Chapter 5 – Periodic Classification of Elements

Short Answer Type Questions

1. The three elements A, B and C with similar properties have atomic masses X, Y and Z respectively. The mass of Y is approximately equal to the average mass of X and Z. What is such an arrangement of elements called as? Give one example of such a set of elements.
2. Elements have been arranged in the following sequence on the basis of their increasing atomic masses.
   F, Na, Mg, Al, Si, P, S, Cl, Ar, K
   - (a) Pick two sets of elements which have similar properties.
   - (b) The given sequence represents which law of classification of elements?

3. Can the following groups of elements be classified as Dobereiner's triad ?
   - (a) Na, Si, Cl
   - (b) Be, Mg, Ca

   Atomic mass of Be 9; Na 23; Mg 24; Si 28; Cl 35; Ca 40
   Explain by giving reason.

4. In Mendele' ev 's Periodic Table the elements were arranged in the increasing order of their atomic masses. However, cobalt with atomic mass of 58.93 amu was placed before nickel having an atomic mass of 58.71 amu. Give reason for the same.
5. Hydrogen occupies a unique position in Modern Periodic Table". Justify the statement.
6. Write the formulae of chlorides of Eka-silicon and Eka-aluminium, the elements predicted by Mendele' ev.
7. Three elements A, B and C have 3, 4 and 2 electrons respectively in their outermost shell. Give the group number to which they belong in the Modern Periodic Table. Also, give their valencies.
8. If an element X is placed in group 14, what will be the formula and the nature of bonding of its chloride?

9. Compare the radii of two species X and Y. Give reasons for your answer.
    - (a) X has 12 protons and 12 electrons
    - (b) Y has 12 protons and 10 electrons

10. Arrange the following elements in increasing order of their atomic radii.
    - (a) Li, Be, F, N
    - (b) Cl, At, Br I

11. Identify and name the metals out of the following elements whose electronic configurations are given below.
    - (a) 2, 8, 2
    - (b) 2, 8, 1
    - (c) 2, 8, 7
    - (d) 2, 1

12. Write the formula of the product formed when the element A (atomic number 19) combines with the element B (atomic number 17). Draw its electronic dot structure. What is the nature of the bond formed?
13. Arrange the following elements in the increasing order of their metallic character
    Mg, Ca, K, Ge, Ga
14. Identify the elements with the following property and arrange them in increasing order of their reactivity
    - (a) An element which is a soft and reactive metal
    - (b) The metal which is an important constituent of limestone
    - (c) The metal which exists in liquid state at room temperature

15. Properties of the elements are given below. Where would you locate the following elements in the periodic table?
    - (a) A soft metal stored under kerosene
    - (b) An element with variable (more than one) valency stored under water.

- (c) An element which is tetravalent and forms the basis of organic chemistry
- (d) An element which is an inert gas with atomic number 2
- (e) An element whose thin oxide layer is used to make other elements corrosion resistant by the process of " anodising"

Long Answer Type Questions

1. An element is placed in 2nd Group and 3rd Period of the Periodic Table, burns in presence of oxygen to form a basic oxide.
   - (a) Identify the element
   - (b) Write the electronic configuration
   - (c) Write the balanced equation when it burns in the presence of air
   - (d) Write a balanced equation when this oxide is dissolved in water
   - (e) Draw the electron dot structure for the formation of this oxide

2. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.
   - (a) Where in the periodic table are elements X and Y placed?
   - (b) Classify X and Y as metal (s), non-metal (s) or metalloid (s)
   - (c) What will be the nature of oxide of element Y? Identify the nature of bonding in the compound formed
   - (d) Draw the electron dot structure of the divalent halide

3. Atomic number of a few elements are given below
   10, 20, 7, 14
   - (a) Identify the elements
   - (b) Identify the Group number of these elements in the Periodic Table
   - (c) Identify the Periods of these elements in the Periodic Table
   - (d) What would be the electronic configuration for each of these elements?
   - (e) Determine the valency of these elements

