 g / cm^3.

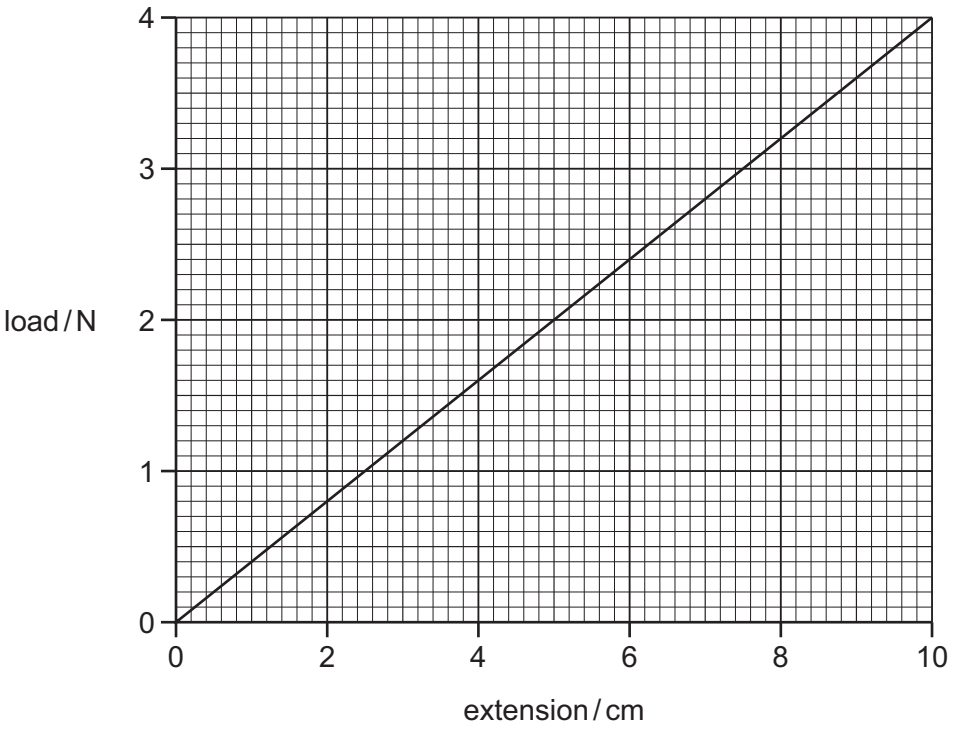
What is the mass of the piece of copper?

A 1.35 g **B** 1.80 g **C** 107 g **D** 142 g

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30 The load–extension graph for a spring is shown.

The unstretched length of the spring is 4.0 cm.



When an object is suspended from the spring, the length of the spring is 9.0 cm.

What is the weight of the object?

A 1.6 N **B** 2.0 N **C** 3.6 N **D** 10 N

31 Force *F* acts on area *A* and exerts pressure *p*.

Which pressure is exerted by a force 2.0*F* that acts on an area 0.50*A*?

A 0.50*p* **B** *p* **C** 2.0*p* **D** 4.0*p*

32 A fixed mass of gas in a container is at constant temperature.

The gas is compressed into a smaller volume. This causes the pressure of the gas to change.

Which statement explains why the pressure of the gas changes?

A The gas particles collide with the walls of the container at higher speed.

B The gas particles collide with the walls of the container at lower speed.

C The gas particles collide with the walls of the container less frequently.

D The gas particles collide with the walls of the container more frequently.

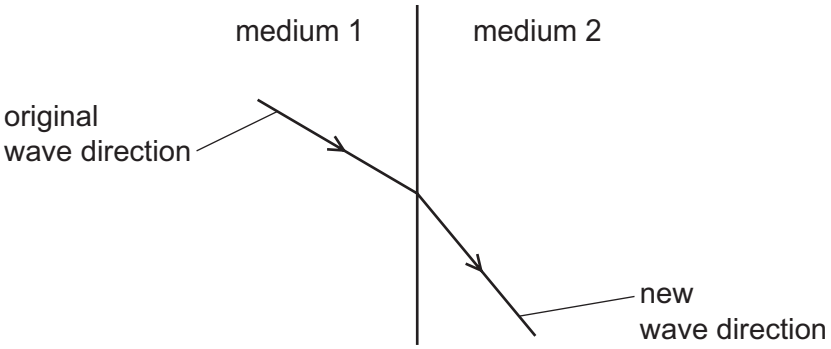
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33 Thermal energy is transferred through a solid metal by conduction.

