

1.1

An atom of iron is represented as ${}^{56}_{26}\text{Fe}$

Give the number of protons, neutrons and electrons in this atom of iron.

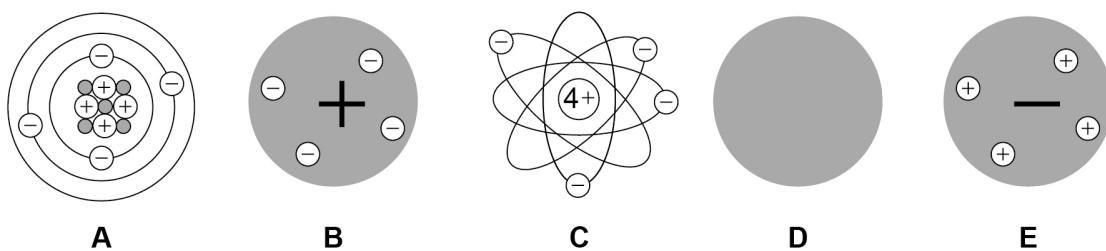
[3 marks]

Number of protons _____

Number of neutrons _____

Number of electrons _____

[]

Figure 3 represents different models of the atom.**Figure 3**

2.1

Which diagram shows the plum pudding model of the atom?

[1 mark]Tick **one** box.

A	
B	
C	
D	
E	

2.2

Which diagram shows the model of the atom developed from the alpha particle scattering experiment?

[1 mark]Tick **one** box.

A	
B	
C	
D	
E	

2.3

Which diagram shows the model of the atom resulting from Bohr's work?

[1 mark]Tick **one** box.

A	
B	
C	
D	
E	

[] This question is about the halogens.

3.1

Write the state symbol for chlorine at room temperature.

[1 mark]

Cl₂ ()

[]

This question is about iron.

Iron reacts with dilute hydrochloric acid to produce iron chloride solution and one other product.

4.1

Suggest how any unreacted iron can be separated from the mixture.

[1 mark]

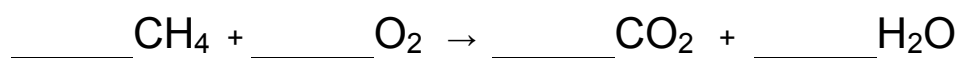
Magnesium reacts with iron chloride solution.

5.1

Alkanes burn in oxygen.

Balance the equation for methane burning.

[1 mark]



[] This question is about atomic structure.

6.1

Atoms contain subatomic particles.

Table 2 shows properties of two subatomic particles.

Complete **Table 2**.

[2 marks]

Table 2

Name of particle	Relative mass	Relative charge
neutron		
		+1

An element **X** has two isotopes.

The isotopes have different mass numbers.

6.2

The model of the atom changed as new evidence was discovered.

The plum pudding model suggested that the atom was a ball of positive charge with electrons embedded in it.

Evidence from the alpha particle scattering experiment led to a change in the model of the atom from the plum pudding model.

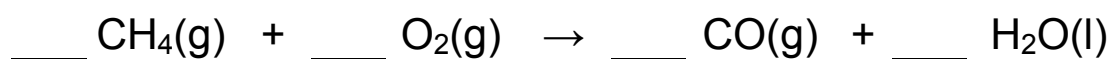
Explain how.

[4 marks]

7.1

Balance the equation for the combustion of methane to produce carbon monoxide.

[1 mark]



[]

This question is about salts.

Ammonium nitrate solution is produced when ammonia gas reacts with nitric acid.

8.1

Give the state symbol for ammonium nitrate solution.

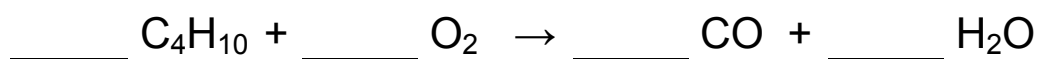
[1 mark]

9.1

One other product of the combustion of butane is carbon monoxide.

Balance the equation.

