



# Cambridge IGCSE™

**CO-ORDINATED SCIENCES**

**0654/22**

Paper 2 Multiple Choice (Extended)

**October/November 2022**

**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. Any blank pages are indicated.



- 1 What do plants need for their nutrition?
- A carbon dioxide, ions, organic compounds and light
  - B carbon dioxide, ions, organic compounds and water
  - C carbon dioxide, ions, light and water
  - D carbon dioxide, organic compounds, light and water

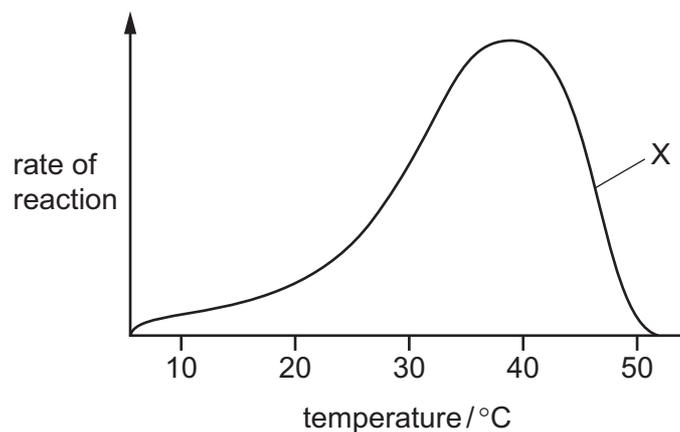
- 2 What is found in plant cells but **not** in animal cells?

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

- 3 Glycerol is a component of which large molecules?

- A fats
- B glycogen
- C proteins
- D starch

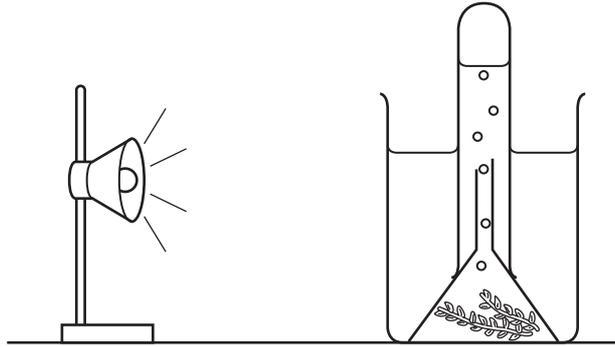
- 4 The graph shows the rate of reaction of salivary amylase at different temperatures.



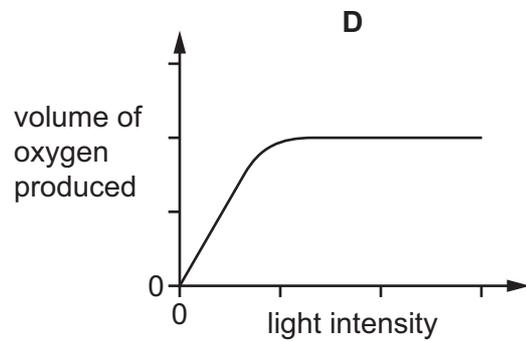
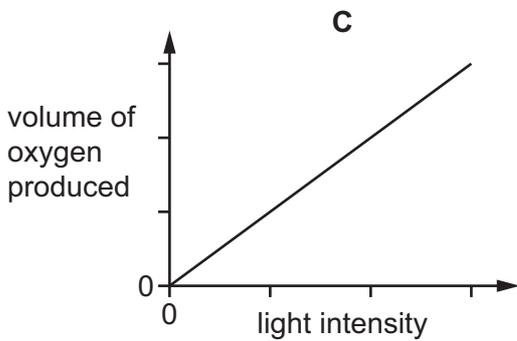
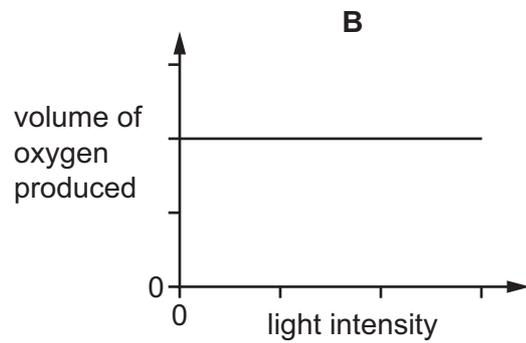
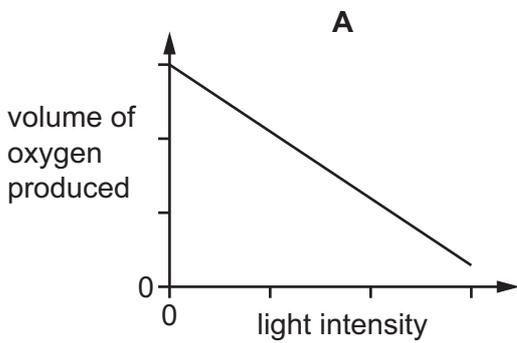
What does the graph show at point X?

