



Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/23

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.

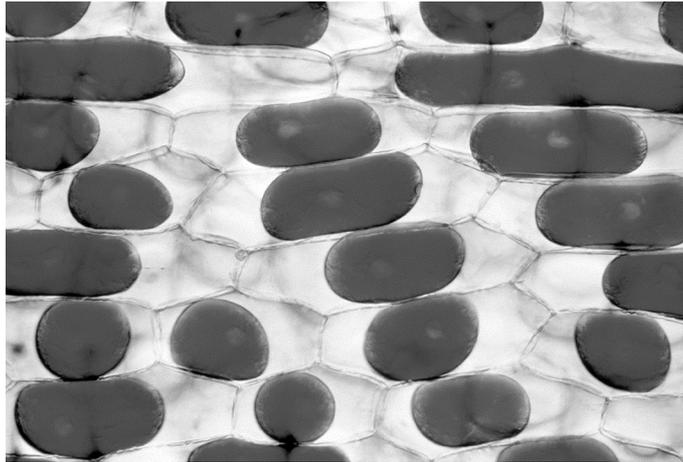
This document has **16** pages. Any blank pages are indicated.



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

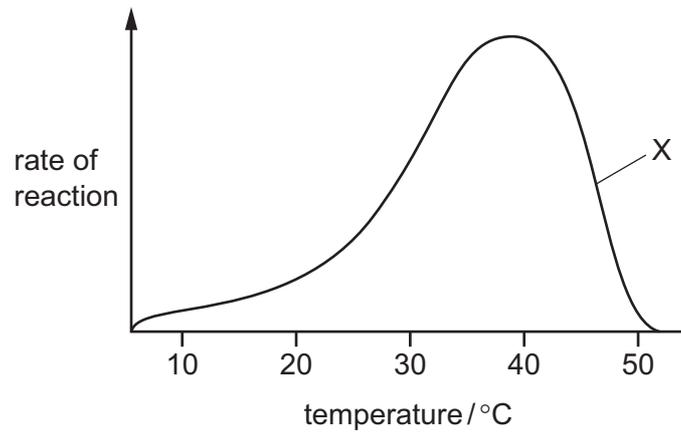
2 The photograph shows red onion cells placed in a concentrated salt solution.



Which statement explains their appearance?

- A Water has moved into the cells against a water potential gradient.
 - B Water has moved out of the cells down a water potential gradient.
 - C Water has moved out of the cells against a water potential gradient.
 - D Water has moved into the cells down a water potential gradient.
- 3 Glycerol is a component of which large molecules?
- A fats
 - B glycogen
 - C proteins
 - D starch

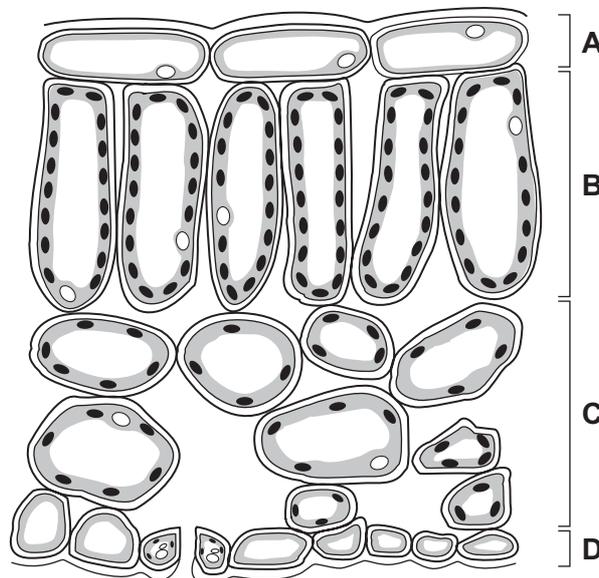
- 4 The graph shows the rate of reaction of salivary amylase at different temperatures.



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 diagram shows a section of a dicotyledonous leaf.

Which layer is the spongy mesophyll?



