Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Physical 1

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Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Q1.

This question is about atomic structure.

(a) Define the mass number of an atom.

_____

_____

(1)

(b) Complete the table below to show the numbers of neutrons and electrons in the species shown.

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

(2)

(c) 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.

Abundance of ^{46}Ti _____ %

(3)

(Total 6 marks)

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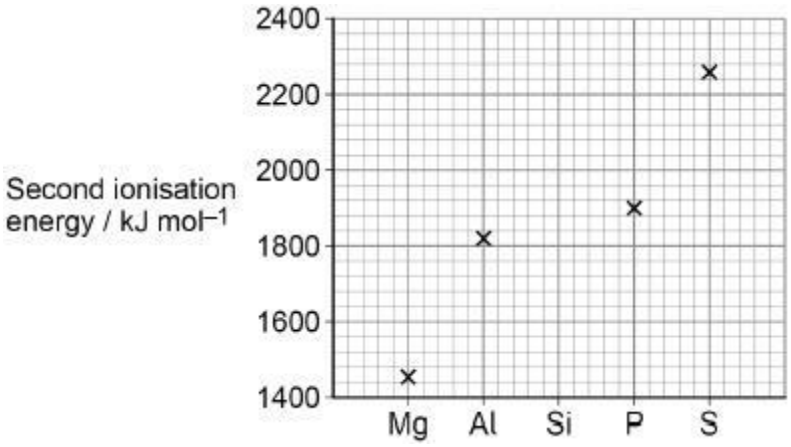
Q2.

This question is about Period 3 elements.

The graph shows the **second** ionisation energies of some elements in Period 3.



(a) Draw a cross (x) on the graph above to show the **second** ionisation energy of silicon.

(1)

(b) Identify the element in Period 3, from sodium to argon, that has the highest **second** ionisation energy.

Give an equation, including state symbols, to show the process that occurs when the **second** ionisation energy of this element is measured.

If you were unable to identify the element you may use the symbol **Q** in your equation.

Element _____

Equation

_____

(2)

(c) Explain why the atomic radius decreases across Period 3, from sodium to chlorine.

_____

_____

_____

_____

(2)

(d) Identify the element in Period 3, from sodium to chlorine, that has the highest electronegativity.

_____

(1)

(e) Phosphorus burns in air to form phosphorus(V) oxide.
Give an equation for this reaction.

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(1)

(Total 7 marks)

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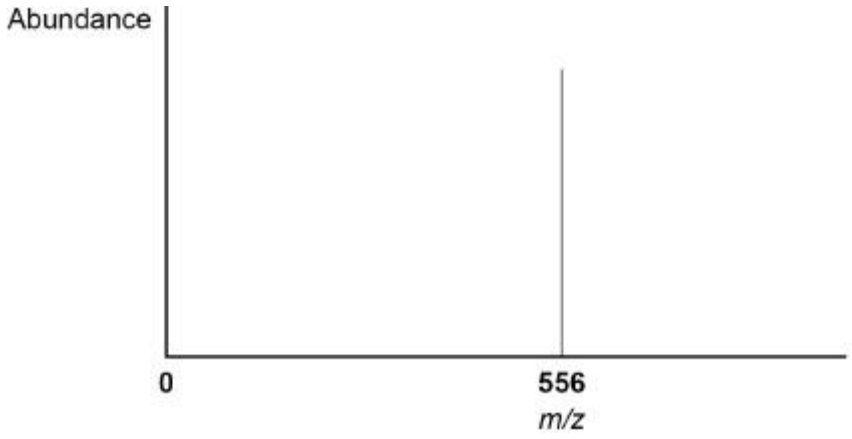
Q3.

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 the diagram.



(a) Describe the process of electrospray ionisation.

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

Description _____

_____

_____

_____

_____

_____

_____

_____

_____

Equation

_____

(4)

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

555 ☐ 556 ☐ 557 ☐

(1)

(c) A molecule **Q** is ionised by electron impact in a TOF mass spectrometer.

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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}

Relative molecular mass _____

(5)

(Total 10 marks)

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