[1 mark]



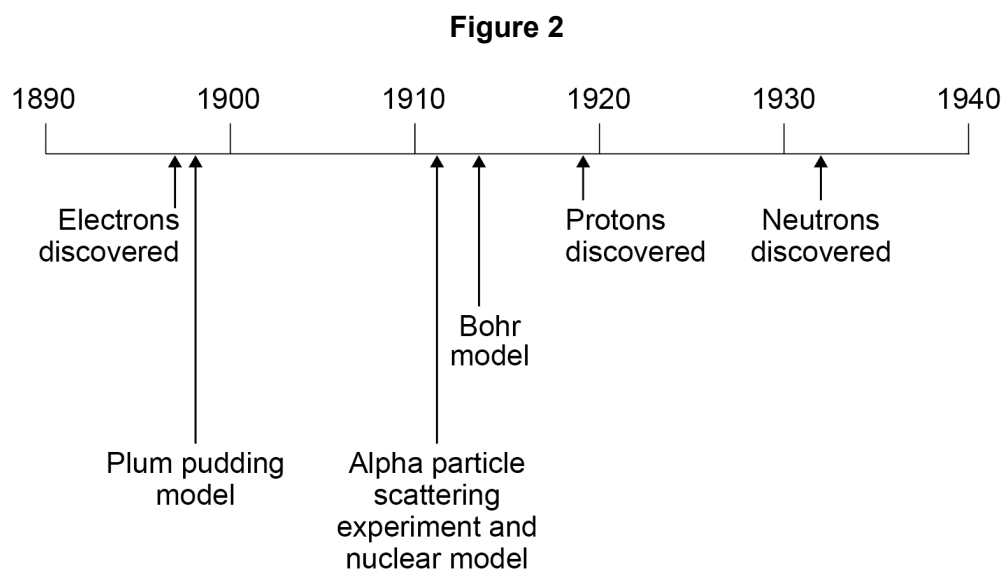
10.1

Suggest how the student could separate the insoluble silver iodide from the mixture at the end of the reaction.

[1 mark]

[] This question is about the development of scientific theories.

Figure 2 shows a timeline of some important steps in the development of the model of the atom.



11.1

The plum pudding model did not have a nucleus.

Describe **three** other differences between the nuclear model of the atom and the plum pudding model.

[3 marks]

1 _____

2 _____

3 _____

11.2

Niels Bohr adapted the nuclear model.

Describe the change that Bohr made to the nuclear model.

[2 marks]

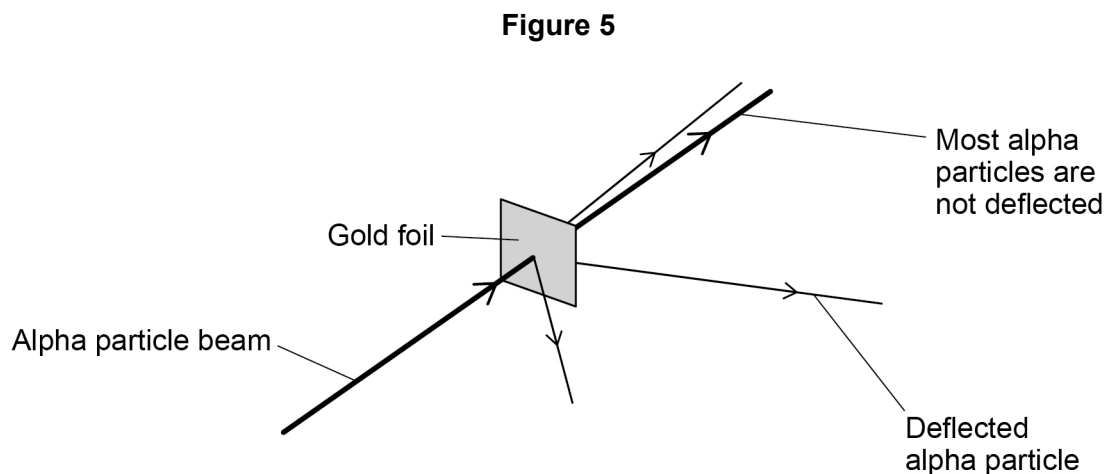
[] This question is about gold and compounds of gold.

12.1

In the alpha particle scattering experiment alpha particles are fired at gold foil.

Alpha particles are positively charged.

Figure 5 shows the results.



What **two** conclusions can be made from the results?

[2 marks]

Tick (✓) **two** boxes.

Atoms are balls of positive charge with embedded electrons.

☐

Atoms are tiny spheres that cannot be divided.

☐

Atoms have a positively charged nucleus.

☐

Mass is concentrated in the nucleus in the centre of atoms.

☐

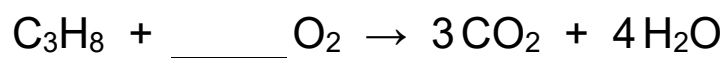
Neutrons exist within the nucleus.

☐

13.1

Balance the equation for the combustion of propane.