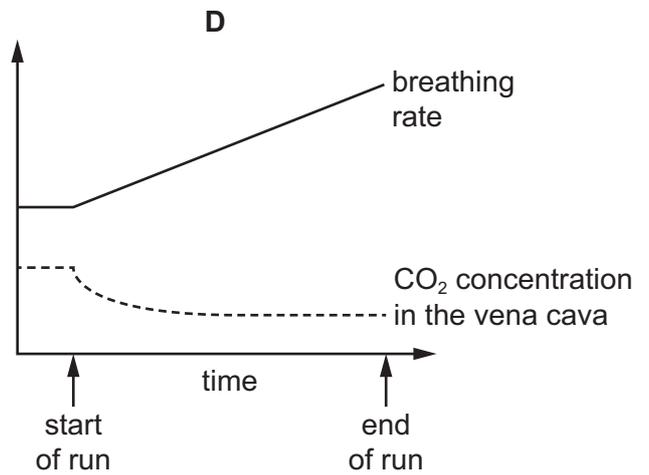
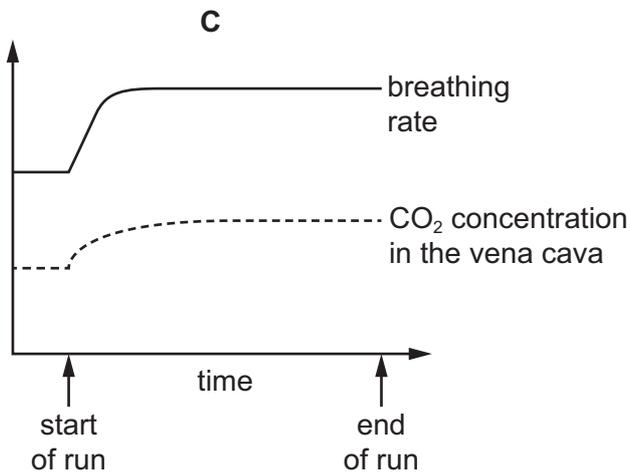
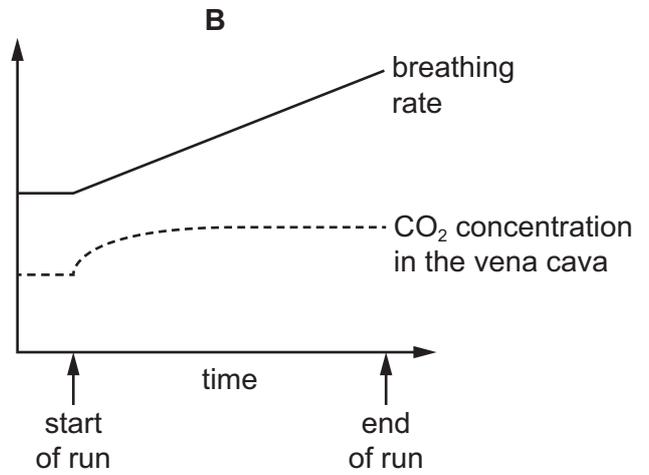
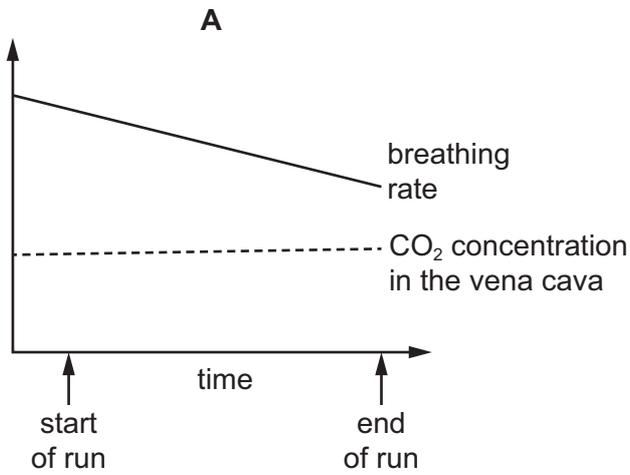
- 6 The condition kwashiorkor is characterised by a poor growth rate, swelling of the hands and feet, and a bulging stomach.

Which component of a balanced diet is lacking in someone with kwashiorkor?

