



# Cambridge IGCSE™

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## CO-ORDINATED SCIENCES

0654/11

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)

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### 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.

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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 Which structure is only found in plant cells?

- A cell membrane
- B cytoplasm
- C nucleus
- D vacuole

- 3 Which row shows a large molecule and a basic unit from which it is made?

|   | large molecule | basic unit |
|---|----------------|------------|
| A | glycogen       | amino acid |
| B | glycogen       | glucose    |
| C | oil            | amino acid |
| D | oil            | glucose    |

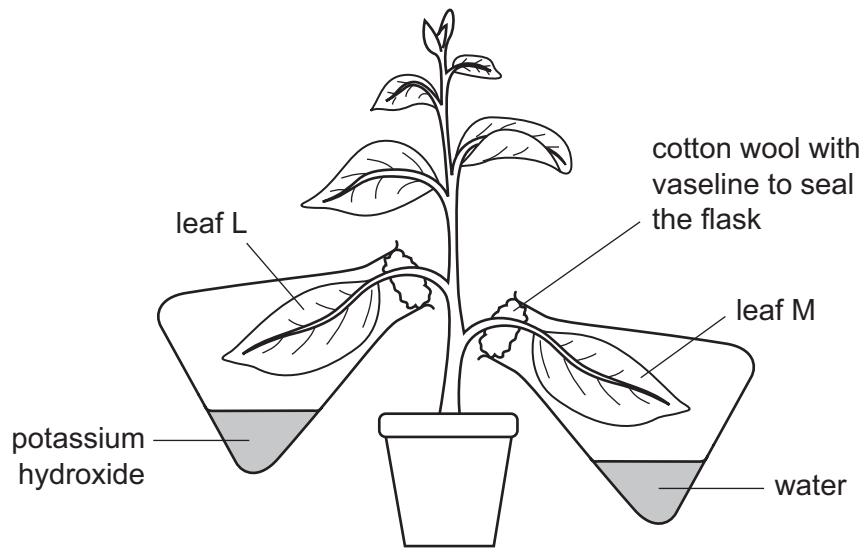
- 4 A student investigated the effect of pH on an enzyme that digests starch.

Which chemical will be needed to determine if any starch has been digested?

- A Benedict's solution
- B biuret solution
- C iodine solution
- D ethanol

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

Potassium hydroxide absorbs carbon dioxide.

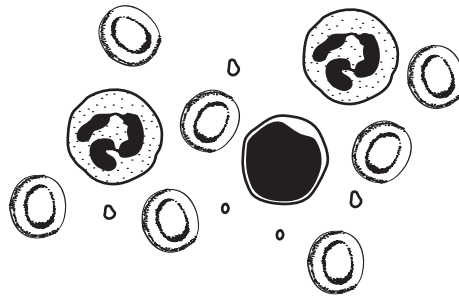


After standing in sunlight for 10 hours, leaf L contained no starch but leaf M contained a lot of starch.

What does this show?

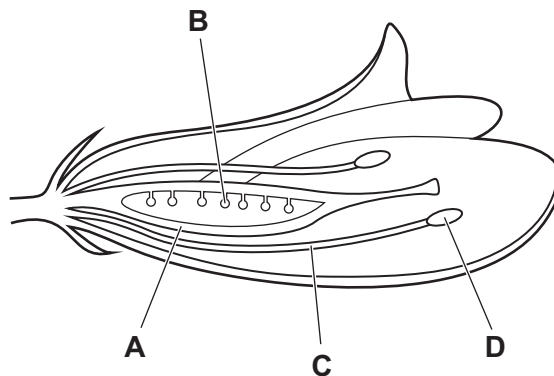
- A A leaf cannot make starch in a sealed flask.
  - B A leaf cannot make starch without carbon dioxide.
  - C A leaf cannot make starch without light.
  - D A leaf cannot make starch without oxygen.
- 6 Which nutrient is well provided by citrus fruits such as oranges and lemons?
- A carbohydrate
  - B protein
  - C vitamin C
  - D vitamin D

- 7 The diagram shows some blood viewed under a light microscope.



How many red blood cells are shown?

