CHEMISTRY 9th (New Book)

CHAPTER NO 8 — Acid Base Chemistry

Exercise: Multiple Choice Questions

1.	Third period and 14th group	2.	nd^x, ns^2
3.	Na	4.	Sulphur
5.	3	6.	Flourine
7.	Na	8.	Ba > Sr > Ca > Mg
9.	F < O < N	10.	Group 1

Q#2: Short Question Answer

i. Why was atomic number chosen to arrange the elements in the periodic table?

Reason:

The atomic number was chosen to arrange the elements in the periodic table because it represents the number of protons in an atom's nucleus. This number is unique to each element and determines its chemical properties and position in the table.

ii. What is the significance of the word periodic?

Significance:

The word "periodic" signifies the repetition of chemical properties of elements at regular intervals when they are arranged by increasing atomic number.

iii. Why does the size of an atom increase as we move down the periodic table?

Trend along group:

The atomic radii of atoms increase from top to bottom in a group. It is because a new shell is being added in the successive period down the group and the inner electrons shield the outermost electrons from the nucleus.

iv. In a group, the elements have the same number of electrons in the outermost shell. Why is it so?

Reason:

Elements in the same group have the same number of valence electrons because they have the same electron configuration in their outermost shell. Therefore, the elements of a group have same chemical properties.

v. ...Do you expect calcium to be more reactive than sodium? Give the reason of your answer.

Reactivity:

No, Calcium is not more reactive than sodium. This is because sodium is an alkali metal and has one electron in its valence shell and has lower ionization energy. Therefore, Sodium is more reactive than Calcium.

vi. Which element has the maximum atomic radius and which element has the minimum atomic radius in the third period?

Atomic Radius:

Element with maximum atomic radius is Sodium (Na) with atomic radius 186 pm.
Element with minimum atomic radius is Chlorine (Cl) with atomic radius 79 pm.

vii. Why are the most electronegative elements present in the sixth and seventh groups?

Most Electronegative Elements:

The most electronegative elements are in Groups VIA and VIIA because they have a strong attraction for electrons due to their high nuclear charge and small atomic size. They need only a few electrons to complete their outermost shell.

viii. The first ionization energy value of magnesium is less than the second one. Give reason.

Ionization Energy of Magnesium:

In order to remove the 1st electron from a neutral atom requires little energy. But after the removal of one electron, the force of attraction of the nucleus on the outermost shell electron increases. That is why more energy is required to remove another electron from the Mg^+ ion.

$Mg \rightarrow Mg^+ + e^- \mid +737\ kJ\ mol^{-1}$

$Mg^+ \rightarrow Mg^{+2} + e^- \mid +1450\ kJ\ mol^{-1}$

ix. Is it possible for two metals or two non-metals to form an ionic bond?

Ionic Bond:

No, it is not possible for two metals or two non-metals to form an ionic bond. The reason is that an ionic bond involves the transfer of an electron from one atom to another atom. This bond is typically formed between metals and non-metals.

x. Which element has the least value of ionization energy and which element has the highest value of electronegativity?

Element with the least value of ionization energy is Cesium (Cs). Its ionization energy is 377 kJ/mol.

Element with the highest value of electronegativity is Fluorine (F). Its electronegativity is 4.0.

Q#3: Constructed Response Questions

i. Suppose a new element is discovered. Where would you like to accommodate this element in the periodic table?

New Element's Accommodation:

It would be placed according to its atomic number and electronic configuration, which determine its group and period in the periodic table.

ii. What is the first element of the periodic table? Will it lose an electron or gain it?

- ➢ The first element is Hydrogen (H). Its atomic number is 1.
- ➢ It usually loses one electron to form H^+ in most chemical reactions.

iii. Atomic radii of boron and aluminium are 88 pm and 125 pm respectively. Which element is expected to lose electron or electrons easily?

Comparison:

Atomic Radius of Boron (B) = 88pm

Atomic Radius of Aluminium (Al) = 125pm

Aluminium is expected to lose electrons more easily because it has a large atomic radius. It means that its outermost shell electrons are farther away from the nucleus and less tightly bound. So it is easier for Aluminium to remove an electron.

iv. How would you find the atomic radius of an atom?

Atomic Radius Calculation:

The atomic radius is determined by measuring the distance between the nuclei of two identical bonded atoms and dividing that distance by 2.

$$\text{Atomic Radius} = \frac{\text{Distance between two nuclei}}{2}$$

Example:

The distance between the nuclei of two bonded carbon atoms is 154pm.

$$\text{Atomic Radius of Carbon} = \frac{154}{2}\ 77\text{pm}$$

v. Why is it not possible for an oxygen atom to accept three electrons to form O^{3-} ion like nitrogen which can accept electrons to form N^{3-}?

Reasons:

- ➢ Oxygen only needs 2 electrons to complete its octet.
- ➢ Adding a third electron causes strong repulsion and would create an unstable ion.
- ➢ The nucleus cannot hold three extra electrons effectively.

Hence, O^{3-} is not stable or possible.