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Science Practice Mock Test Foundation [Higher]

This Paper contain 3 sections – Biology, Physics, Chemistry,

Time Allowed– 1hr 45 Min
Total Marks – 90

Do not write outside the box

0 1 A scientist cooled the air inside a container.

0 1. 1 The temperature of the air changed from 20 °C to 0 °C

The volume of the container of air stayed the same.

Explain how the motion of the air molecules caused the pressure in the container to change as the temperature decreased.

[3 marks]

0 1. 2 The air contained water that froze at 0 °C

The change in internal energy of the water as it froze was 0.70 kJ

The specific latent heat of fusion of water is 330 kJ/kg

Calculate the mass of ice produced.

Use the Physics Equations Sheet.

[3 marks]

Mass of ice = _____ kg

Do not write outside the box

0 1 . 3 The air also contained oxygen, nitrogen and carbon dioxide.

Oxygen boils at –183 °C and freezes at –218 °C
Nitrogen boils at –195 °C and freezes at –210 °C
Carbon dioxide sublimates at –78 °C

The scientist continued to cool the air to a temperature of –190 °C

What is the state of each substance at –190 °C?

[2 marks]

Tick (✓) **one** box for **each** row of the table.

Substance	**Solid**	**Liquid**	**Gas**
Oxygen			
Nitrogen			
Carbon dioxide			

Question 1 continues on the next page

Do not write outside the box

0 1 . 4 The air also contained a small amount of argon.

As the temperature of the air decreased from 20 °C to –190 °C the argon changed from a gas to a liquid to a solid.

Explain the changes in the arrangement and movement of the particles of the argon as the temperature of the air decreased.

[6 marks]

14

Do not write outside the box

0 2 Protactinium (Pa) is radioactive.

0 2 . 1 An atom of one isotope of protactinium contains 91 protons and 143 neutrons.

What is the correct symbol for this atom?

[1 mark]

Tick (✓) **one** box.

$^{143}_{91}Pa$ ☐ $^{234}_{91}Pa$ ☐ $^{234}_{143}Pa$ ☐ $^{91}_{52}Pa$ ☐

A teacher investigated how the count rate from a sample of protactinium changed over time.

Table 2 shows the results.

