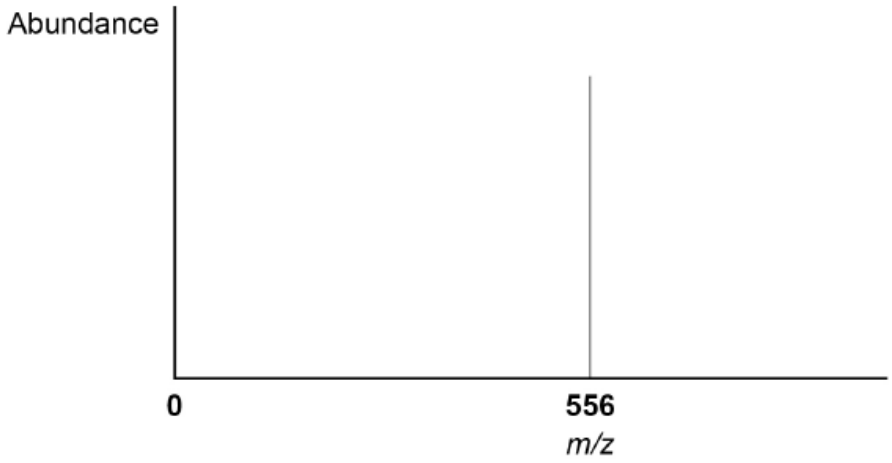
AQA – Atomic structure – A2 Chemistry P1

1. June/ 2019/Paper_1/No.2

0 2 Time of flight (TOF) mass spectrometry can be used to analyse large molecules such as the pentapeptide, leucine encephalin (**P**).

P is ionised by electrospray ionisation and its mass spectrum is shown in **Figure 2**.

Figure 2



0 2 . 1 Describe the process of electrospray ionisation.

Give an equation to represent the ionisation of **P** in this process.

[4 marks]

Description _____

_____

_____

_____

_____

_____

_____

_____

_____

Equation

0 2 . 2 What is the relative molecular mass of **P**?
Tick (✓) **one** box.

[1 mark]

555 ☐ 556 ☐ 557 ☐

0 2 . 3 A molecule **Q** is ionised by electron impact in a TOF mass spectrometer.
The $\mathbf{Q}^+$ ion has a kinetic energy of 2.09×10^{-15} J
This ion takes 1.23×10^{-5} s to reach the detector.
The length of the flight tube is 1.50 m

Calculate the relative molecular mass of **Q**.

$KE = \frac{1}{2}mv^2$ where m = mass (kg) and v = speed (m s^{-1})

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

[5 marks]

Relative molecular mass _____

2. June/ 2019/Paper_1/No.3

0 3 This question is about periodicity, the Period 4 elements and their compounds.

0 3 . 1 State the meaning of the term periodicity.

[1 mark]

0 3 . 2 Identify the element in Period 4 with the highest electronegativity value.

[1 mark]

0 3 . 3 Identify the element in Period 4 with the largest atomic radius.
Explain your answer.

[3 marks]

Element _____

Explanation _____

0 3 . 4 The equations for two reactions of arsenic(III) oxide are shown.

$$As_2O_3 + 6HCl \rightarrow 2AsCl_3 + 3H_2O$$

$$As_2O_3 + 6NaOH \rightarrow 2Na_3AsO_3 + 3H_2O$$

Name the property of arsenic(III) oxide that describes its ability to react in these two ways.

[1 mark]

0 3 . 5 Complete the equation for the formation of arsenic hydride.

[1 mark]

As_2O_3 + Zn + $HNO_3 \rightarrow$ AsH_3 + $Zn(NO_3)_2$ + H_2O

3. June/ 2021/Paper_1/No.2

0 2 This question is about atomic structure.

0 2 . 1 Define the mass number of an atom.

[1 mark]

0 2 . 2 Complete **Table 3** to show the numbers of neutrons and electrons in the species shown.

[2 marks]

Table 3

	Number of protons	Number of neutrons	Number of electrons
^{46}Ti	22		
$^{49}Ti^{2+}$	22		

0 2 . 3 A sample of titanium contains four isotopes, ^{46}Ti, ^{47}Ti, ^{48}Ti and ^{49}Ti
This sample has a relative atomic mass of 47.8
In this sample the ratio of abundance of isotopes ^{46}Ti, ^{47}Ti and ^{49}Ti is 2:2:1

Calculate the percentage abundance of ^{46}Ti in this sample.

[3 marks]

Abundance of ^{46}Ti _____ %