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

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Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

This question is about s-block metals.

(a) Give the full electron configuration for the calcium ion, Ca^{2+}

_____

(1)

(b) Explain why the second ionisation energy of calcium is lower than the second ionisation energy of potassium.

_____

_____

_____

_____

_____

(2)

(c) Identify the s-block metal that has the highest first ionisation energy.

_____

(1)

(d) Give the formula of the hydroxide of the element in Group 2, from Mg to Ba, that is least soluble in water.

_____

(1)

(e) A student added 6 cm^3 of 0.25 mol dm^{-3} barium chloride solution to 8 cm^3 of 0.15 mol dm^{-3} sodium sulfate solution.
The student filtered off the precipitate and collected the filtrate.

Give an ionic equation for the formation of the precipitate.
Show by calculation which reagent is in excess.
Calculate the total volume of the other reagent which should be used by the student so that the filtrate contains only one solute.

Ionic equation _____

Reagent in excess _____

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Total volume of other reagent _____

_____

_____

_____

_____

(3)

(f) A sample of strontium has a relative atomic mass of 87.7 and consists of three isotopes, ^{86}Sr, ^{87}Sr and ^{88}Sr
In this sample, the ratio of abundances of the isotopes ^{86}Sr :^{87}Sr is 1:1

State why the isotopes of strontium have identical chemical properties.
Calculate the percentage abundance of the ^{88}Sr isotope in this sample.

Why isotopes of strontium have identical chemical properties

_____

_____

_____

Percentage abundance of ^{88}Sr _____ %

(4)

(g) A time of flight (TOF) mass spectrum was obtained for a sample of barium that contains the isotopes ^{136}Ba, ^{137}Ba and ^{138}Ba

The sample of barium was ionised by electron impact.

Identify the ion with the longest time of flight.

_____

(1)

(h) A $^{137}Ba^{+}$ ion travels through the flight tube of a TOF mass spectrometer with a kinetic energy of 3.65×10^{-16} J
This ion takes 2.71×10^{-5} s to reach the detector.

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}

Calculate the length of the flight tube in metres.

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Give your answer to the appropriate number of significant figures.

Length of flight tube _____ m

(5)

(Total 18 marks)

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