- A** 1                      **B** 3                      **C** 5                      **D** 7
- 8 What is the word equation for aerobic respiration?
- A** carbon dioxide + water → glucose + oxygen
- B** carbon dioxide + oxygen → glucose + water
- C** glucose + oxygen → carbon dioxide + water
- D** glucose + water → carbon dioxide + oxygen
- 9 A person touches a hot object with their hand. They quickly pull their hand away.
- Which statement is correct?
- A** The effector is their hand.
- B** The effector is the hot object.
- C** The receptor is in the muscles of their arm.
- D** The receptor is in the skin of their hand.
- 10 The diagram shows a section of a pea flower.
- Which part is the ovary?



11 Natural selection involves several stages.

- 1 passing on alleles to the next generation
- 2 struggle for survival
- 3 competition for resources
- 4 production of many offspring

What is the correct order of these stages?

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

12 The diagram shows a food chain.

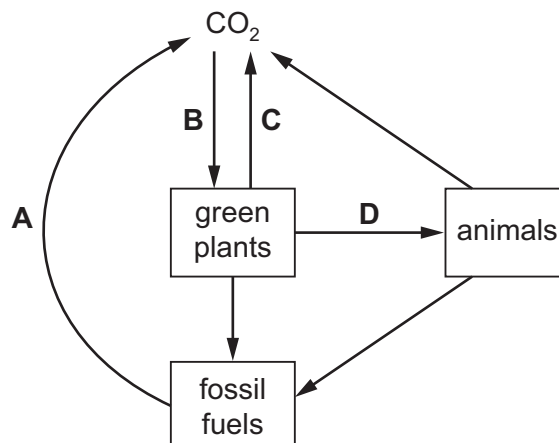
grass → gazelle → lion

Which position does the lion occupy in the food chain?

- A** primary consumer
- B** producer
- C** secondary consumer
- D** tertiary consumer

13 The diagram shows a simplified carbon cycle.

Which labelled arrow represents respiration?



**14** Which row identifies physical changes and chemical changes?

|          | physical changes                  | chemical changes                         |
|----------|-----------------------------------|------------------------------------------|
| <b>A</b> | cooking an egg and ice melting    | rusting of iron                          |
| <b>B</b> | ice melting and water boiling     | burning wood                             |
| <b>C</b> | mixing sand and water             | baking a cake and water boiling          |
| <b>D</b> | rusting of iron and baking a cake | solid dissolving and ethanol evaporating |

**15** Part of the Periodic Table is shown.

The letters are not the symbols of the elements in the Periodic Table.

A periodic table grid is shown with the following elements marked:

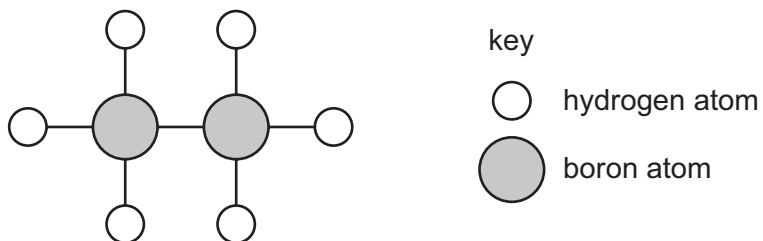
- W** is located in the top-left corner (Period 1, Group 1).
- X** is located in the second row, first column (Period 2, Group 1).
- Y** is located in the third row, eighth column from the left (Period 3, Group 16).
- Z** is located in the third row, ninth column from the left (Period 3, Group 17).

The grid consists of 4 rows and 18 columns, with some cells empty to represent the periodic table's structure.

Which statement is **not** correct?

- A** W and X are metallic elements.
- B** W and Z form an ionic compound.
- C** X and Y form a covalent compound.
- D** Z is a non-metallic element.

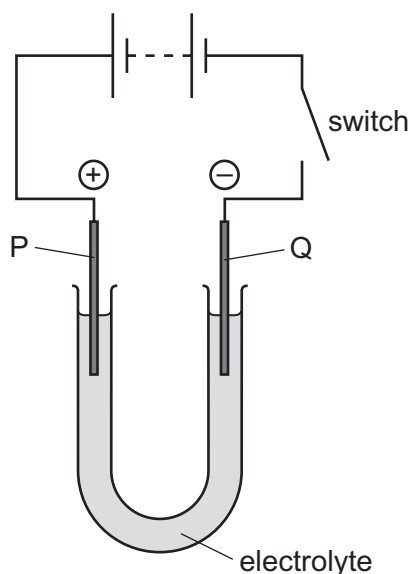
16 A model of a molecule is shown.