Which row describes how the atoms and delocalised electrons in a solid metal behave during this process?

	atoms	delocalised electrons
A	move throughout the metal	move throughout the metal
B	move throughout the metal	vibrate about fixed positions
C	vibrate about fixed positions	move throughout the metal
D	vibrate about fixed positions	vibrate about fixed positions

34 A wave passes from medium 1 into medium 2. The diagram shows the change in direction of the wave.



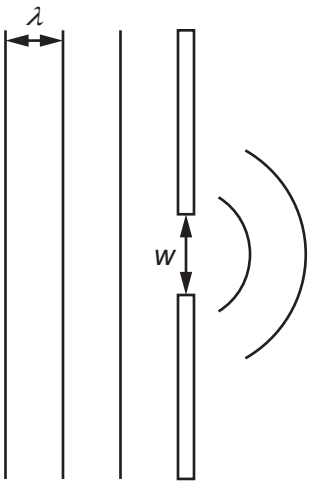
Which row describes what happens to the frequency and the wavelength of the wave as it passes from medium 1 into medium 2?

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

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35 The diagram shows a water wave diffracted through a gap in a barrier.

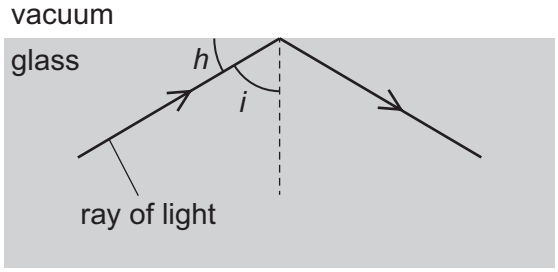
The wavelength of the wave is λ and the width of the gap is w.



Which row shows values of λ and w that produce the greatest diffraction?

	λ / cm	w / cm
A	1.0	2.0
B	1.0	4.0
C	2.0	2.0
D	2.0	4.0

36 A glass block is surrounded by a vacuum. A ray of light strikes the inside of the glass block. The ray of light is totally reflected back into the block.



Which statement explains why this happens?

A Angle h is greater than the critical angle.

B Angle i is greater than the critical angle.

C Light **cannot** travel through a vacuum.

D The ray of light is travelling along the normal.

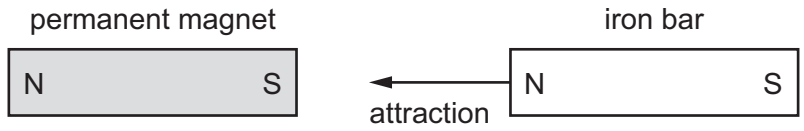
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37 The diagram shows an unmagnetised iron bar placed in the magnetic field of a permanent magnet.

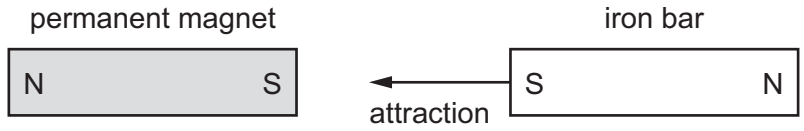


Which diagram shows what happens to the iron bar?

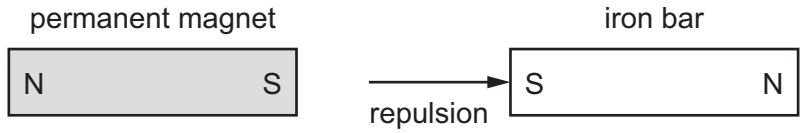
A



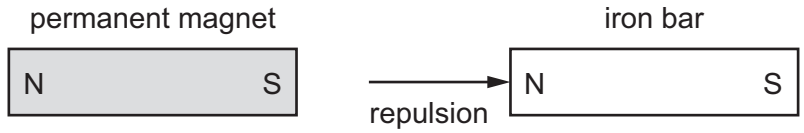
B



C

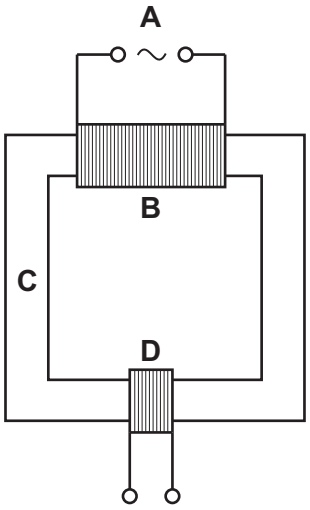


D



38 The diagram shows a step-down transformer.

Which part of the transformer is the secondary coil?



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39 A gamma source in a school laboratory is stored in a box with a lid.

Which feature of the box is needed for the safe storage of the gamma source?

A The box is earthed.

B The box is lined with lead.

C The box is made of copper.

D The lid is made of wood.

40 Which object that orbits the Sun is a minor planet?

A Mercury

B Neptune

C Pluto

D Uranus

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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.).