- A The enzyme has stopped working.
- B The reaction is nearly completed.
- C The reaction rate is controlled by pH.
- D The temperature is higher than the optimum.

- 5 The volume of oxygen produced by a submerged aquatic plant is investigated at different light intensities as shown.



Which graph shows how the volume of oxygen produced varies with light intensity?

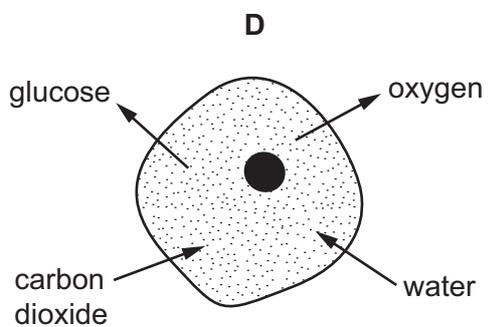
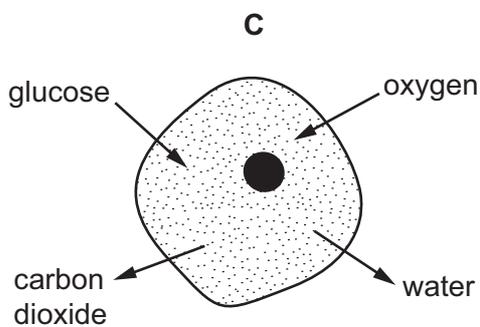
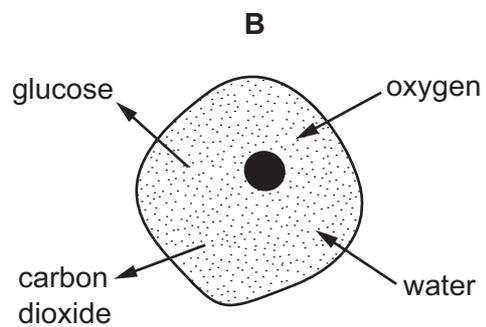
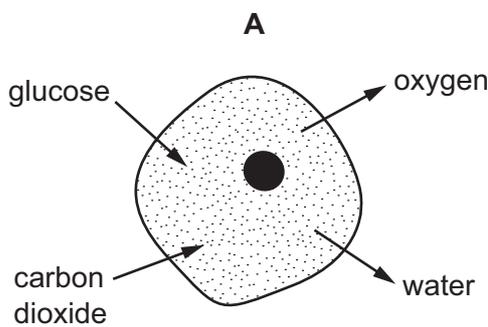


- 6 Which features of villi help to maximise the absorption of digested food?

- 1 a good blood supply
- 2 a large surface area
- 3 the presence of enzymes
- 4 the presence of lacteals

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

- 7 Which statement explains the effect of a higher temperature on the rate of transpiration?
- A** More water evaporates from the stomata, creating a water potential gradient that draws a column of water molecules up the xylem.
- B** Less water evaporates from the stomata, creating a water potential gradient that draws a column of water molecules up the xylem.
- C** More water evaporates from the stomata, creating a water potential gradient that draws a column of water molecules up the phloem.
- D** Less water evaporates from the stomata, creating a water potential gradient that draws a column of water molecules up the phloem.
- 8 Which diagram of a cell shows the correct movement of substances for the process of aerobic respiration?