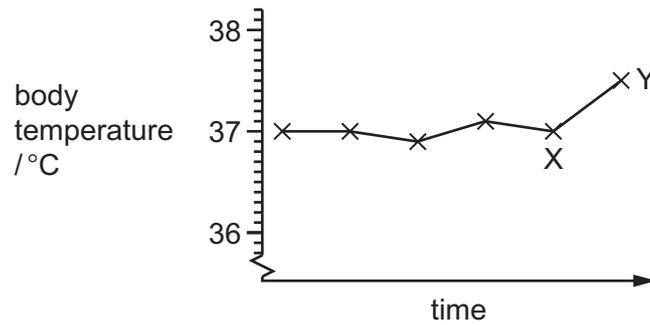
- A fibre
 - B protein
 - C iron
 - D vitamin D
- 7 Which sequence is correct for part of the blood flow pathway in a mammal?
- A heart → pulmonary artery → lungs → pulmonary vein
 - B heart → pulmonary vein → lungs → vena cava
 - C lungs → pulmonary artery → heart → pulmonary vein
 - D lungs → pulmonary vein → heart → pulmonary artery

8 An athlete is running 1000 m.

Which graph shows the changes in their breathing rate and the concentration of carbon dioxide in their vena cava during the run?

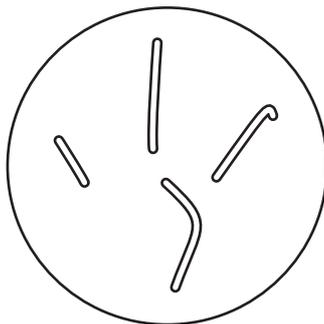


- 9 The graph shows the variation of body temperature over time of a healthy person at rest.



How will the body reverse the temperature change shown between times X and Y?

- A** decreased breathing rate
B decreased pulse rate
C shivering
D sweating
- 10 What are the advantages of a plant reproducing asexually?
- 1 increased variety of genetic material
 - 2 only small flowers need to be produced
 - 3 rapid increase in population size
- A** 1 only **B** 2 only **C** 3 only **D** 1, 2 and 3
- 11 The diagram shows a nucleus from a cell of an organism. The structures shown within the nucleus are chromosomes.



Why is the nucleus haploid?

- A** because each chromosome contains only one copy of the DNA
B because there are only four chromosomes
C because there are two sets of chromosomes
D because there is a single set of unpaired chromosomes

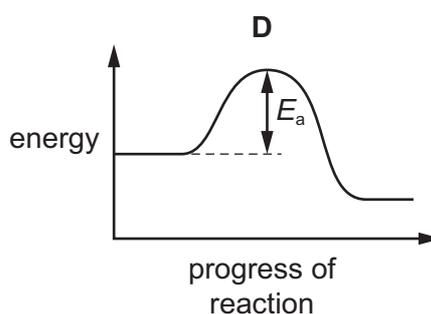
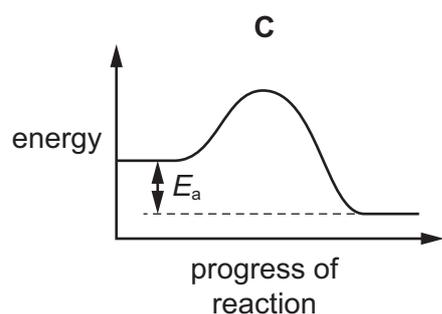
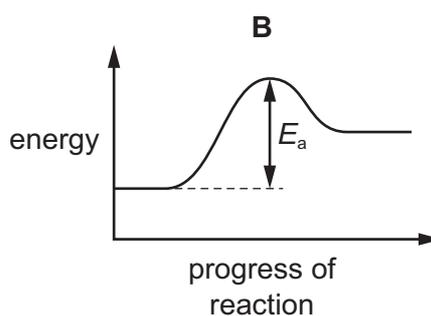
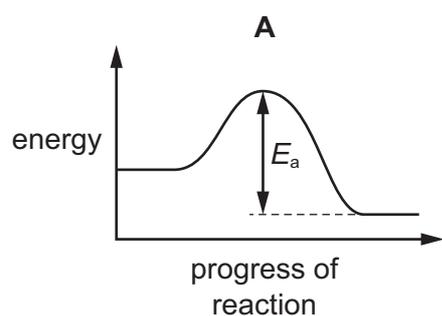
- 12 What is a carnivore?
- A an organism that gets its energy by eating animals
 - B an organism that gets its energy by eating plants
 - C an organism that gets its energy from dead matter
 - D an organism that makes its own organic matter
- 13 What is an undesirable effect of deforestation?
- A It 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 In which substance are the particles closest together at room temperature?
- A CO₂ B Ne C N₂ D Zn
- 15 How many neutrons are in one atom of the isotope $^{35}_{17}\text{Cl}$?
- A 17 B 18 C 35 D 52
- 16 Which statement about ions is **not** correct?
- A Atoms form ions by gaining or losing electrons.
 - B Ions are formed by non-metal atoms only when they lose electrons.
 - C Ions in a solid ionic compound form a lattice structure.
 - D Ions with opposite charges attract each other.
- 17 1 g of hydrogen contains 6×10^{23} atoms.
- The relative atomic mass of helium is 4.
- How many atoms does 1 g of helium contain?
- A 1.5×10^{23} B 3×10^{23} C 6×10^{23} D 2.4×10^{24}