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

|          | formula                | bonding  |
|----------|------------------------|----------|
| <b>A</b> | $2\text{BH}_3$         | covalent |
| <b>B</b> | $2\text{BH}_3$         | ionic    |
| <b>C</b> | $\text{B}_2\text{H}_6$ | covalent |
| <b>D</b> | $\text{B}_2\text{H}_6$ | 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 initial and final temperatures of four different experiments are measured.

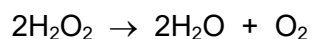
The results are shown.

Which experiment is the most endothermic?

|          | initial temperature / °C | final temperature / °C |
|----------|--------------------------|------------------------|
| <b>A</b> | 22                       | 17                     |
| <b>B</b> | 21                       | 25                     |
| <b>C</b> | 20                       | 27                     |
| <b>D</b> | 20                       | 18                     |

- 19** Aqueous hydrogen peroxide decomposes slowly and produces water and oxygen gas.

The equation for this decomposition is shown.



The time taken to produce the first 20 cm<sup>3</sup> of gas and the total volume of gas produced in the reaction are measured.

The experiment is repeated using a catalyst.

Which row describes the results for the second experiment?

|          | time taken to produce first 20 cm <sup>3</sup> of gas | total volume of gas produced |
|----------|-------------------------------------------------------|------------------------------|
| <b>A</b> | less than experiment 1                                | the same as experiment 1     |
| <b>B</b> | less than experiment 1                                | more than experiment 1       |
| <b>C</b> | more than experiment 1                                | the same as experiment 1     |
| <b>D</b> | more than experiment 1                                | more than experiment 1       |

- 20** The colour of universal indicator in solutions S, T and U is shown.

| solution                      | S      | T     | U      |
|-------------------------------|--------|-------|--------|
| colour of universal indicator | orange | green | purple |

Which row shows the pH values of the solutions?

|          | S | T | U  |
|----------|---|---|----|
| <b>A</b> | 1 | 5 | 9  |
| <b>B</b> | 1 | 7 | 14 |
| <b>C</b> | 4 | 5 | 9  |
| <b>D</b> | 4 | 7 | 14 |

- 21** When a small piece of potassium is placed in water, hydrogen gas is given off very quickly.

Which element reacts in a similar way?

- A** copper
- B** iron
- C** magnesium
- D** 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 the colour of cobalt(II) chloride after water is added to it?

- A** blue
- B** pink
- C** white
- D** green

**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** Calcium carbonate (limestone) is a base.

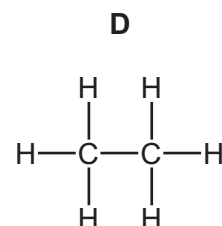
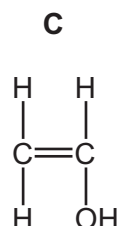
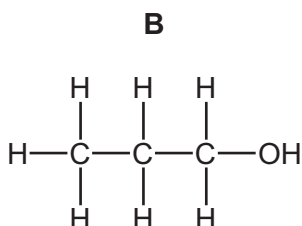
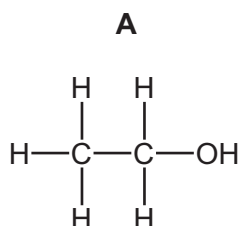
Which uses of limestone depend on it acting as a base?

- 1 making lime
- 2 neutralising acid waste
- 3 stone buildings
- 4 treatment of soil

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

**26** Four molecules are shown.

Which structure represents ethanol?