- 9 When a person moves from a brightly lit room into a dark room, the pupils in their eyes change in size.

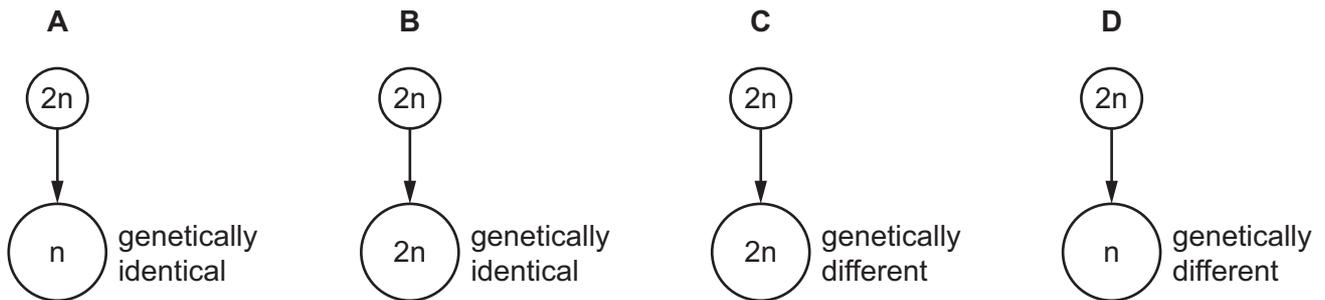
Which row correctly describes the change in size and explains what causes this change?

	pupil size	radial muscles	circular muscles
<b>A</b>	decreases	contract	relax
<b>B</b>	decreases	relax	contract
<b>C</b>	increases	contract	relax
<b>D</b>	increases	relax	contract

10 What is most likely to describe a flower that is wind-pollinated?

- A Anthers are small and inside the flower.
- B Anthers are large and outside the flower.
- C Stigmas are large and inside the flower.
- D Stigmas are small and outside the flower.

11 If  $2n$  is the diploid number of chromosomes in a nucleus, which diagram is correct for meiosis?



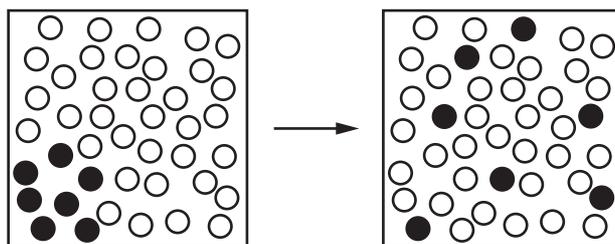
12 What is a producer in a food web?

- A an organism that gets its energy by digesting plants
- B an organism that makes its own food using light energy
- C an organism that obtains energy from digested animals
- D an organism that gets its energy from dead or waste organic matter

13 What is an undesirable effect of deforestation?

- A It increases the oxygen concentration of the atmosphere.
- B It leads to erosion and loss of soil.
- C It makes land available for agriculture.
- D It pollutes the air with methane.

14 Which change is represented by the diagram?



- A condensation
- B diffusion
- C evaporation
- D solidification

15 An atom of an element contains 9 protons, 10 neutrons and 9 electrons.

What is the nucleon number (mass number) of this element?

- A 9
- B 10
- C 19
- D 28

16 Which statements about the reaction between a metal and a non-metal are correct?

- 1 Metal atoms gain electrons.
- 2 Metal atoms lose electrons.
- 3 The non-metal is the reducing agent.
- 4 The non-metal is the oxidising agent.

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

17 1 g of hydrogen contains  $6 \times 10^{23}$  atoms.

The relative atomic mass of helium is 4.

How many atoms does 1 g of helium contain?

- A  $1.5 \times 10^{23}$
- B  $3 \times 10^{23}$
- C  $6 \times 10^{23}$
- D  $2.4 \times 10^{24}$

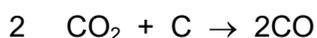
- 18 Which ions gain and lose electrons during the electrolysis of concentrated aqueous sodium chloride?

	ions gaining electrons	ions losing electrons
<b>A</b>	$\text{H}^+$	$\text{Cl}^-$
<b>B</b>	$\text{H}^+$	$\text{OH}^-$
<b>C</b>	$\text{Na}^+$	$\text{Cl}^-$
<b>D</b>	$\text{Na}^+$	$\text{OH}^-$

- 19 Which row describes the type of energy change and the energy transfer when bonds are broken during a chemical reaction?

	type of change	energy transfer
<b>A</b>	endothermic	given out
<b>B</b>	endothermic	taken in
<b>C</b>	exothermic	given out
<b>D</b>	exothermic	taken in

- 20 The equations for reactions in the blast furnace are shown.



