Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/13**

Paper 1 Multiple Choice (Core) **May/June 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.

[Turn over

1 What is respiration?

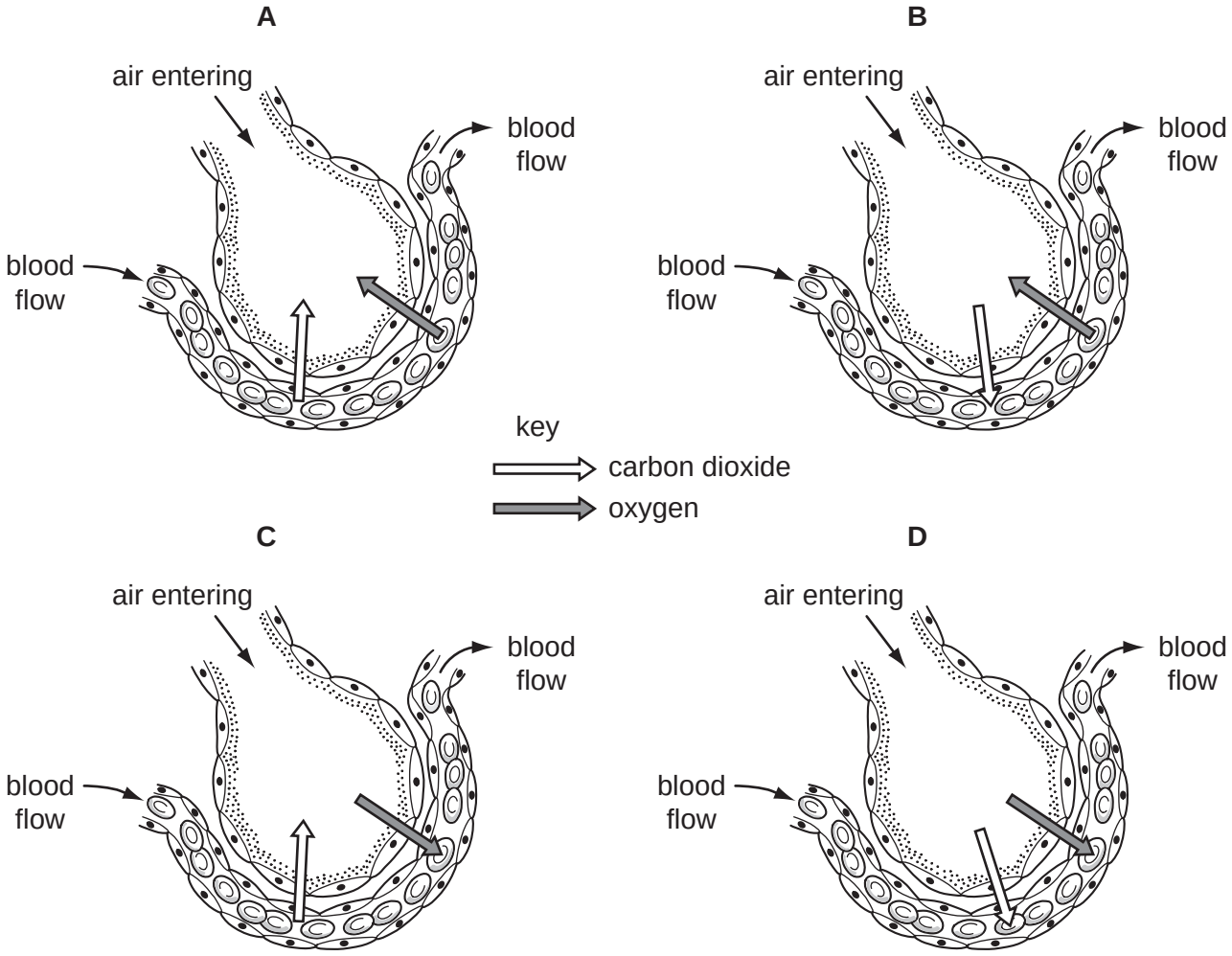
A breakdown of food by enzymes in the alimentary canal