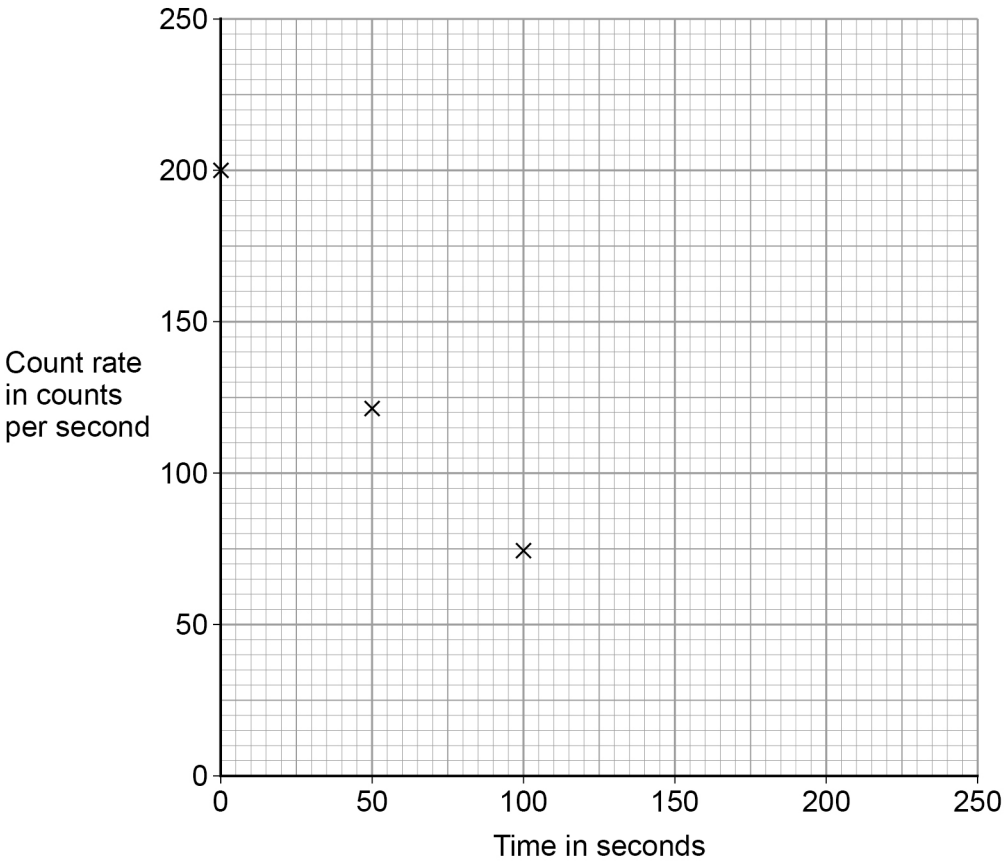
Table 2

Time in seconds	Count rate in counts per second
0	200
50	122
100	74
150	45
200	27

Do not write outside the box

Figure 6 shows some of the teacher's results.

Figure 6



0 2 . 2 Complete the graph in **Figure 6**.

Use data from **Table 2**.

Draw the line of best fit.

[2 marks]

0 2 . 3 How much time did it take for the count rate to change from 200 counts per second to 100 counts per second?

[1 mark]

Time taken = _____ s

0 2 . 4 What is the half-life of protactinium?

[1 mark]

Half-life = _____ s

Turn over ►

Do not write outside the box

0 2 . 5 The nuclear radiation from the protactinium can pass through paper.

This radiation can only be detected up to 1 metre away from the protactinium.

What type of radiation is emitted by the protactinium?

[1 mark]

Tick (✓) **one** box.

Alpha ☐

Beta ☐

Gamma ☐

Neutron ☐

0 2 . 6 The teacher read an article about the effects of radiation on the human body.

Why are articles in scientific journals generally more trustworthy than articles in newspapers?

[1 mark]

_____

_____

7

Do not write outside the box

0 3 Magnetic force is a non-contact force.

0 3 . 1 Which **two** of these are also non-contact forces?

[2 marks]

Tick (✓) **two** boxes.

Air resistance ☐

Electrostatic ☐

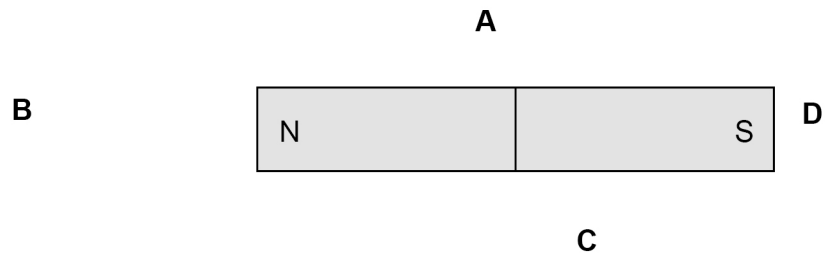
Friction ☐

Gravitational ☐

Tension ☐

0 3 . 2 **Figure 1** shows a bar magnet.

Figure 1



Which letter shows the position where the magnetic field around the bar magnet is strongest?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Do not write outside the box

0 3 . 3 When two magnets are brought close to each other they exert a force on each other.

Describe how two bar magnets can be used to demonstrate a force of attraction and a force of repulsion.

[2 marks]

Force of attraction _____

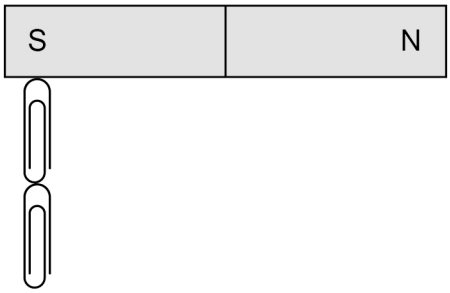
_____

Force of repulsion _____

_____

Figure 2 shows some paper clips that are attracted to a permanent magnet.

Figure 2



0 3 . 4 The paperclips become magnetised when they are close to the permanent magnet.

What is the name of this type of magnetism?

[1 mark]

Tick (✓) **one** box.

Forced magnetism ☐

Induced magnetism ☐

Strong magnetism ☐

0 3 . 5 Label the north and south poles of the two magnetised paper clips in **Figure 2**.