Which statement is correct?

- A** In reaction 1, carbon is reduced.  
**B** In reaction 2, carbon dioxide is oxidised.  
**C** In reaction 3, carbon monoxide is oxidised.  
**D** In reaction 4, silicon dioxide is reduced.

21 Which statements about the elements in Group VII of the Periodic Table are correct?

- 1 Only one of them is a liquid at room temperature.
- 2 Their colours become darker down the group.
- 3 Their melting points and boiling points decrease down the group.
- 4 They are all metallic elements called halogens.

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

22 Filament lamps require an inert atmosphere.

Which gas is used to fill these lamps?

- A** argon
- B** helium
- C** hydrogen
- D** oxygen

23 Alloys are formed by dissolving one metal in another.

Alloys are .....1..... .

.....2..... alloys conduct electricity.

Which words complete gaps 1 and 2?

	1	2
<b>A</b>	compounds	All
<b>B</b>	compounds	Some
<b>C</b>	mixtures	All
<b>D</b>	mixtures	Some

24 Part of the reactivity series is shown.

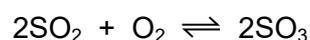
calcium	most reactive
carbon	↓
iron	
hydrogen	
lead	
copper	
gold	

Which statement is correct?

- A Calcium can be extracted by heating its oxide with hydrogen.
- B Copper forms an oxide that can be reduced by heating with gold.
- C Gold forms an oxide that cannot be reduced by heating with carbon.
- D Lead can be extracted by passing hydrogen over its heated oxide.

25 Sulfur dioxide is oxidised to sulfur trioxide in the Contact process.

The equation for this reaction is shown.



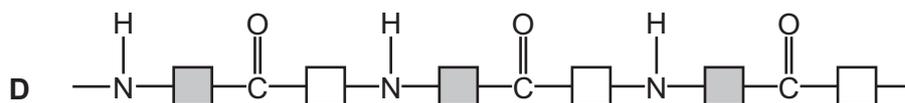
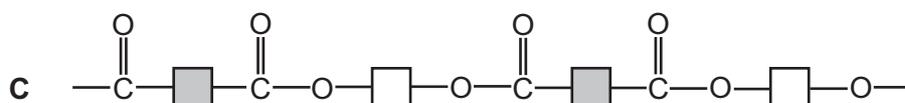
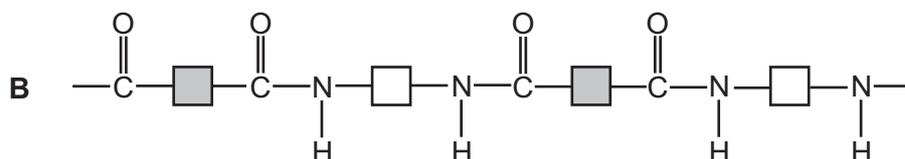
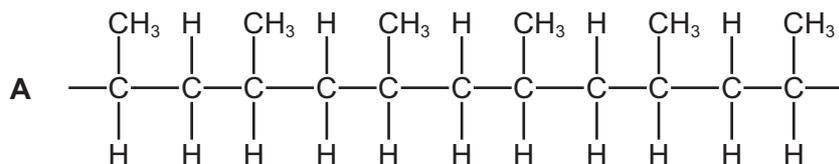
Which row describes the conditions for this reaction?

	catalyst	temperature / °C	pressure / atm
<b>A</b>	Fe	200	2
<b>B</b>	Fe	450	250
<b>C</b>	V <sub>2</sub> O <sub>5</sub>	200	250
<b>D</b>	V <sub>2</sub> O <sub>5</sub>	450	2

26 What is **not** a use of limestone?

- A manufacture of calcium oxide
- B neutralising industrial waste products
- C purifying water
- D treating acidic soil

27 Which diagram represents the structure of nylon?



28 A rock has a mass of 360 g.

A large measuring cylinder contains 500 cm<sup>3</sup> of water.