18 Molten calcium bromide is electrolysed using inert electrodes.

What is the ionic half-equation at the cathode?

- A $\text{Ca}^+ \rightarrow \text{Ca} + \text{e}^-$
- B $\text{Ca}^+ + \text{e}^- \rightarrow \text{Ca}$
- C $\text{Ca}^{2+} \rightarrow \text{Ca} + 2\text{e}^-$
- D $\text{Ca}^{2+} + 2\text{e}^- \rightarrow \text{Ca}$

19 Which energy level diagram correctly represents an exothermic reaction?



key
 E_a = activation energy

20 Which equation represents a redox reaction?

- A $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- B $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} \rightarrow \text{CuSO}_4 + 5\text{H}_2\text{O}$
- C $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$
- D $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

21 What is **not** a property of transition elements?

- A They often act as catalysts.
- B They form coloured compounds.
- C They have high densities.
- D They have low melting points.

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 are1..... .

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

Which words complete gaps 1 and 2?

	1	2
A	compounds	All
B	compounds	Some
C	mixtures	All
D	mixtures	Some

24 P, Q, R and S are four metals.

The oxide of metal R can be reduced by metal S, but not by metal P.

The oxide of metal Q can be reduced both by metal S and by metal P.

Which row shows the order of reactivity of these metals?

	least reactive	—————→			most reactive
A	Q	R	P	S	
B	Q	P	R	S	
C	S	P	R	Q	
D	S	R	P	Q	

25 Which statements about the Contact process are correct?

- 1 An iron catalyst is used.
- 2 Oleum is added to water.
- 3 Sulfur dioxide is converted to sulfur trioxide.
- 4 Sulfur trioxide is reacted with water.

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

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 statement describes addition polymers?

A They contain long chains made from only one type of monomer.

B They contain $\begin{array}{c} \text{O} \\ \parallel \\ \text{---C---N---} \\ | \\ \text{H} \end{array}$ links.

C They contain carbon-carbon double bonds.

D They contain $\begin{array}{c} \text{O} \\ \parallel \\ \text{---C---O---} \end{array}$ links.

28 The gravitational field strength at the Earth's North Pole is greater than at the Equator.

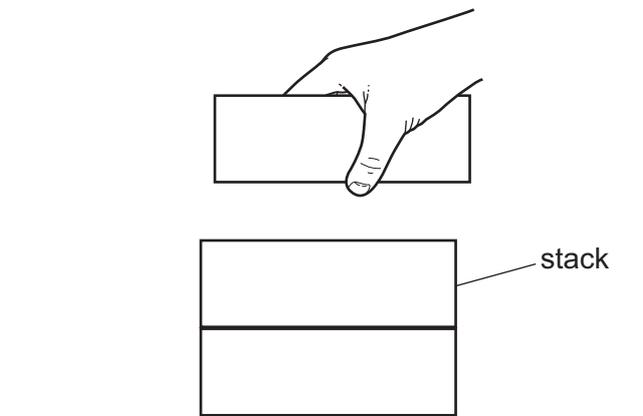
An object is moved from the Equator to the North Pole.

