

**SMACON**  
**Competence Based Curriculum**  
**End of Term One Assessment-2025**  
**Chemistry**  
**Senior Five**  
**2 Hours**

**Instructions**

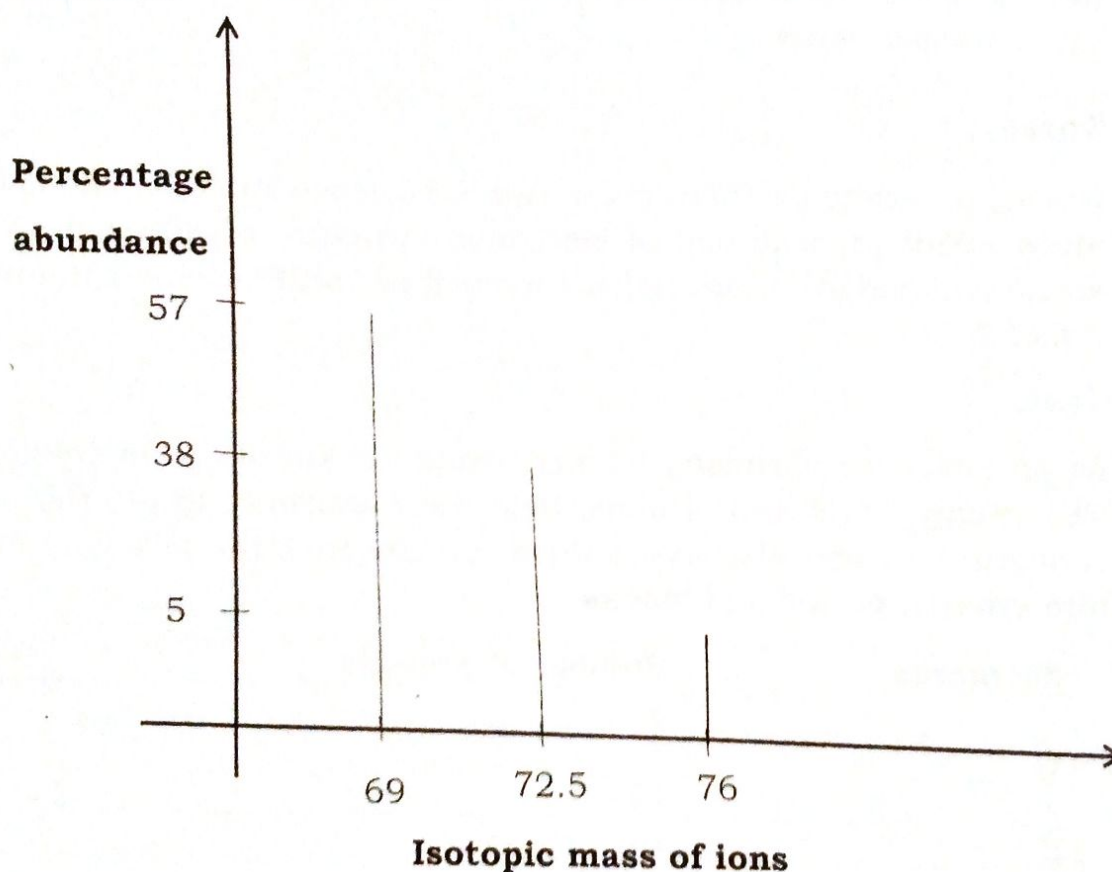
- This paper comprises of three items
- Attempt all items

**Item One**

The following information has been published about a new element **X**,

- **X** exists as a diatomic liquid at room temperature.
- **X** has two naturally existing isotopes (**X**-34.5 and **X**-38)

A researcher of chemistry was interested in determining the most abundant isotopes of **X** in nature, he obtained a mass spectrum shown below using a mass spectrometer.



The Researcher was confused as the results obtained did not match his expectations. You have been approached to offer necessary information.

**Task:**

As a learner of chemistry;

- a. Briefly describe how the mass spectrum in Figure above was obtained.
- b. Why does the mass spectrum of **X** show three peaks yet the elements has two naturally existing isotopes.
- c. What conclusion can the Researcher draw from the abundance of isotopes about the relative atomic mass of **X**?

### Item Two

- a. A beam of sub atomic (fundamental) particles was passed through an electric field. They were then deflected to different plates at varying extents. Based on this situation,
- give an account of the observation made.
  - What could be the properties of the subatomic particles analysed in (a) above.
- b. The atom whose atomic number is **92**, underwent beta decay and thereafter alpha decay to form a new stable atom, during eth study 20.5g of the sample had reduced by 10.3g after 30 Minutes.
- Account for the changes the atom under went under different nuclear decays.
  - Determine the **half-life** of this sample.
  - Explain one **industrial, agricultural** and **medical application** of nuclear decay.

### Item Three

- a. During an academic interaction, two S.5 science students had conflicting ideas about presentation of electronic structure of Nitrogen( $_{15}\text{N}$ ) as an element in periodic table. Hellena wrote it as  $1\text{S}^22\text{P}^5$  whereas Hannie wrote it as 2:5.

#### Task.

As an advanced chemistry learner, using the knowledge of energy levels, sub energy levels and orbitals, help these students to get the accurate configuration and also assist them to categorise the following elements into **groups, period** and **blocks**.

Elements	Number of protons
P	3
Q	7
R	12
S	13
T	24
U	29

- b. Describe the relative similarity between **sodium** and **potassium** as group one elements using their reactions with water.

END