



# Cambridge IGCSE™

## CO-ORDINATED SCIENCES

0654/13

Paper 1 Multiple Choice (Core)

October/November 2021

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.

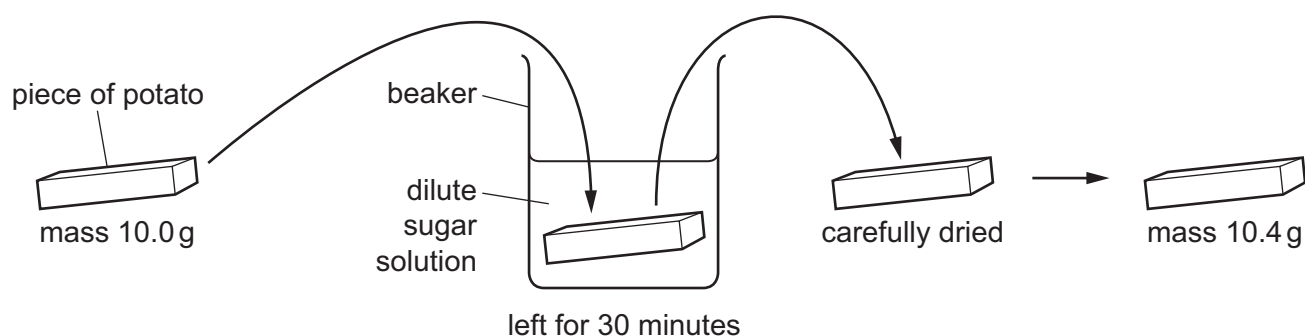


- 1 All living organisms can break down nutrient molecules to release energy.

What is this process?

- A excretion
- B growth
- C nutrition
- D respiration

- 2 The diagram shows the stages of an experiment.

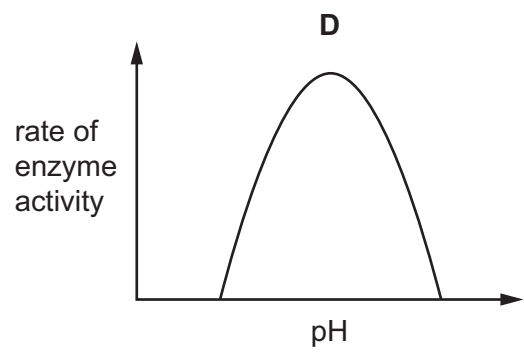
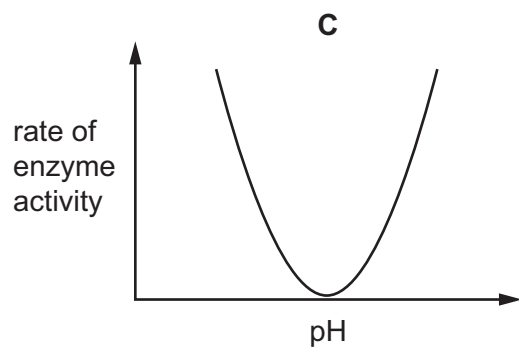
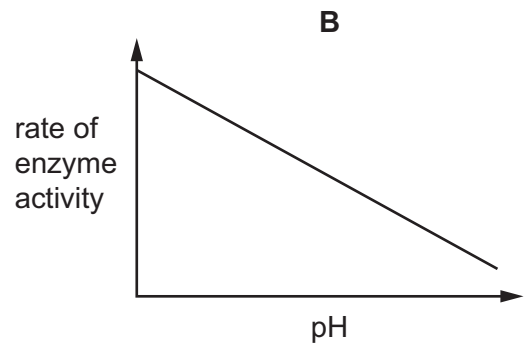
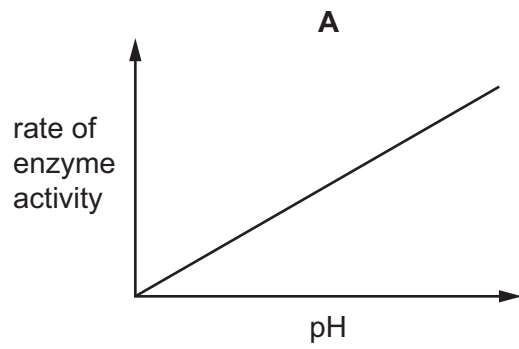


Which statement is a correct explanation for the increase in mass?