What effect, if any, does this have on the mass and on the weight of the object?

	mass	weight
A	increases	increases
B	increases	stays the same
C	stays the same	increases
D	stays the same	stays the same

- 29 A brick has a mass of 1.5 kg. It rests on the ground and the area of contact with the ground is 0.030 m^2 .

A stack of such bricks is made by placing the bricks on top of each other, as shown.



The pressure on the ground due to the stack must **not** exceed 5700 Pa.

What is the maximum number of bricks that can be made into such a stack?

gravitational field strength = 10 N/kg

- A 11 B 12 C 114 D 256
- 30 Which equation for kinetic energy (K.E.) is correct?
- A $\text{K.E.} = \frac{1}{2}(mv)^2$
 B $\text{K.E.} = \frac{1}{2}mv^2$
 C $\text{K.E.} = mv^2$
 D $\text{K.E.} = mgh$
- 31 A car accelerates uniformly from rest along a horizontal road. After 5.0 s, its kinetic energy is 400 kJ.
- What is the useful power produced by the engine of the car?
- A 80 W B 2000 W C 80 000 W D 2 000 000 W
- 32 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

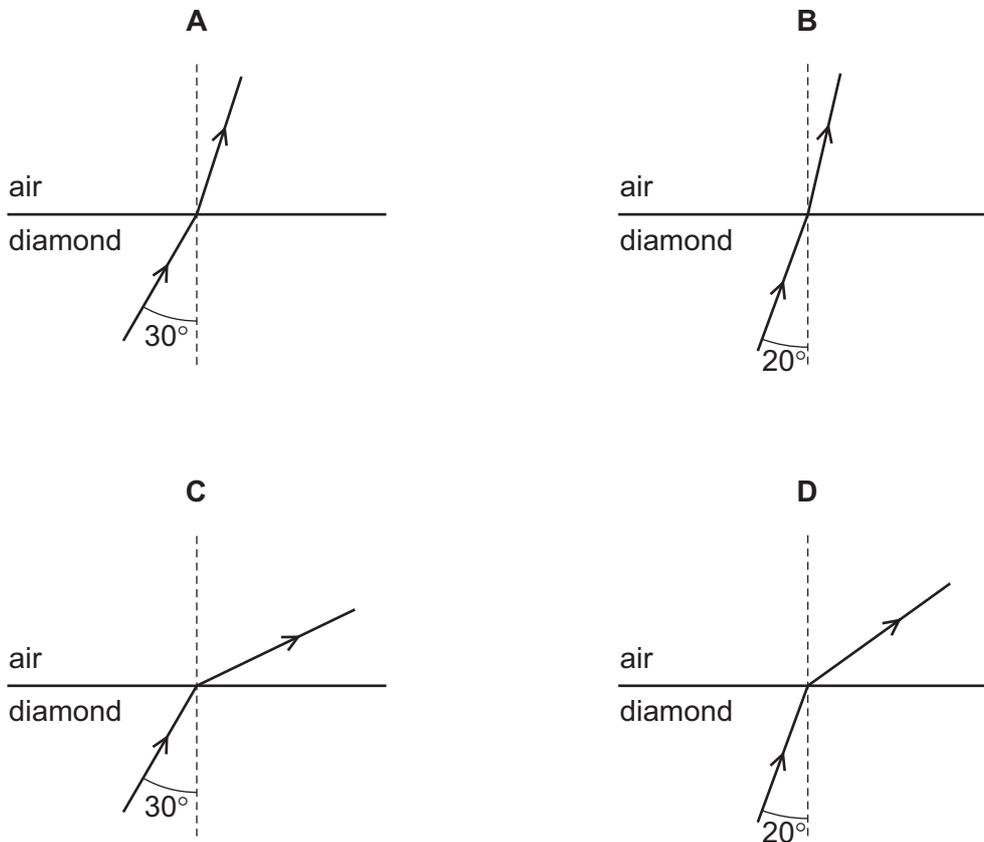
- 33 A fixed mass of gas is trapped in a container. The temperature of the gas is increased but the volume of the container does not change.