The rock is now lowered into the water and completely submerged. The water level in the measuring cylinder rises to 650 cm<sup>3</sup>.

Which calculation gives the density of the rock?

**A**  $\frac{360}{150} \text{ g/cm}^3$

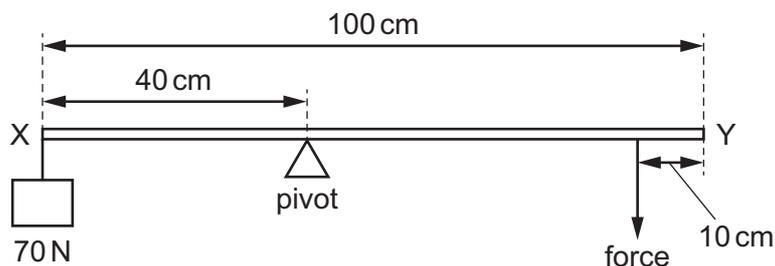
**B**  $360 \times 150 \text{ g/cm}^3$

**C**  $\frac{360}{650} \text{ g/cm}^3$

**D**  $360 \times 650 \text{ g/cm}^3$

- 29 The diagram shows a beam XY of length 100 cm. The weight of the beam can be ignored. There is a pivot at 40 cm from end X and a load of weight 70 N is suspended at end X.

The beam is balanced by a force acting at 10 cm from end Y.



What is the magnitude of this force?

- A** 47 N                    **B** 56 N                    **C** 70 N                    **D** 280 N
- 30 A force acting on an object increases the kinetic energy of the object from 20 J to 50 J in 5.0 s.
- What is the average power produced by the force?
- A** 4.0 W                    **B** 6.0 W                    **C** 10 W                    **D** 14 W
- 31 From which type of energy is electrical energy transferred in a hydroelectric power station?
- A** chemical potential energy  
**B** elastic potential (strain) energy  
**C** gravitational potential energy  
**D** nuclear energy
- 32 The liquid in a liquid-in-glass thermometer is replaced with a different liquid that expands more for the same increase in temperature.

The scale on the thermometer is changed because of the new liquid.

What happens to the sensitivity and what happens to the range of the thermometer?

	sensitivity	range
<b>A</b>	decreases	decreases
<b>B</b>	decreases	increases
<b>C</b>	increases	decreases
<b>D</b>	increases	increases

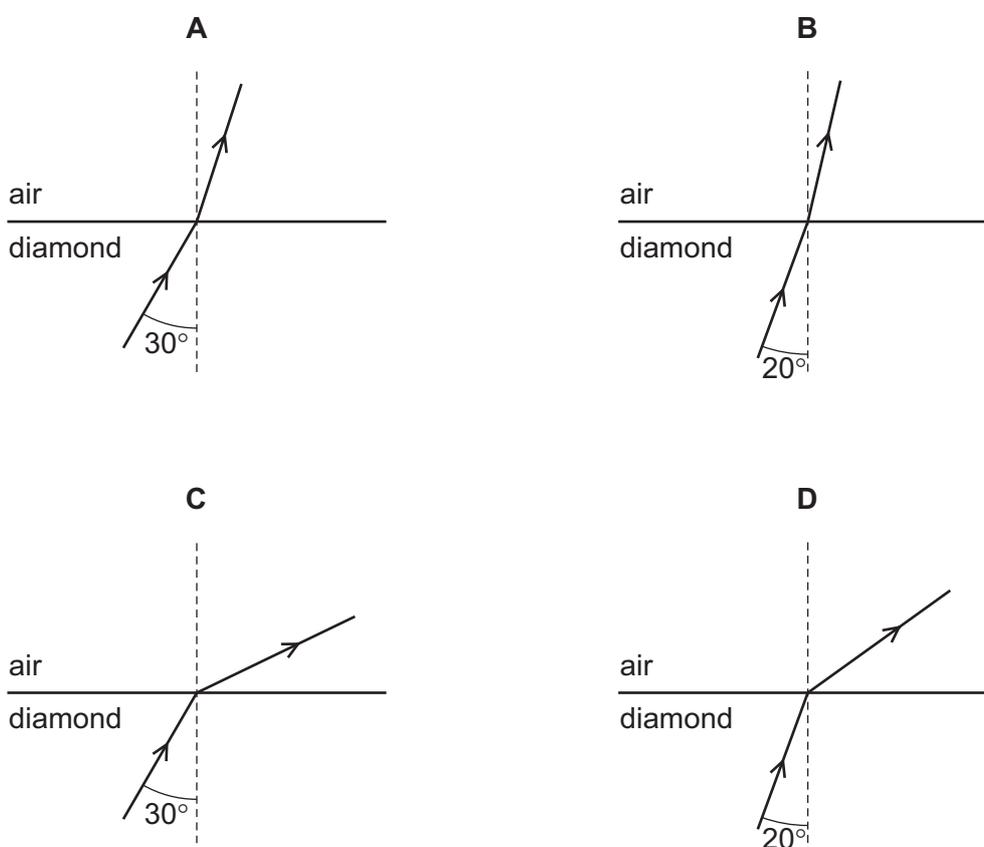
33 One cause of air movement in the atmosphere is convection.