B breathing to supply oxygen to cells

C release of carbon dioxide from the lungs

D release of energy for body activities

2 Which diagram correctly shows the diffusion of carbon dioxide and oxygen between an alveolus and a capillary?



3 Which row matches the nutrient to the chemical elements that it contains?

	nutrient	carbon	hydrogen	oxygen	nitrogen
A	fat	✓	✓	✗	✗
B	protein	✓	✓	✓	✓
C	starch	✓	✗	✓	✓
D	sugar	✗	✓	✓	✓

key
✓ = contains element
✗ = does not contain element

4 Which type of molecule are enzymes?

A fat

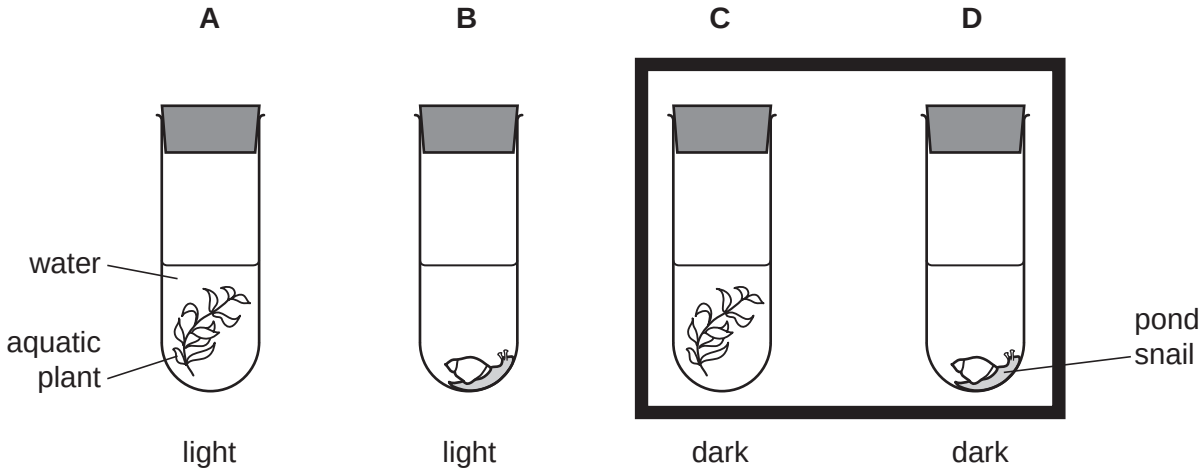
B carbohydrate

C protein

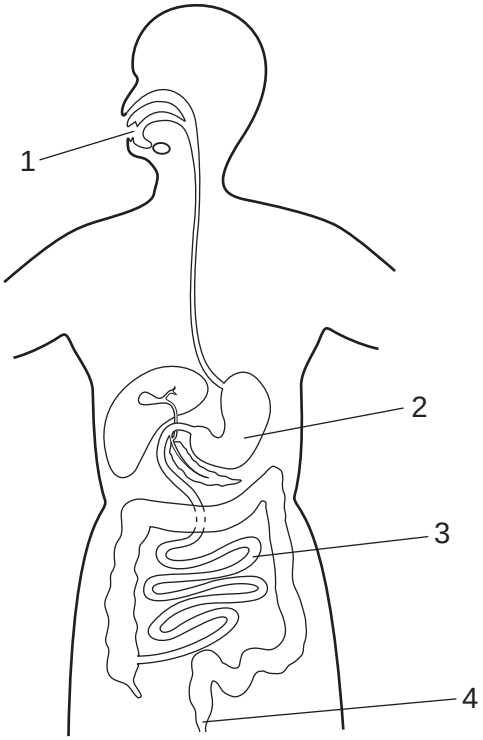
D DNA

5 Four test-tubes were set up as shown.

Which test-tube will contain the most dissolved oxygen after 24 hours?