How do the kinetic energy of the molecules and the pressure of the gas change?

	kinetic energy	pressure
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 34 The critical angle for diamond in air is 25° . Light travels faster in air than in diamond.

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



- 35 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

36 A charge of 480 C passes through a wire in 3.0 minutes.

What is the average current in the wire?

- A 2.7 A B 24 A C 160 A D 1440 A

37 What is an advantage of connecting lamps in parallel in a circuit, rather than in series?

- A The lamps do not use as much energy.
 B The lamps last longer before failing.
 C The potential difference (p.d.) across each lamp is smaller.
 D When one lamp fails, all the others remain lit.

38 A device that is designed to protect a circuit contains a thin wire. When there is a large current in the circuit, the thin wire melts and cuts off the supply.

What is the device?

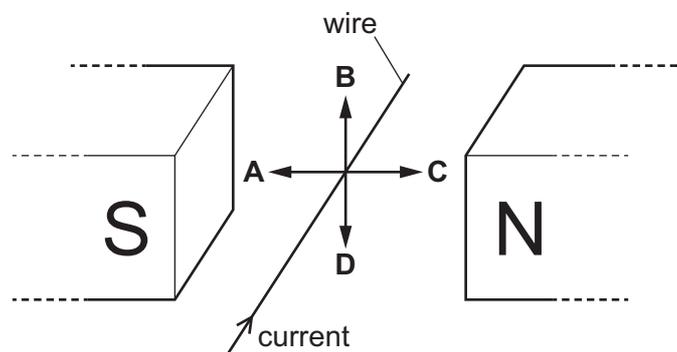
- A fuse
 B lamp
 C resistor
 D thermistor

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

The current direction in the wire is shown.

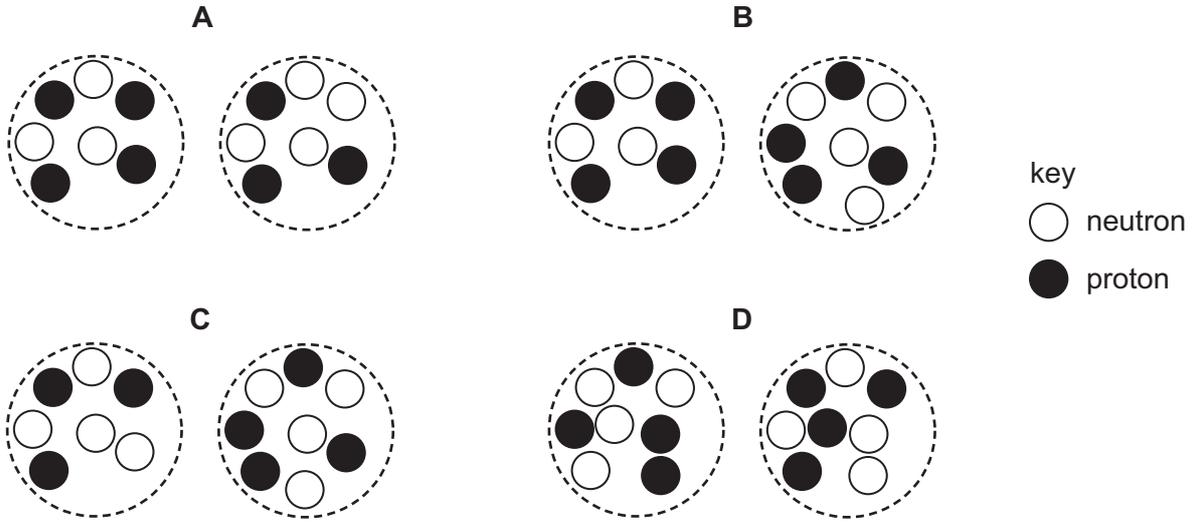
A force is produced on the wire.

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 Li lithium 7	4 Be beryllium 9	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Key atomic number atomic symbol name relative atomic mass </div>										2 He helium 4			
11 Na sodium 23	12 Mg magnesium 24											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16
19 K potassium 39	20 Ca calcium 40	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	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	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	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 —	116 Lv livermorium —	—	—	—

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 dm³ at room temperature and pressure (r.t.p.).