

**AQA – Atomic structure – A2 Chemistry P1**

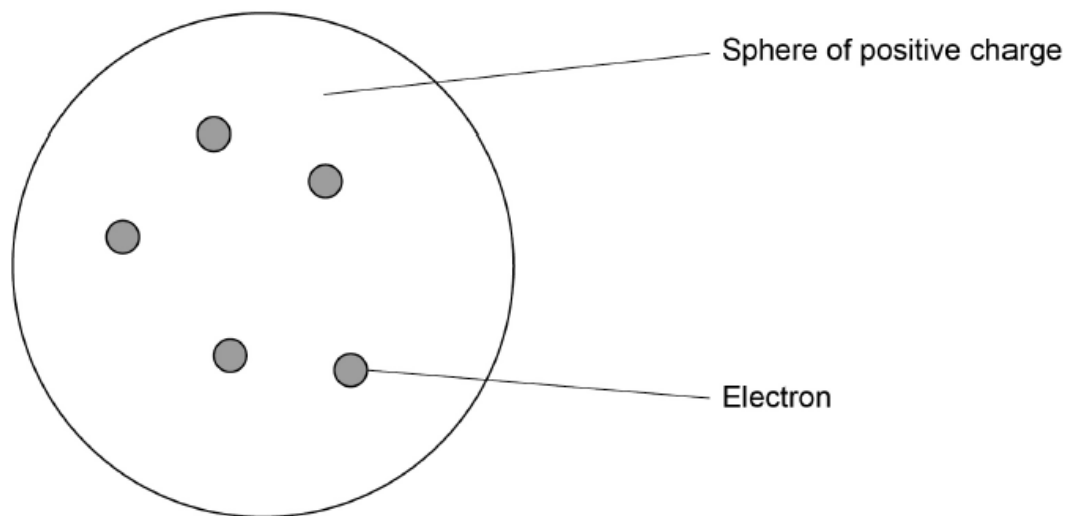
1. No.1

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This question is about atomic structure.

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In 1897 JJ Thomson discovered the electron. He suggested that atoms were positively charged spheres with electrons embedded within them.

**Figure 1** represents an atom using Thomson's model.**Figure 1**

Suggest the identity of this atom.

Give **two** differences between the modern model of an atom and the Thomson model of an atom.**[3 marks]**

Identity \_\_\_\_\_

Difference 1 \_\_\_\_\_

\_\_\_\_\_

Difference 2 \_\_\_\_\_

\_\_\_\_\_

0 1 . 2

Tellurium has a relative atomic mass of 127.6  
Iodine has a relative atomic mass of 126.9

Define relative atomic mass.

Suggest **one** property of tellurium that justifies its position before iodine in the modern Periodic Table.

[3 marks]

Definition \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Justification \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

0 1 . 3

A sample of tellurium is analysed in a time of flight (TOF) mass spectrometer using electron impact ionisation.

Give an equation, including state symbols, for this ionisation.

[1 mark]

\_\_\_\_\_

0 1 . 4

In the TOF mass spectrometer an ion of an isotope of tellurium, with mass number  $y$ , travels along a 1.25 m flight tube with a kinetic energy of  $1.88 \times 10^{-12}$  J

The ion takes  $3.00 \times 10^{-7}$  s to reach the detector.

$$KE = \frac{1}{2} mv^2$$

$KE$  = kinetic energy / J

$m$  = mass / kg

$v$  = speed /  $\text{m s}^{-1}$

Calculate the mass, in g, of 1 mole of these tellurium ions.

Use your answer to suggest the mass number  $y$  of the tellurium isotope.

The Avogadro constant,  $L = 6.022 \times 10^{23} \text{ mol}^{-1}$

[5 marks]

Mass \_\_\_\_\_ g

Mass number  $y$  \_\_\_\_\_

0 1 . 5

Tellurium has several other isotopes.

Two of these isotopes are  $^{126}\text{Te}$  and  $^{124}\text{Te}$ 

A different sample of tellurium is analysed using a TOF mass spectrometer.

Which statement about kinetic energy ( $KE$ ) is correct?

[1 mark]

Tick (✓) **one** box.The  $KE$  of  $^{126}\text{Te}^+$  is greater than the  $KE$  of  $^{124}\text{Te}^+$ ☐The  $KE$  of  $^{126}\text{Te}^+$  is the same as the  $KE$  of  $^{124}\text{Te}^+$ ☐The  $KE$  of  $^{126}\text{Te}^+$  is less than the  $KE$  of  $^{124}\text{Te}^+$ ☐

2. No.6

Which row contains two species with different numbers of electrons?

[1 mark]

A  $\text{NH}_3$  and  $\text{HF}$ ☐B  $\text{CO}_3^{2-}$  and  $\text{NO}_3^-$ ☐C  $\text{H}_3\text{O}^+$  and  $\text{HF}_2^+$ ☐D  $\text{CH}_4$  and  $\text{NH}_2^-$ ☐