- A Sugar has moved into the cells of the potato by osmosis.
  - B Sugar has moved out of the cells of the potato by osmosis.
  - C Water has moved into the cells of the potato by osmosis.
  - D Water has moved out of the cells of the potato by osmosis.
- 3 Which molecule contains carbon?

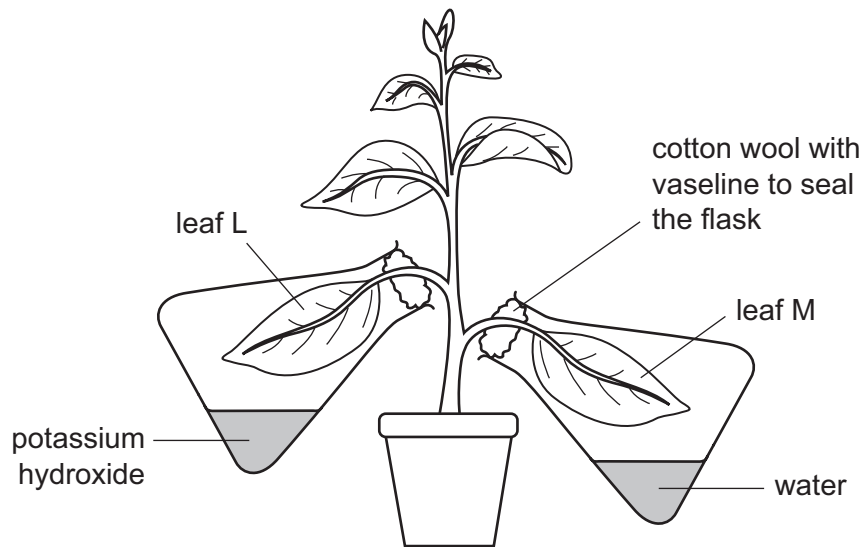
- A ammonia
- B fat
- C sulfuric acid
- D water

4 Which graph shows the effect of pH on the rate of activity of an enzyme?



- 5 The diagram shows an experiment to investigate photosynthesis. When leaves photosynthesise, they store some carbohydrates as starch.

Potassium hydroxide absorbs carbon dioxide.

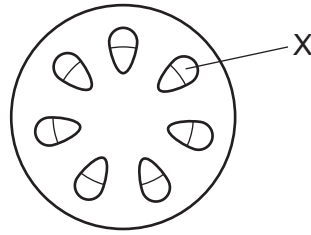


After standing in sunlight for 10 hours, leaf L contained no starch but leaf M contained a lot of starch.

What does this show?

- A A leaf cannot make starch in a sealed flask.
  - B A leaf cannot make starch without carbon dioxide.
  - C A leaf cannot make starch without light.
  - D A leaf cannot make starch without oxygen.
- 6 Which component of a balanced diet is a source of energy?
- A carbohydrates
  - B minerals
  - C vitamins
  - D water

- 7 The diagram shows a transverse section through a plant stem.



Which tissue is X?

- A mesophyll
  - B phloem
  - C epidermis
  - D xylem
- 8 A person ran up as many stairs as they could in one minute.

What would be the effect on their breathing?

|   | depth of breathing | rate of breathing |
|---|--------------------|-------------------|
| A | decreased          | decreased         |
| B | decreased          | increased         |
| C | increased          | decreased         |
| D | increased          | increased         |

- 9 A student wrote some notes about hormones.

She wrote: 'A hormone is produced by a .....1..... . It is transported in the blood .....2..... . It alters the activity of one or more .....3..... organs.'

Which row correctly completes gaps 1, 2 and 3?

|   | 1      | 2      | 3        |
|---|--------|--------|----------|
| A | gland  | cells  | specific |
| B | gland  | plasma | target   |
| C | tissue | cells  | specific |
| D | tissue | plasma | target   |

10 In which structure is pollen made?

- A anther
- B ovary
- C sepal
- D stigma

11 Two parents with genotypes of BB and Bb were crossed.

Which genotypes and ratios would be expected in the offspring?