[2 marks]

8

Do not write outside the box

0 4 Magnetic force is a non-contact force.

0 4 . 1 Which **two** of these are also non-contact forces?

[2 marks]

Tick (✓) **two** boxes.

- Air resistance ☐
- Electrostatic ☐
- Friction ☐
- Gravitational ☐
- Tension ☐

0 4 . 2 **Figure 1** shows a bar magnet.

Figure 1

Which letter shows the position where the magnetic field around the bar magnet is strongest?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

End of Physics

Do not write outside the box

0 1 Conditions inside the human body are controlled.

0 1 . 1 What is the control of conditions inside the body called?

[1 mark]

Tick (✓) **one** box.

Excretion ☐

Fertilisation ☐

Homeostasis ☐

Osmosis ☐

0 1 . 2 What are the **two** ways information is sent to control body conditions?

[2 marks]

Tick (✓) **two** boxes.

By antigens ☐

By hormones ☐

By muscles ☐

By nerve impulses ☐

By red blood cells ☐

0 1 . 3 One condition in the body that needs to be controlled is the level of water.

Give **one** other condition in the human body that needs to be controlled.

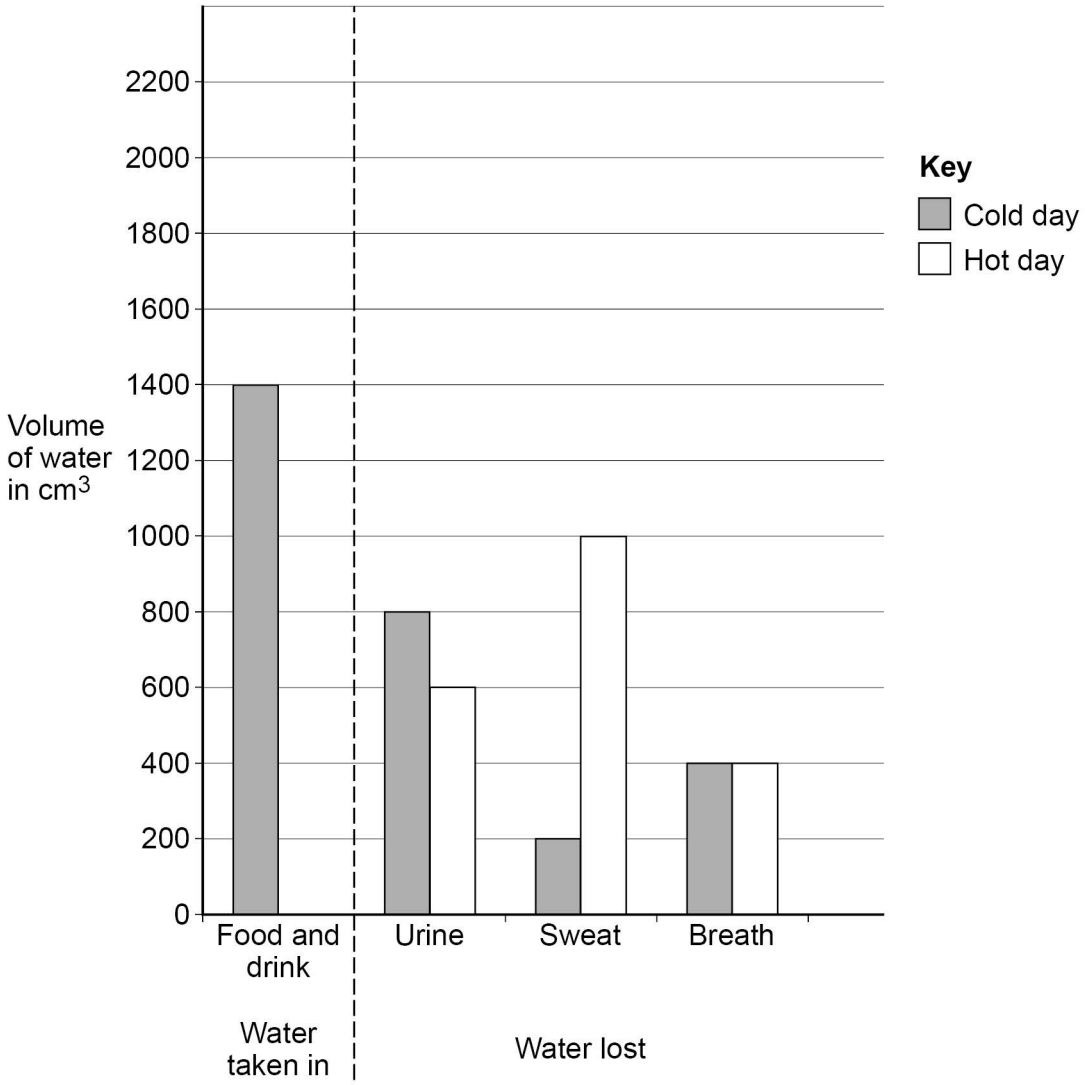
[1 mark]