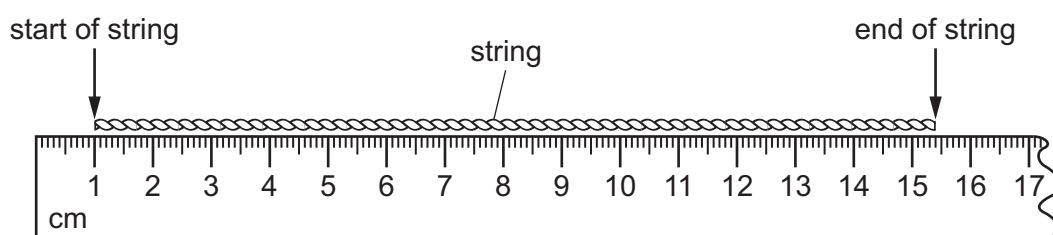
27 Which substance rapidly decolourises aqueous bromine?

- A ethane
- B ethanol
- C ethene
- D poly(ethene)

28 A student uses a piece of string to measure the circumference of a pencil.

He wraps the string around the outside of the pencil. The string wraps round exactly six times.

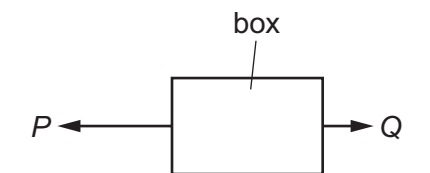
He measures the length of string used with a rule.



What is the circumference of the pencil?

- A 2.4 cm
- B 2.6 cm
- C 14.4 cm
- D 15.4 cm

29 The diagram shows a large force of magnitude  $P$  and a small force of magnitude  $Q$  acting on a box.



Which expression gives the magnitude of the resultant force on the box?

- A  $P + Q$
- B  $P - Q$
- C  $P \times Q$
- D  $\frac{P}{Q}$

30 A ball falls vertically downwards.

Which energy transfer takes place as the ball accelerates downwards?

- A gravitational potential to elastic potential (strain)
- B gravitational potential to kinetic
- C elastic potential (strain) to kinetic
- D kinetic to gravitational potential

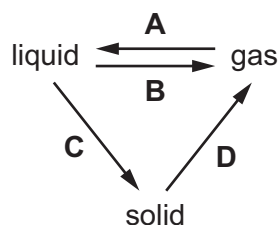
- 31** Four cars travel the same distance directly up the same steep hill.

The weights of the cars and the times for their journeys are shown in the table.

Which car develops the greatest power?

|          | weight of car / N | time taken / s |
|----------|-------------------|----------------|
| <b>A</b> | 15 000            | 10             |
| <b>B</b> | 15 000            | 15             |
| <b>C</b> | 20 000            | 10             |
| <b>D</b> | 20 000            | 15             |

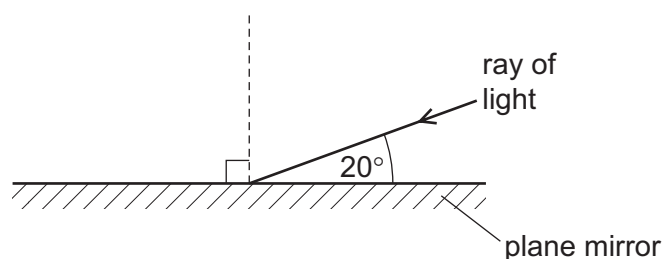
- 32** Which labelled arrow on the diagram represents condensation?



- 33** Water in a metal pan is heated on a gas burner.

What are the main methods by which heat is transferred through the metal pan to the water and throughout the water?