- A 1 BB : 1 Bb      B 1 Bb : 1 bb      C 3 BB : 1 Bb      D 3 Bb : 1 BB

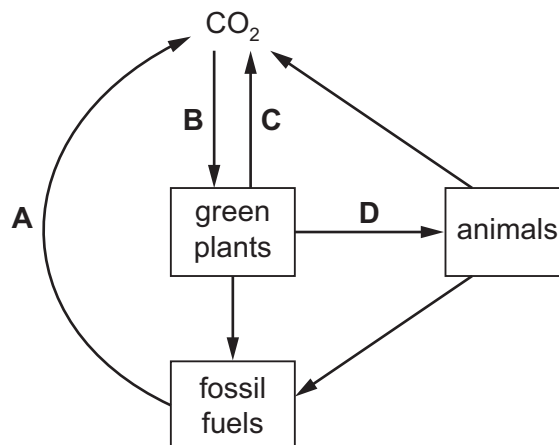
12 A producer is an organism which makes its own organic nutrients.

Which process does a producer use and what is the source of energy?

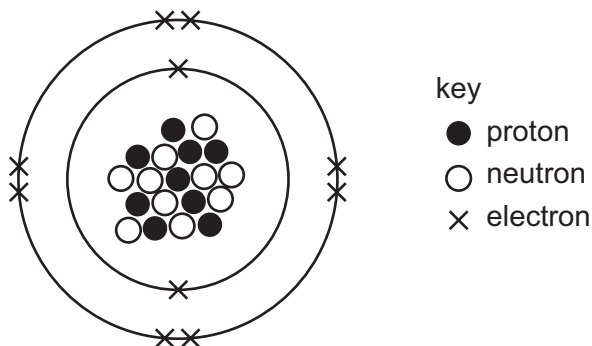
|   | process        | source of energy    |
|---|----------------|---------------------|
| A | photosynthesis | dead organic matter |
| B | respiration    | sunlight            |
| C | photosynthesis | sunlight            |
| D | respiration    | dead organic matter |

13 The diagram shows a simplified carbon cycle.

Which labelled arrow represents respiration?



14 The protons, neutrons and electrons in a particle are shown.



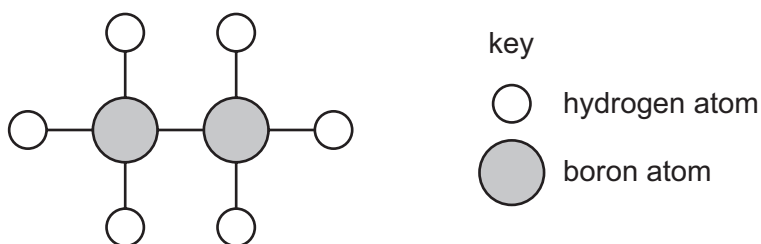
Which symbol represents this particle?

- A** F                      **B** F<sup>-</sup>                      **C** Ne                      **D** Ne<sup>+</sup>

15 Which row describes the properties of a covalent compound?

|          | melting point<br>/ °C | solubility<br>in water | undergoes<br>electrolysis<br>when molten |
|----------|-----------------------|------------------------|------------------------------------------|
| <b>A</b> | 100                   | insoluble              | no                                       |
| <b>B</b> | 110                   | soluble                | yes                                      |
| <b>C</b> | 950                   | insoluble              | no                                       |
| <b>D</b> | 2200                  | soluble                | yes                                      |

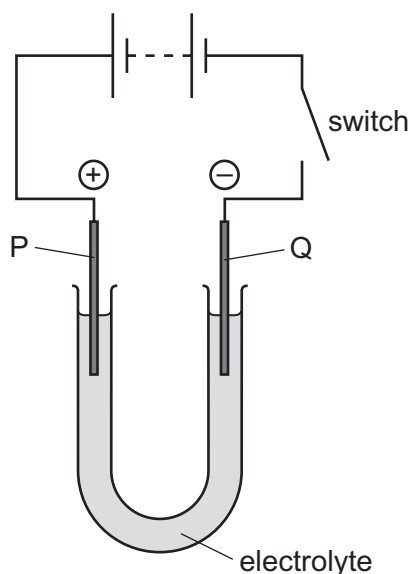
16 A model of a molecule is shown.