Do not write outside the box

Figure 1 shows the volumes of water taken in and lost by one person.

The volume for water taken in on a hot day has **not** been plotted on the bar graph.

Figure 1



0 1 . 4 The person lost 1400 cm^3 of water on the cold day.

How much extra water did they lose on the hot day?

[2 marks]

Extra volume of water lost = _____ cm^3

Turn over ►

Do not write outside the box

0 1 . 5 Explain why the volume of water lost on a hot day is higher than on a cold day.

[2 marks]

0 1 . 6 A boy drank 750 cm^3 of water.

His total intake of water for that day was 3000 cm^3

Calculate the percentage of the boy's total intake that the 750 cm^3 represents.

[2 marks]

Percentage = _____ %

10

Do not write outside the box

0 3 Homeostasis regulates the internal conditions of the human body.

0 3 . 1 Which **two** processes are regulated by homeostasis?

[2 marks]

Tick (✓) **two** boxes.

- Controlling water output in urine ☐
- Defending the body against pathogens ☐
- How quickly you walk ☐
- Keeping cool on a hot day ☐
- Waking up in the morning ☐

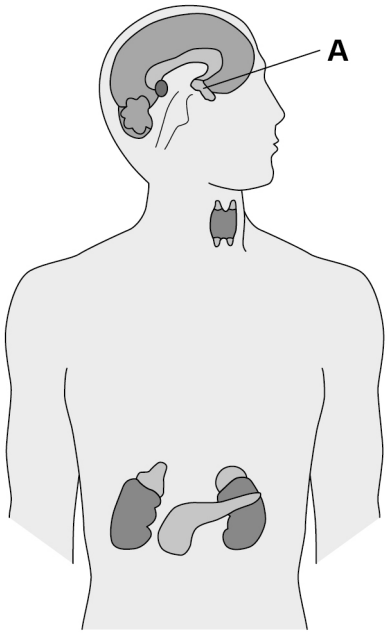
Do not write outside the box

Hormones are produced by glands in the endocrine system.

Each hormone has an effect on a target organ.

Figure 6 shows glands of the endocrine system.

Figure 6



0 3 . 2 What is the name of gland **A**?

[1 mark]

Tick (✓) **one** box.

Pancreas ☐

Pituitary ☐

Thyroid ☐

Question 3 continues on the next page

Do not write outside the box

Before eating a sugar-coated cereal a person had a blood glucose concentration of 5.2 mmol/dm^3

Soon after eating the cereal the person had a blood glucose concentration of 8.4 mmol/dm^3

0 3 . 3 Calculate the increase in the blood glucose concentration.

[1 mark]

Increase = _____ mmol/dm^3

0 3 . 4 The person needed medication to decrease their blood glucose concentration.

Suggest what disorder the person has.

[1 mark]

0 3 . 5 There is a problem with the hormone control of the person.

What is the problem?

[1 mark]

Tick (✓) **one** box.

The blood is not taking hormones to target organs. ☐

The pancreas is not releasing insulin. ☐

The pituitary gland is not being stimulated. ☐

Do not write outside the box

0 3 . 6 The person:

- works in an office
- drives to work
- is overweight
- watches the television and reads every night
- drinks a hot chocolate every night.

Suggest **two** lifestyle changes the person could make to help treat their disorder.