6 The diagram shows the human digestive system.



Where do digestion, egestion, ingestion and absorption take place?

	digestion	egestion	ingestion	absorption
A	1	4	2	3
B	2	4	1	3
C	3	1	4	2
D	4	3	2	1

7 Transpiration is the process by which water moves through a plant.

From which cells in the leaf does most of the water evaporate and through which structure is it lost as water vapour to the atmosphere?

	evaporates from	lost as water vapour through
A	epidermis	cuticle
B	epidermis	stomata
C	mesophyll	cuticle
D	mesophyll	stomata

8 A child blows into a rubber balloon.

What is the percentage of oxygen inside the balloon?

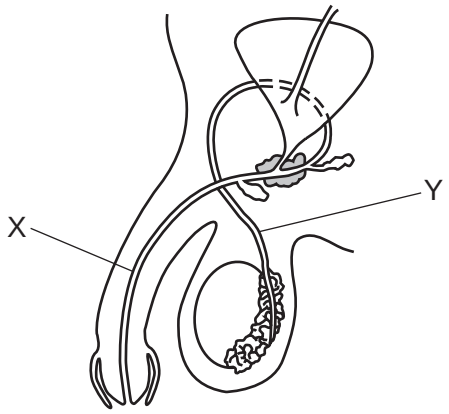
A 0% **B** 4% **C** 16% **D** 21%

9 A student is in a dangerous situation and adrenaline is released into the blood. The table shows changes to pulse rate, breathing rate and pupil diameter.

Which row correctly describes the effect of adrenaline?

	pulse rate	breathing rate	pupil diameter
A	decrease	increase	decrease
B	decrease	decrease	increase
C	increase	increase	increase
D	increase	decrease	decrease

10 The diagram shows the human male reproductive system.



What are the functions of X and Y?

	X	Y
A	carries urine and semen out of the body	transfers sperm to the urethra
B	production of male gametes	transfers semen to the vagina during sexual intercourse
C	transfers semen to the vagina during sexual intercourse	production of male gametes
D	transfers sperm to the urethra	carries urine and semen out of the body

11 Which row is correct for the inheritance of sex in humans?

	female	male
A	XX	XY
B	XY	XX
C	YY	XX
D	XX	YY

12 Dung beetles lay their eggs in the faeces of plant-eating mammals like buffalo. Both the adult beetles and their young stages eat the **undigested** food in the faeces.

Which diagram shows this food relationship?

A buffalo → dung beetles; buffalo → grass

B dung beetles → grass → buffalo

C grass → dung beetles → buffalo

D grass → buffalo; grass → dung beetles

13 Which process removes carbon dioxide from the atmosphere?

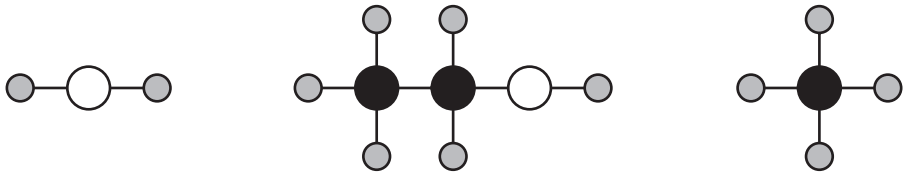
A combustion

B photosynthesis

C respiration

D transpiration

14 The structures of some substances are shown.



water ethanol methane

Which row shows the total number of different elements and the total number of atoms in the three structures?

	total number of different elements	total number of atoms
A	3	9
B	3	17
C	7	9
D	7	17

15 Which method can be used to separate graphite from dilute nitric acid?

A chromatography

B crystallisation

C distillation

D filtration

16 Which statement about a carbon dioxide molecule is correct?

A It is composed of metallic elements, which are covalently bonded.

B It is composed of metallic elements, which are ionically bonded.

C It is composed of non-metallic elements, which are covalently bonded.

D It is composed of non-metallic elements, which are ionically bonded.

17 Hydrogen reacts with iodine to form hydrogen iodide.

The equation for this reaction is shown.

$$H_2 + I_2 \rightarrow 2HI$$

During this reaction the temperature increases.

Which statement explains why the temperature increases?

A One molecule of hydrogen is forming two molecules of hydrogen iodide.

B The reaction is exothermic.

C The reaction is very fast.

D The reaction takes in energy.