Which row shows the formula of this molecule and describes the type of bonding between the atoms?

|          | formula                       | bonding  |
|----------|-------------------------------|----------|
| <b>A</b> | 2BH <sub>3</sub>              | covalent |
| <b>B</b> | 2BH <sub>3</sub>              | ionic    |
| <b>C</b> | B <sub>2</sub> H <sub>6</sub> | covalent |
| <b>D</b> | B <sub>2</sub> H <sub>6</sub> | ionic    |

17 The diagram shows the electrolysis of a compound.



When the switch is closed, the solution around electrode P turns orange because a halogen is formed.

The positive electrode P is called the .....1....., and the halogen is .....2..... .

Which words complete gaps 1 and 2?

|          | 1       | 2        |
|----------|---------|----------|
| <b>A</b> | anode   | bromine  |
| <b>B</b> | anode   | chlorine |
| <b>C</b> | cathode | bromine  |
| <b>D</b> | cathode | chlorine |

18 The same masses of four substances are added separately to four samples of  $10\text{ cm}^3$  of dilute hydrochloric acid at  $22^\circ\text{C}$ .

The final temperature of each reaction mixture is measured.

Which reaction is most endothermic?

|          | final temperature / $^\circ\text{C}$ |
|----------|--------------------------------------|
| <b>A</b> | 29                                   |
| <b>B</b> | 27                                   |
| <b>C</b> | 20                                   |
| <b>D</b> | 17                                   |

- 19** Dilute hydrochloric acid is added to excess solid calcium carbonate.

Which change increases the rate of this reaction?

- A** decrease the concentration of the acid
- B** decrease the volume of the acid
- C** reduce the size of the solid particles
- D** reduce the temperature

- 20** A gas turns damp litmus paper white.

What is the gas?

- A** carbon dioxide
- B** chlorine
- C** hydrogen chloride
- D** sulfur dioxide

- 21** Which statement about the elements in Group I and in Group VII of the Periodic Table is correct?

- A** Chlorine has a darker colour than iodine.
- B** Each molecule of a halogen contains one atom.
- C** Potassium reacts with cold water more vigorously than lithium.
- D** The melting point of lithium is lower than the melting point of sodium.

- 22** Why does the steel used to make a drill contain manganese?

- A** to increase the density of the steel
- B** to increase the hardness of the steel
- C** to increase the malleability of the steel
- D** to increase the melting point of the steel

- 23** What is a chemical test for water?

- A** It turns anhydrous cobalt(II) chloride white.
- B** It turns anhydrous copper(II) sulfate blue.
- C** It turns blue copper(II) sulfate white.
- D** It turns pink cobalt(II) chloride blue.

24 Which process does **not** produce carbon dioxide?

- A complete combustion of fossil fuels
- B reaction of an acid with a carbonate
- C respiration in plants
- D rusting iron

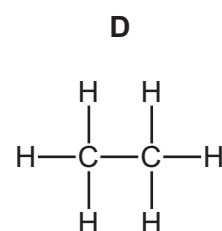
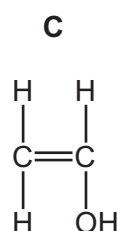
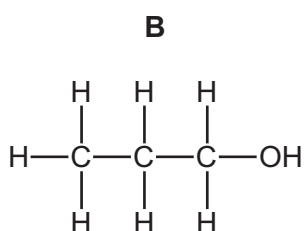
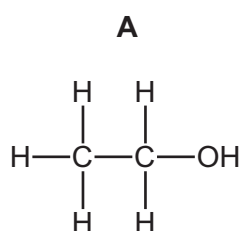
25 Which statements about limestone are correct?

- 1 Limestone is used to neutralise industrial waste products.
- 2 Limestone is used to treat acidic soil.
- 3 Thermal decomposition of limestone produces calcium oxide.

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

26 Four molecules are shown.

Which structure represents ethanol?



27 Which statement about ethene, C<sub>2</sub>H<sub>4</sub>, is **not** correct?

- A It is an unsaturated hydrocarbon.
- B It is produced by cracking.
- C It is used to make a polymer.
- D It turns aqueous bromine brown.

- 28** A student uses a stop-watch to measure the time taken for a ball to drop 2.0 m to the ground.

The measurement is taken five times.