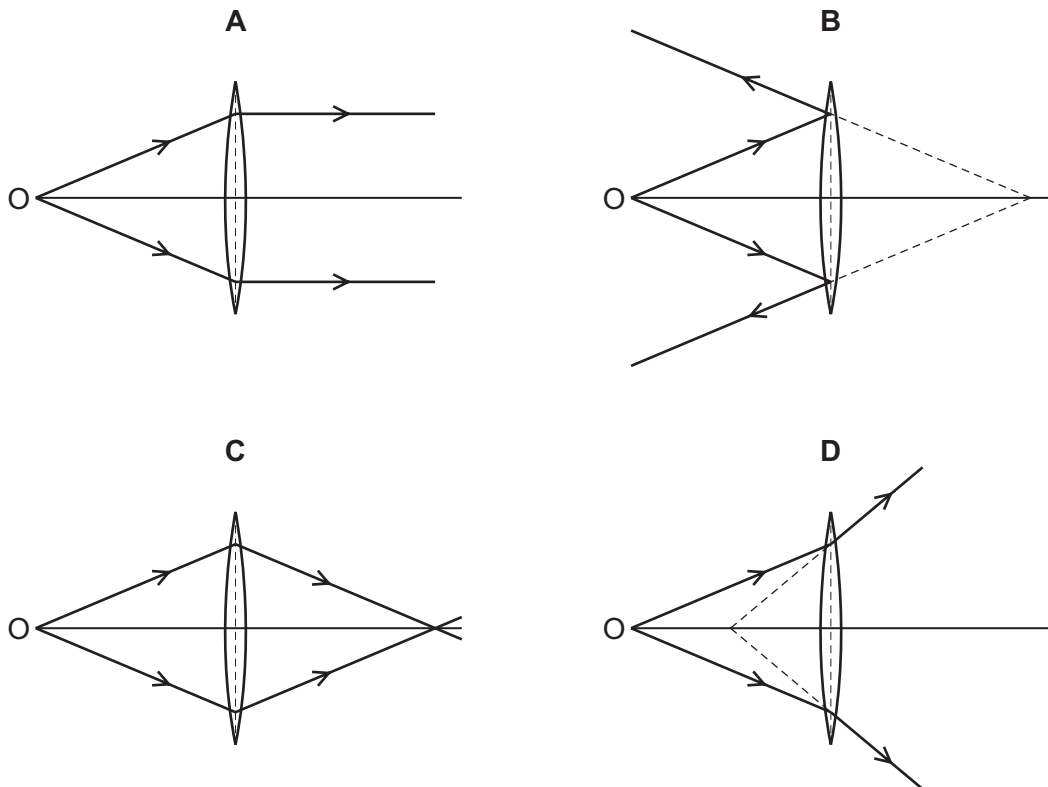
- A** conduction through the metal pan and convection in the water
  - B** convection through the metal pan and conduction in the water
  - C** convection through the metal pan and radiation in the water
  - D** radiation through the metal pan and conduction in the water
- 34** The diagram shows a ray of light striking a plane mirror.



What is the angle of reflection?

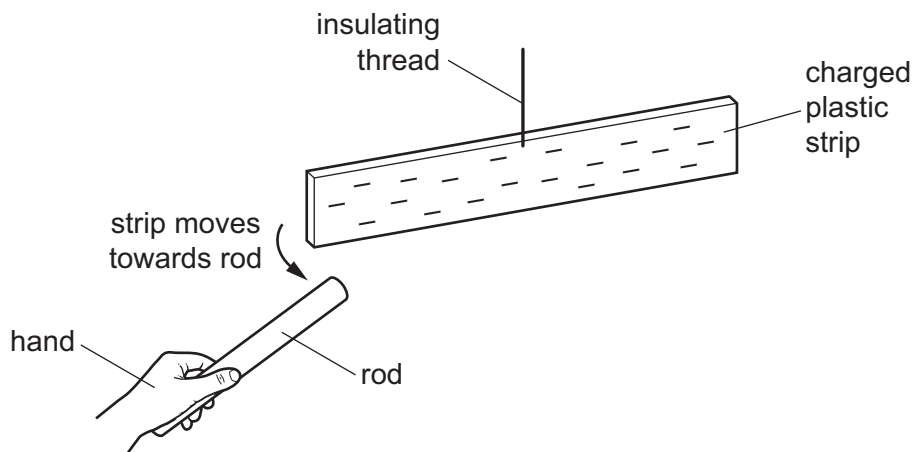
- A** 20°
- B** 40°
- C** 70°
- D** 90°

35 Which diagram shows a converging lens forming a real image of an object O?



36 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.

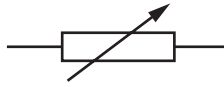
As the rod approaches the plastic strip, the strip moves towards the rod.



Which statement is correct?

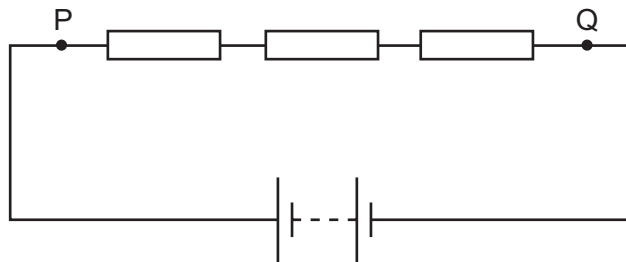
- A The rod is a negatively charged electrical conductor.
- B The rod is a negatively charged electrical insulator.
- C The rod is a positively charged electrical conductor.
- D The rod is a positively charged electrical insulator.