18 The catalytic converter in the exhaust of a car brings about the reaction shown.

$$2NO + 2CO \rightarrow 2CO_2 + N_2$$

Which row about this reaction is correct?

	oxidation	reduction
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = occurs

✗ = does not occur

19 The results of two tests on substance X are listed.

1 A lilac flame is produced in a flame test.

2 A gas which turns damp red litmus blue is produced when X is heated with aluminium powder and aqueous sodium hydroxide.

What is X?

A potassium nitrate

B potassium sulfate

C sodium nitrate

D sodium sulfate

20 What reacts with ammonia gas?

	hydrochloric acid	sodium hydroxide
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = reacts

✗ = does not react

21 Which row describes trends in the properties of Group I elements as the group is descended?

	melting point	reactivity with water
A	decreasing	decreasing
B	decreasing	increasing
C	increasing	decreasing
D	increasing	increasing

22 Bauxite is the main ore of aluminium.

Which method is used to extract pure aluminium from bauxite?

A fractional distillation

B electrolysis

C neutralisation

D thermal decomposition

23 In order to make water from reservoirs fit to drink .....1..... is used to kill bacteria.

Water in a condenser is used during distillation as a .....2..... .

When water is used to make ethanol from ethene it is acting as a .....3..... .

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	chlorination	coolant	reactant
B	chlorination	solvent	solvent
C	filtration	coolant	reactant
D	filtration	solvent	solvent

24 Other than hydrogen and oxygen, which substance provides only **one** of the essential elements for plant growth?

A K_3PO_4 **B** KNO_3 **C** $(NH_4)_3PO_4$ **D** NH_4NO_3

25 What are the products of the thermal decomposition of calcium carbonate, $CaCO_3$?

A calcium and carbon dioxide

B calcium, carbon and oxygen

C calcium oxide and carbon dioxide

D calcium oxide and carbon monoxide

26 Which property allows petroleum to be separated by fractional distillation?

A boiling point

B colour

C density

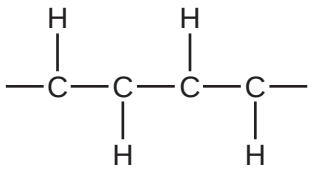
D melting point

27 Poly(ethene) is a saturated hydrocarbon.

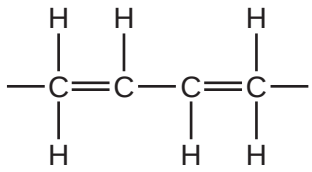
It is formed by the addition polymerisation of ethene, $H_2C=CH_2$.

Which diagram shows part of a molecule of poly(ethene)?

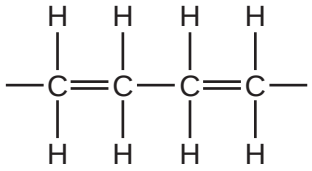
A



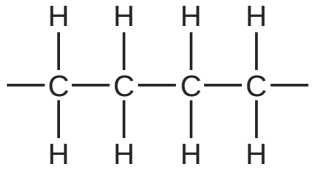
B



C



D



28 A girl runs 5000 m in 1200 seconds and then walks a further 3000 m in 1800 seconds.

What is her average speed for this journey?

A 1.7 m/s **B** 2.7 m/s **C** 2.9 m/s **D** 5.8 m/s

29 An object is falling freely near the Earth without air resistance.

Which statement about the acceleration of the object is correct?

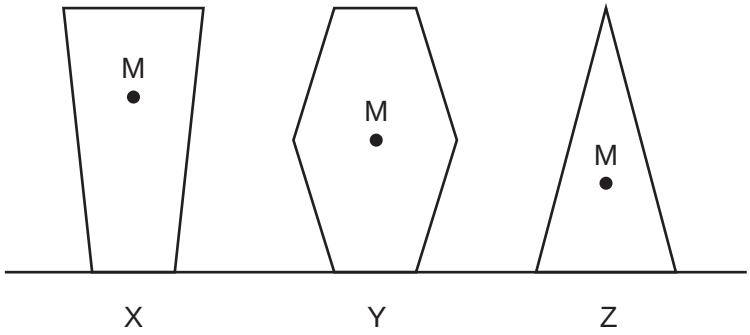
A It is constant, but not zero.