These are the results:

20.16 s

20.22 s

20.14 s

20.22 s

20.26 s

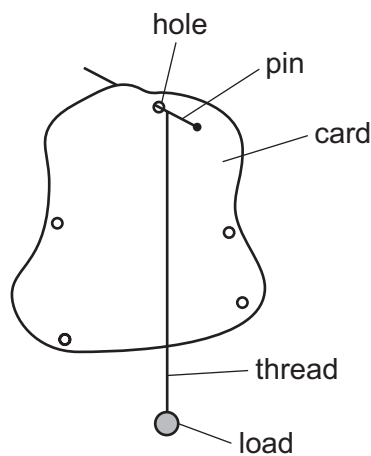
Which value for the time taken should be used?

- A** 20.16 s      **B** 20.20 s      **C** 20.22 s      **D** 20.26 s
- 29** A student wishes to determine the centre of mass of a piece of card.

She makes five holes in the card.

She suspends the card from a pin, as shown.

She hangs a load from a thread attached to the pin and marks the line of the thread on the card.



The student repeats the procedure using a different hole.

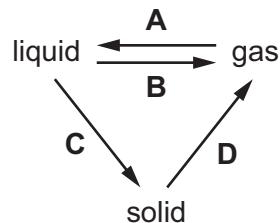
What is the smallest number of lines that she needs to draw to determine the position of the centre of mass of the card?

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

- 30** When driving cars on soft sand, drivers are advised to reduce the pressure of the air in the tyres.

Why does this cause the cars to sink less into the sand?

- A** The area of the tyres in contact with the sand is decreased.
  - B** The area of the tyres in contact with the sand is increased.
  - C** The downward force on the sand is decreased.
  - D** The downward force on the sand is increased.
- 31** Which type of energy does an object have due to its motion?
- A** elastic potential
  - B** gravitational potential
  - C** kinetic
  - D** nuclear
- 32** Which labelled arrow on the diagram represents condensation?



- 33** Four rods have the same dimensions. They are made of four different metals and are all at room temperature.

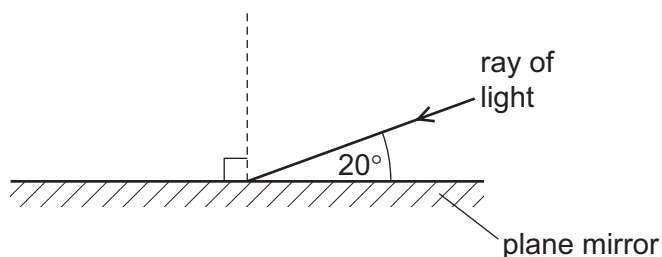
All the rods are heated equally at one end for the same length of time.

The final temperature of the other end of each rod is shown in the table.

Which rod is the worst conductor of heat?

|          | final temperature / °C |
|----------|------------------------|
| <b>A</b> | 50                     |
| <b>B</b> | 62                     |
| <b>C</b> | 70                     |
| <b>D</b> | 82                     |

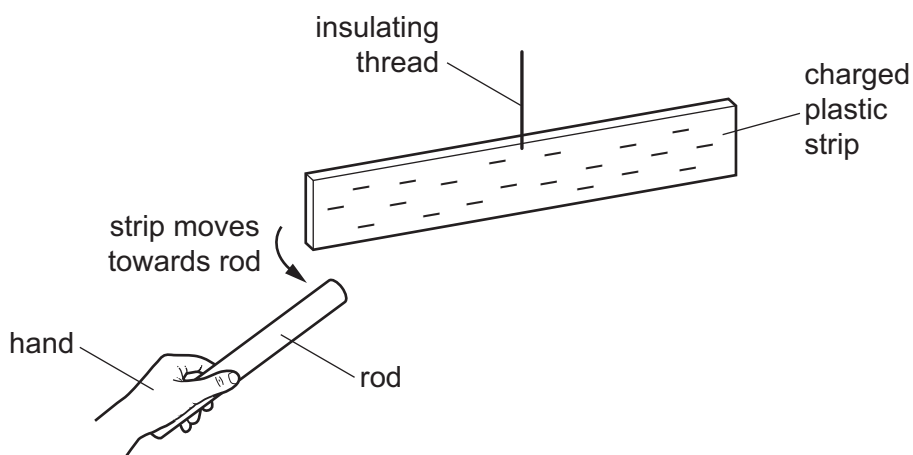
- 34 The diagram shows a ray of light striking a plane mirror.



What is the angle of reflection?

- A**  $20^\circ$                       **B**  $40^\circ$                       **C**  $70^\circ$                       **D**  $90^\circ$
- 35 A rod is rubbed with a dry piece of cloth. A scientist holds the rod in her hand and brings it close to a negatively charged plastic strip. The strip is suspended by an insulating thread.