[1 mark]



Gallium (Ga) is in Group 3 of the modern periodic table.

14.1

Give the numbers of electrons and neutrons in an atom of the isotope $^{69}_{31}\text{Ga}$

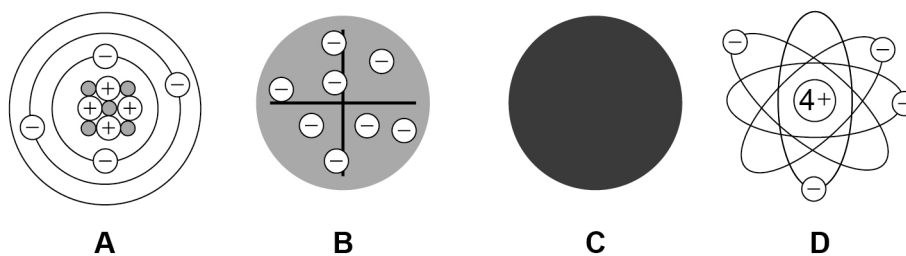
[2 marks]

Number of electrons _____

Number of neutrons _____

Figure 2 represents different models of the atom.

Figure 2



15.1

Which model represents the plum pudding model?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☐

15.2

Which model resulted from Chadwick's experimental work?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☐

Question 1 continues on the next page

[] Acids react to produce salts.

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

16.1

What is the state symbol for nitric acid?

[1 mark]

17.1

Complete **Figure 2** to show the electronic structure of an aluminium atom.

Use the periodic table.

[1 mark]

Figure 2

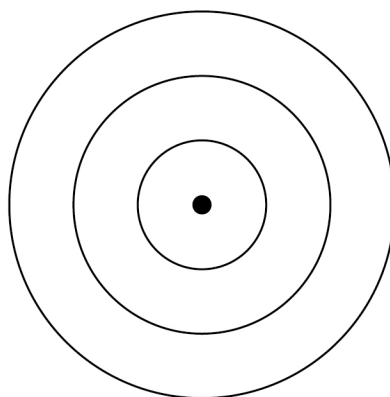
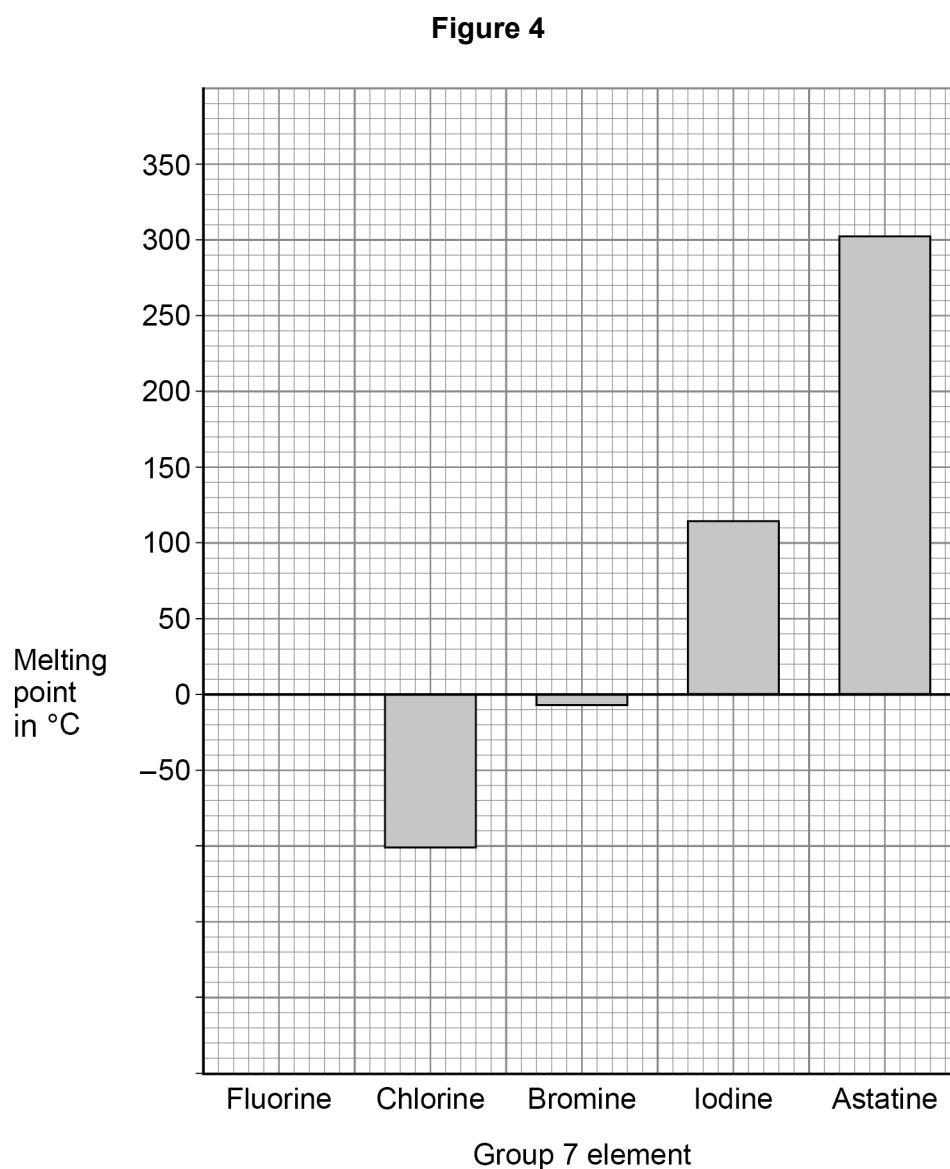