[2 marks]

1 _____

_____

2 _____

_____

8

Turn over for the next question

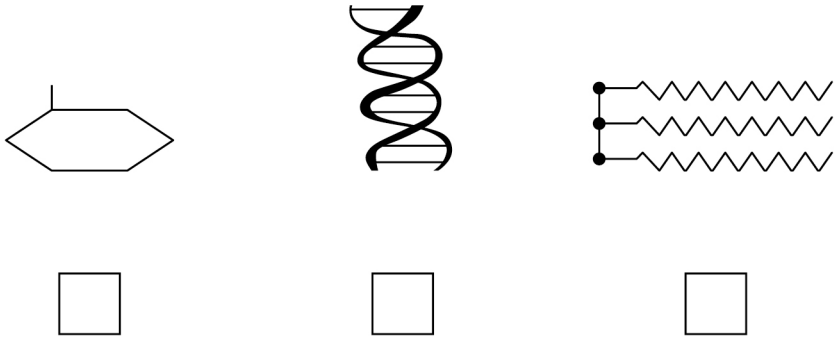
Do not write outside the box

0 4 This question is about DNA and genes.

0 4 . 1 Which diagram represents a DNA molecule?

[1 mark]

Tick (✓) **one** box.



0 4 . 2 Describe the structure of a DNA molecule.

[1 mark]

0 4 . 3 A gene is a small section of DNA on a chromosome.

Complete the sentences.

[2 marks]

A gene codes for a particular sequence of _____ .

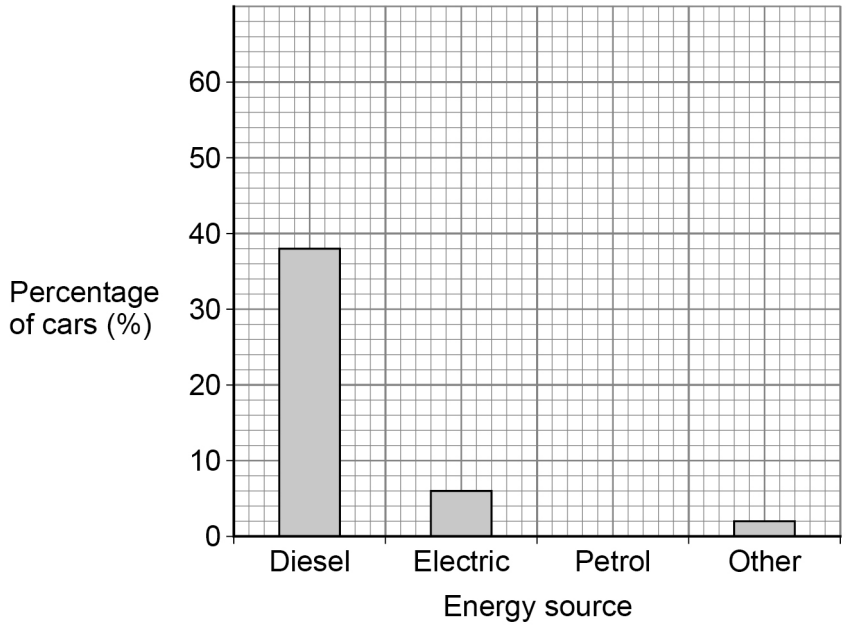
This sequence makes a specific _____ .

Do not write outside the box

0 1 Cars cause atmospheric pollution.

0 1 . 1 **Figure 2** shows the percentage of cars in the UK using different energy sources.

Figure 2



The percentage of cars using petrol is 54%.

Draw the bar for petrol on **Figure 2**.

[1 mark]

Do not write outside the box

Some car emissions contain nitrogen dioxide.

Table 1 shows the concentration of nitrogen dioxide in the air in three different areas for 1 week.

Table 1

	Concentration of nitrogen dioxide in the air in arbitrary units		
Day	**City centre**	**Countryside**	**Motorway**
Monday	35	8	22
Tuesday	37	8	23
Wednesday	37	8	23
Thursday	34	8	23
Friday	37	8	23
Saturday	29	7	20
Sunday	22	6	17

0 1 . 2 Which column of data has the greatest range?

[1 mark]

Tick (✓) **one** box.

City centre ☐

Countryside ☐

Motorway ☐

Do not write outside the box

0 1 . 3 Explain why the concentration of nitrogen dioxide in the air is lower on Sunday.

[2 marks]

0 1 . 4 Calculate the mean value for the concentration of nitrogen dioxide in the air in the city centre for the days from Monday to Friday.

Use **Table 1**.