As the rod approaches the plastic strip, the strip moves towards the rod.



Which statement is correct?

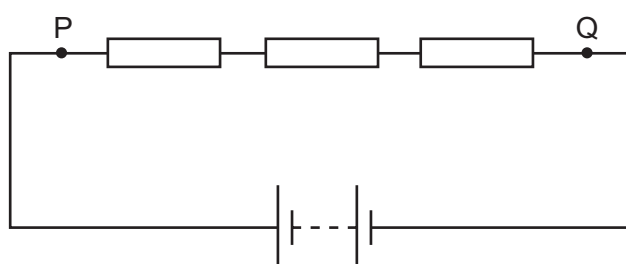
- A** The rod is a negatively charged electrical conductor.  
**B** The rod is a negatively charged electrical insulator.  
**C** The rod is a positively charged electrical conductor.  
**D** The rod is a positively charged electrical insulator.

- 36** An ammeter is used to measure the current in a metal wire.

Which row describes the current and how the ammeter is connected to the wire?

|          | description of current | how ammeter is connected  |
|----------|------------------------|---------------------------|
| <b>A</b> | flow of electrons      | in parallel with the wire |
| <b>B</b> | flow of electrons      | in series with the wire   |
| <b>C</b> | flow of protons        | in parallel with the wire |
| <b>D</b> | flow of protons        | in series with the wire   |

- 37** Three resistors are connected in series with a battery, as shown.



The current at point P is 6.0 A.

What is the current at point Q?

- A** 0 A                      **B** 2.0 A                      **C** 3.0 A                      **D** 6.0 A

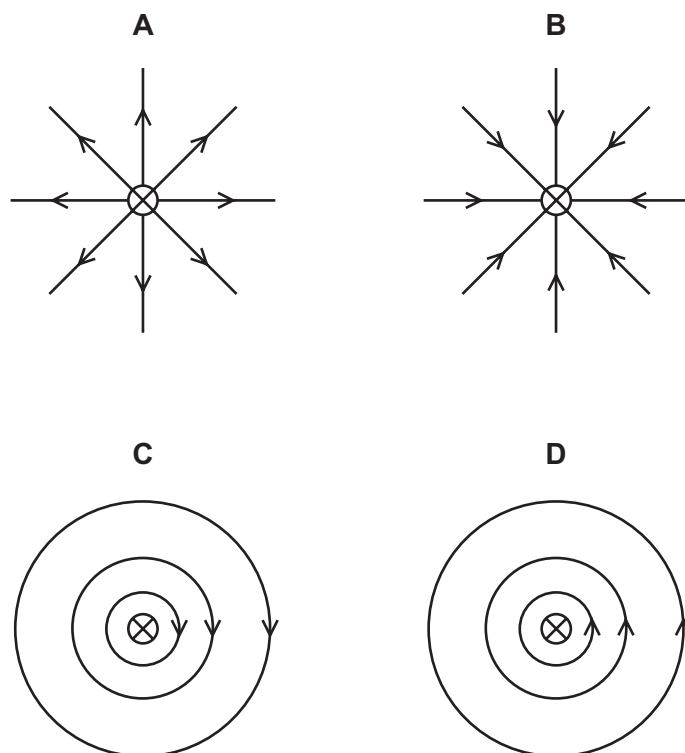
- 38** A hairdryer is protected by a 10 A fuse.

What is the purpose of the fuse?

- A** It decreases the current in the hairdryer to 10 A when the current is more than 10 A.  
**B** It increases the current in the hairdryer to 10 A when the current is less than 10 A.  
**C** It maintains a constant temperature in the hairdryer.  
**D** It melts when the current in the hairdryer is greater than 10 A.

**39** The diagrams show the cross-section of a straight wire carrying a current into the page.

Which diagram shows the pattern and direction of the magnetic field around the wire?



**40** Which description of an  $\alpha$ -particle is correct?

- A** It contains 2 protons and 2 neutrons.
- B** It contains 2 protons and 4 neutrons.
- C** It contains 4 protons and 2 neutrons.
- D** It contains 4 protons and 4 neutrons.

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The Periodic Table of Elements

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

lanthanoids

actinoids

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).