B It is decreasing.

C It is increasing.

D It is zero.

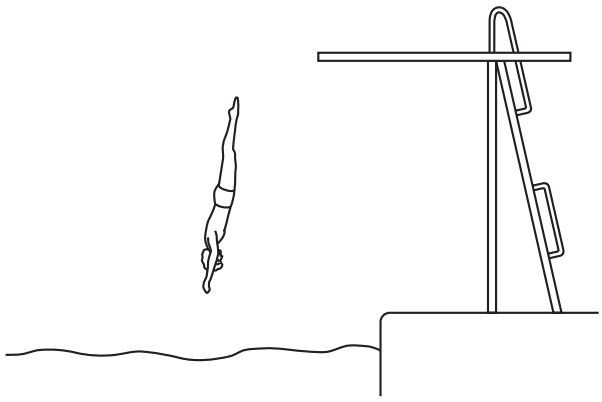
30 Three objects X, Y and Z are at rest on a table. The centre of mass of each object is labelled M.



What is the order of stability of these three objects, from most stable to least stable?

A $X \rightarrow Y \rightarrow Z$ **B** $Y \rightarrow Z \rightarrow X$ **C** $X \rightarrow Z \rightarrow Y$ **D** $Z \rightarrow Y \rightarrow X$

31 The diagram shows a man diving into water.



Which form of energy is increasing as he accelerates downwards through the air?

A chemical

B elastic potential (strain)

C gravitational potential

D kinetic

32 There is a vacuum between the double walls of a vacuum flask.

Which of the methods of thermal energy transfer are prevented by the vacuum?

A conduction only

B conduction and convection

C convection only

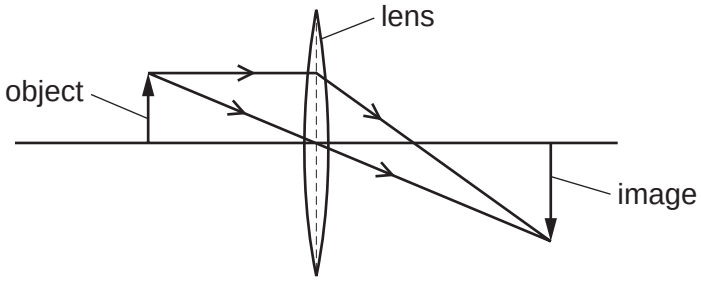
D radiation only

33 A boy looks into a plane mirror that is 50 cm in front of his face.

How far from the boy's face is the image of his face?

A 25 cm **B** 50 cm **C** 100 cm **D** 150 cm

34 The diagram shows the image of an object produced by a thin converging lens.



How is the image described?

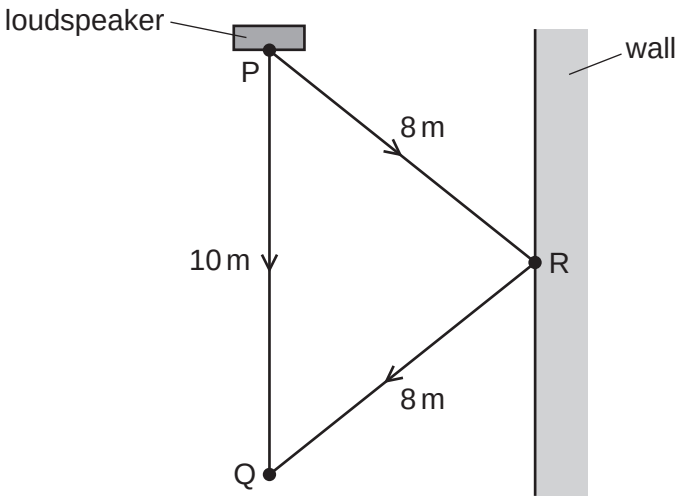
A diminished and inverted

B diminished and upright

C enlarged and inverted

D enlarged and upright

35 Sound from a loudspeaker at P travels directly to Q. Sound also reaches Q after being reflected from a wall at R.



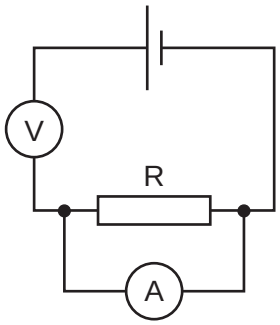
The speed of sound is 330 m / s.