Which statement describes air that rises in the atmosphere due to convection?

- A It is cooler and less dense than the surrounding air.
- B It is cooler and more dense than the surrounding air.
- C It is warmer and less dense than the surrounding air.
- D It is warmer and more dense than the surrounding air.

34 The critical angle for diamond in air is  $25^\circ$ . Light travels faster in air than in diamond.

Which diagram shows the path of light passing from diamond into air?



35 The speeds of sound in three different states of the same substance are 480 m/s, 1500 m/s and 1800 m/s.

Which row gives the state for each of these speeds?

	480 m/s	1500 m/s	1800 m/s
<b>A</b>	gas	liquid	solid
<b>B</b>	gas	solid	liquid
<b>C</b>	solid	gas	liquid
<b>D</b>	solid	liquid	gas

36 Which type of magnet can be switched on and off many times per second?

- A an electromagnet only
- B a permanent magnet only
- C both electromagnets and permanent magnets
- D neither electromagnets or permanent magnets

37 A plastic rod is rubbed with a cloth causing a negative charge on the rod.

Which statements are correct?

- 1 The rod gains electrons.
- 2 The cloth loses electrons.
- 3 The cloth becomes positively charged.

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

38 The maximum current in a food mixer during normal use is 3.1 A.

What is the most suitable rating for a fuse used to protect the mixer?

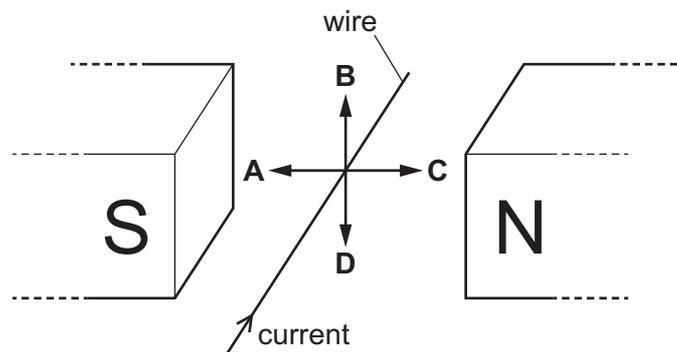
A 1 A                    B 3 A                    C 5 A                    D 8 A

39 A current-carrying wire is placed between the poles of a magnet, as shown.

The current direction in the wire is shown.