[2 marks]

Mean value for concentration of nitrogen dioxide = _____ arbitrary units

Do not write outside the box

Nitrogen dioxide is removed from car emissions by catalytic converters.

0 1 . 5 Which **two** of the following are correct statements about catalysts?

[2 marks]

Tick (✓) **two** boxes.

Catalysts are included in the chemical equation for a reaction. ☐

Catalysts are **not** used up in a reaction. ☐

Catalysts decrease the surface area of the reactants. ☐

Catalysts increase the concentration of the reactants. ☐

Catalysts lower the activation energy of a reaction. ☐

0 1 . 6 The catalyst in catalytic converters contains platinum.

Platinum is an unreactive metal obtained from the Earth's crust.

Complete the sentence.

Choose the answer from the box.

[1 mark]

finite resource	**formulation**	**renewable resource**

Platinum is a _____ .

Do not write outside the box

0 1 . 7 Emissions from cars that burn fossil fuels contain carbon dioxide.

What is used to test for carbon dioxide?

[1 mark]

Tick (✓) **one** box.

Burning splint ☐

Glowing splint ☐

Limewater ☐

10

Turn over for the next question

Do not write outside the box

0 2 Acids react to produce salts.

Universal indicator is added to water and then nitric acid is added to the mixture.

0 2 . 1 Give the colour change when nitric acid is added to the mixture of universal indicator and water.

[1 mark]

Tick (✓) **one** box.

Blue to red ☐

Green to purple ☐

Green to red ☐

Red to purple ☐

0 2 . 2 What happens to the pH of water when nitric acid is added?

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Stays the same ☐

Increases ☐

0 2 . 3 What is the state symbol for nitric acid?

[1 mark]

_____

Do not write outside the box

Zinc carbonate reacts with nitric acid.

The word equation for the reaction is:

zinc carbonate + nitric acid → zinc nitrate + water + carbon dioxide

white solid — colourless solution

0 2 . 4 Give **two** observations that would be made when zinc carbonate is added to nitric acid until the zinc carbonate is in excess.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 5 The formula of the zinc ion is Zn^{2+}

The formula of the nitrate ion is NO_3^-

What is the formula for zinc nitrate?

[1 mark]

Tick (✓) **one** box.

$ZnNO_3$ ☐

$Zn(NO_3)_2$ ☐

Zn_2NO_3 ☐

$Zn_2(NO_3)_2$ ☐

Do not write outside the box

0 2 . 6 Acids react with insoluble metal oxides to produce salts.

Plan a method to produce a pure, dry sample of the soluble salt copper chloride from an acid and a metal oxide.

[6 marks]

12

Do not write outside the box

0 3 This question is about the periodic table and argon.

0 3 . 1 What order did scientists use to arrange elements in early periodic tables?

[1 mark]

Tick (✓) **one** box.

Atomic weight of element ☐

Number of neutrons in an atom of element ☐

Size of atoms of element ☐

Year element was discovered ☐

0 3 . 2 In early periodic tables some elements were placed in the wrong groups.

Mendeleev overcame some of these problems in his periodic table.

Complete the sentence.

[1 mark]

Mendeleev did this by leaving _____ for elements that had not been discovered.

Question 3 continues on the next page

Do not write outside the box

0 3 . 3 What is the name of the group that contains argon?

[1 mark]

Tick (✓) **one** box.

Alkali metals ☐

Halogens ☐

Noble gases ☐

0 3 . 4 An atom of argon is represented as $^{40}_{18}Ar$

Determine the number of protons and the number of neutrons in one atom of argon.

[2 marks]

Number of protons _____

Number of neutrons _____

0 3 . 5 Different atoms of argon are, $^{39}_{18}Ar$ and $^{38}_{18}Ar$

What is the name given to these different atoms of argon?

[1 mark]

Tick (✓) **one** box.

Fullerenes ☐

Ions ☐

Isotopes ☐

Molecules ☐

Do not write outside the box

0 3 . 6 What is the electronic structure of an argon atom, $^{40}_{18}Ar$?

[1 mark]

Tick (✓) **one** box.

2 ☐ 2, 8 ☐ 2, 8, 2 ☐ 2, 8, 8 ☐

0 3 . 7 Why is argon unreactive?

[1 mark]

_____

_____

8

End of the exam questions

►