37 What is represented by the circuit symbol shown?



- A fixed resistor
- B fuse
- C switch
- D variable resistor

38 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

39 The table shows the usual current in each of four household appliances and the fuse used to protect each of them.

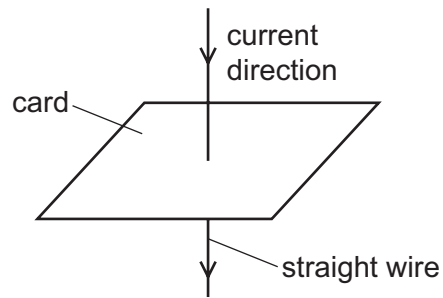
The only fuses available are rated at 3 A, 5 A or 13 A.

Which row shows an appliance that has been fitted with the most appropriate of the fuses available?

|   | appliance   | current / A | fuse rating / A |
|---|-------------|-------------|-----------------|
| A | hairdryer   | 5.5         | 5               |
| B | kettle      | 7.5         | 13              |
| C | lawnmower   | 5.0         | 3               |
| D | slow cooker | 1.0         | 5               |

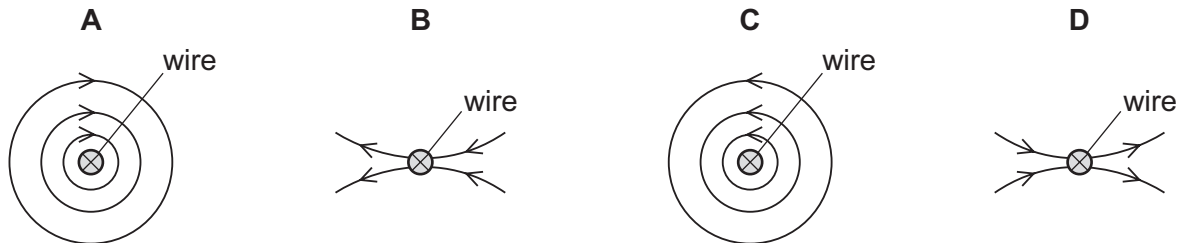
**40** A straight vertical wire passes through the centre of a card.

The wire carries a current in the direction shown.



The current produces a magnetic field around the wire.

Which diagram shows the pattern of the magnetic field lines and their direction when seen from above?



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The Periodic Table of Elements

| Group                      |                             |                                                                |                             |                                 |                              |                              |                              |                            |                              |                                |                               |                               |                             |                               |                              |                              |                            |                                |
|----------------------------|-----------------------------|----------------------------------------------------------------|-----------------------------|---------------------------------|------------------------------|------------------------------|------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------|-----------------------------|-------------------------------|------------------------------|------------------------------|----------------------------|--------------------------------|
| I                          | II                          | Key                                                            |                             |                                 |                              |                              |                              |                            |                              |                                |                               | III                           | IV                          | V                             | VI                           | VII                          | VIII                       |                                |
|                            |                             | atomic number<br>atomic symbol<br>name<br>relative atomic mass |                             |                                 |                              |                              |                              |                            |                              |                                |                               | 1<br>H<br>hydrogen<br>1       |                             |                               |                              |                              |                            |                                |
| 3<br>Li<br>lithium<br>7    | 4<br>Be<br>beryllium<br>9   |                                                                |                             |                                 |                              |                              |                              |                            |                              |                                |                               | 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>aluminium<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>— | 118<br>Og<br>oganesson<br>—  | 119<br>Ts<br>tennessine<br>— | 120<br>Nh<br>nihonium<br>— | 121<br>Ds<br>darmstadtium<br>— |

lanthanoids

|                              |                            |                                 |                              |                             |                             |                             |                               |                            |                               |                              |                           |                               |                              |                              |
|------------------------------|----------------------------|---------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------|-------------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|------------------------------|
| 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>— |

actinoids

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).