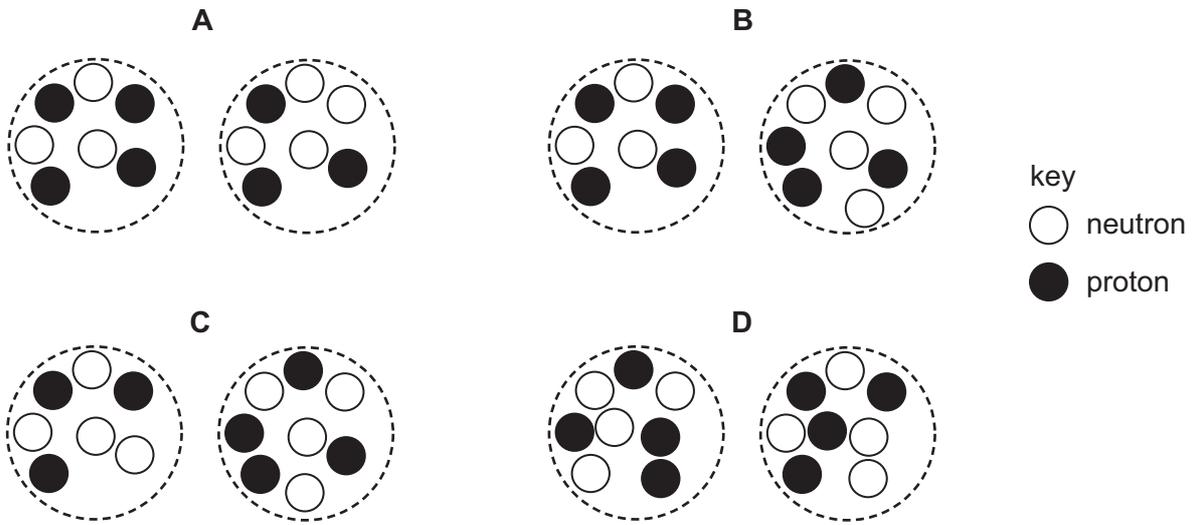
A force is produced on the wire.

In which labelled direction does the force act?



40 The diagrams represent pairs of nuclei of some atoms.

Which pair shows nuclei of different isotopes of the same element?



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The Periodic Table of Elements

Group															
I	II	III						IV	V	VI	VII	VIII			
3 <b>Li</b> lithium 7	4 <b>Be</b> beryllium 9	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>Key</b>                      atomic number                      atomic symbol                      name                      relative atomic mass                 </div>										2 <b>He</b> helium 4			
11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24											5 <b>B</b> boron 11	6 <b>C</b> carbon 12	7 <b>N</b> nitrogen 14	8 <b>O</b> oxygen 16
19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	13 <b>Al</b> aluminium 27	14 <b>Si</b> silicon 28	15 <b>P</b> phosphorus 31	16 <b>S</b> sulfur 32	17 <b>Cl</b> chlorine 35.5	18 <b>Ar</b> argon 40	33 <b>As</b> arsenic 75	34 <b>Se</b> selenium 79	35 <b>Br</b> bromine 80	36 <b>Kr</b> krypton 84				
37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	39 <b>Y</b> yttrium 89	40 <b>Zr</b> zirconium 91	41 <b>Nb</b> niobium 93	42 <b>Mo</b> molybdenum 96	43 <b>Tc</b> technetium —	44 <b>Ru</b> ruthenium 101	45 <b>Rh</b> rhodium 103	46 <b>Pd</b> palladium 106	47 <b>Ag</b> silver 108	48 <b>Cd</b> cadmium 112	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	53 <b>I</b> iodine 127	54 <b>Xe</b> xenon 131
55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	57–71 lanthanoids	72 <b>Hf</b> hafnium 178	73 <b>Ta</b> tantalum 181	74 <b>W</b> tungsten 184	75 <b>Re</b> rhenium 186	76 <b>Os</b> osmium 190	77 <b>Ir</b> iridium 192	78 <b>Pt</b> platinum 195	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium —	85 <b>At</b> astatine —	86 <b>Rn</b> radon —
87 <b>Fr</b> francium —	88 <b>Ra</b> radium —	89–103 actinoids	104 <b>Rf</b> rutherfordium —	105 <b>Db</b> dubnium —	106 <b>Sg</b> seaborgium —	107 <b>Bh</b> bohrium —	108 <b>Hs</b> hassium —	109 <b>Mt</b> meitnerium —	110 <b>Ds</b> darmstadtium —	111 <b>Rg</b> roentgenium —	112 <b>Cn</b> copernicium —	116 <b>Lv</b> livermorium —	—	—	—

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

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