What is the **difference** in time for sound to travel from P to Q by the two routes?

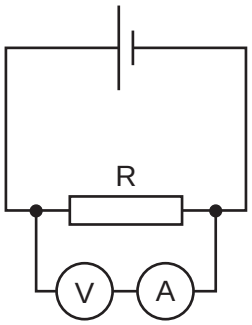
A $\left(\frac{6}{330}\right)$ s **B** $\left(\frac{16}{330}\right)$ s **C** (6×330) s **D** (16×330) s

36 Which circuit can be used to take measurements to determine the resistance of resistor R?

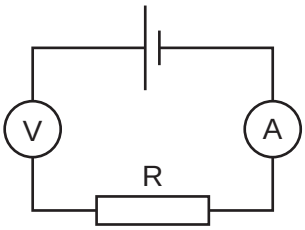
A



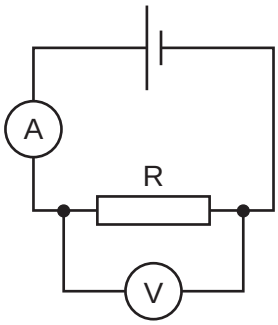
B



C

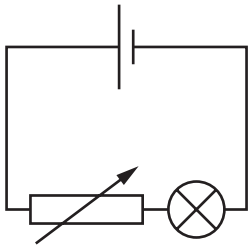


D

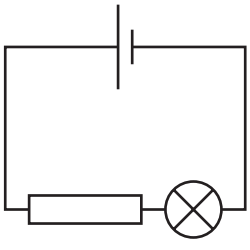


37 In which circuit can the brightness of the lamp be varied continuously?

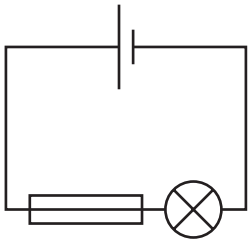
A



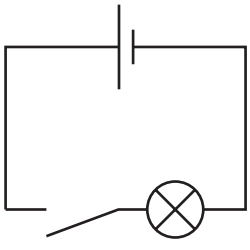
B



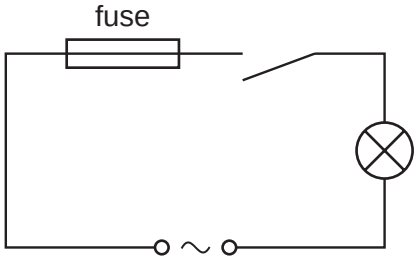
C



D



38 A student connects the circuit shown.



When the switch is closed the fuse blows and stops the current.

What is a possible reason for this?

A The current rating of the fuse is too high.

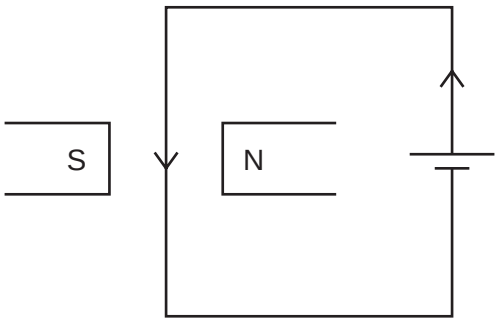
B The current is too large.

C The lamp is too dim.

D The voltage is too small.

39 The diagram shows a wire in a magnetic field.

There is a current in the wire.



The force produced on the wire causes the wire to move into the page.

The direction of the current is now reversed.

What happens to the wire?

A It does not move at all.

B It moves out of the page.

C It moves sideways towards one of the poles of the magnet.

D It still moves into the page.

40 A radioactive nucleus emits a β-particle.

What happens to the proton number (atomic number) of the nucleus?

A It stays the same.

B It increases by 1.

C It decreases by 2.

D It decreases by 4.

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 –		114 Fl flerovium –		116 Lv livermorium –		

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.).