Figure 4 shows the melting points of some Group 7 elements.



☐ ☐ ☐ The melting point of fluorine is $-220\text{ }^{\circ}\text{C}$.

18.1

What is the state symbol for bromine at $-50\text{ }^{\circ}\text{C}$?

Use **Figure 4**.

[1 mark]

Tick (✓) **one** box.

(aq)

☐

(g)

☐

(l)

☐

(s)

☐

A scientist produced potable water from 150 cm³ of salty water.

19.1

Which process can be used to produce potable water from salty water?

[1 mark]

Tick (✓) **one** box.

Distillation

☐

Electrolysis

☐

Filtration

☐

Sterilisation

☐

0 2 3 The salty water contains sodium chloride

Source: AQA 2022 Combined Science Paper 2

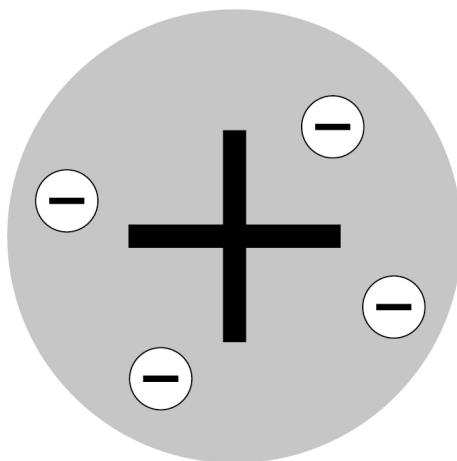
[] Discoveries in chemistry led to a better understanding of atomic structure.

20.1 Atoms were originally thought to be tiny spheres that could not be divided.

The plum pudding model of the atom was then developed.

Figure 1 represents the plum pudding model of the atom.

Figure 1



Describe the plum pudding model of the atom.

[2 marks]

20.2 Atoms contain electrons, neutrons and protons.

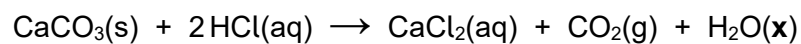
Write these three particles in order of their discovery.

[1 mark]

Earliest _____

Latest _____

The equation for the reaction is:



21.1

What is the state symbol (**x**) in the equation?

[1 mark]

Tick (✓) **one** box.

(aq) ☐ (g) ☐ (l) ☐ (s) ☐

Question 1 continues on the next page

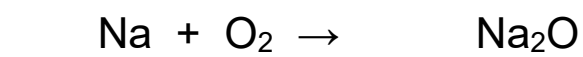
[] Sodium is in Group 1 of the periodic table.

Sodium reacts with oxygen to produce sodium oxide.

22.1

Balance the equation for the reaction.

[1 mark]



[] Group 7 elements are known as the halogens.

All atoms of Group 7 elements contain protons, neutrons and electrons.

23.1

What is the order of discovery of the proton, neutron and electron?

[1 mark]

Tick (✓) **one** box.

electron → neutron → proton

☐

electron → proton → neutron

☐

neutron → proton → electron

☐

proton → electron → neutron

☐

A bromine atom can be represented as $^{81}_{35}\text{Br}$.

23.2

What is the number of neutrons in this bromine atom?

[1 mark]

[] The combustion of fuels is a source of atmospheric pollutants.

24.1 Methane is a fuel.

Balance the equation for the combustion of methane.

[1 mark]