4. Complete the following cross word puzzle (Figure 5.1)

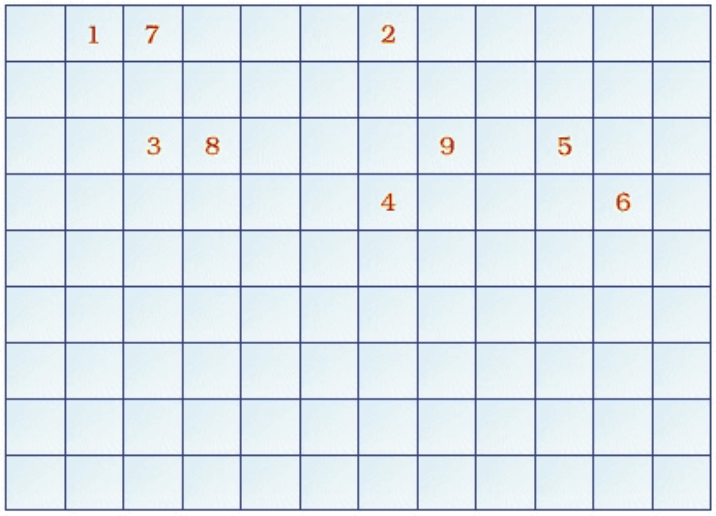

Fig. 5.1

Across:

- (1) An element with atomic number 12.
- (3) Metal used in making cans and member of Group 14.
- (4) A lustrous non-metal which has 7 electrons in its outermost shell.

Down:

- (2) Highly reactive and soft metal which imparts yellow colour when subjected to flame and is kept in kerosene.
- (5) The first element of second Period
- (6) An element which is used in making fluorescent bulbs and is second member of Group 18 in the Modern Periodic Table
- (7) A radioactive element which is the last member of halogen family.
- (8) Metal which is an important constituent of steel and forms rust when exposed to

moist air.

- (9) The first metalloid in Modern Periodic Table whose fibres are used in making bullet-proof vests

5. (a) In this ladder (Figure 5.2) symbols of elements are jumbled up. Rearrange these symbols of elements in the increasing order of their atomic number in the Periodic Table.
   (b) Arrange them in the order of their group also.

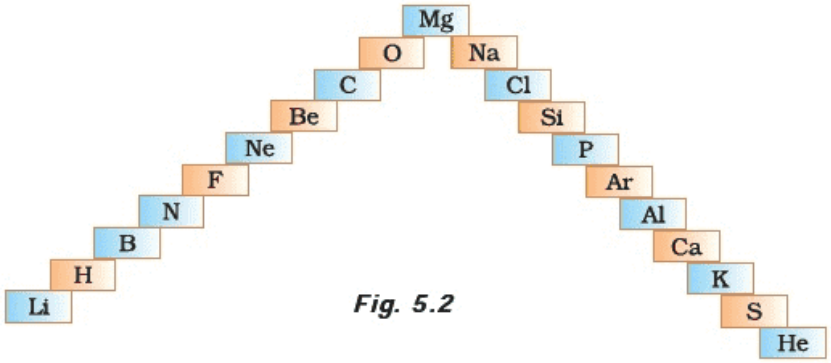

Fig. 5.2

6. Mendeleev predicted the existence of certain elements not known at that time and named two of them as Eka-silicon and Eka-aluminium.
   - (a) Name the elements which have taken the place of these elements
   - (b) Mention the group and the period of these elements in the Modern Periodic Table.
   - (c) Classify these elements as metals, non-metals or metalloids
   - (d) How many valence electrons are present in each one of them?

7. a) Electropositive nature of the element(s) increases down the group and decreases across the period
   (b) Electronegativity of the element decreases down the group and increases across the period
   (c) Atomic size increases down the group and decreases across a period (left to right)
   (d) Metallic character increases down the group and decreases across a period.

8. On the basis of the above trends of the Periodic Table, answer the following about the elements with atomic numbers 3 to 9.
9. (a) Name the most electropositive element among them
   (b) Name the most electronegative element
   (c) Name the element with smallest atomic size
   (d) Name the element which is a metalloid
   (e) Name the element which shows maximum valency.
10. An element X which is a yellow solid at room temperature shows catenation and allotropy. X forms two oxides which are also formed during the thermal decomposition of ferrous sulphate crystals and are the major air pollutants.
    - (a) Identify the element X
    - (b) Write the electronic configuration of X
    - (c) Write the balanced chemical equation for the thermal decomposition of ferrous sulphate crystals?
    - (d) What would be the nature (acidic/ basic) of oxides formed?
    - (e) Locate the position of the element in the Modern Periodic Table.

11. An element X of group 15 exists as diatomic molecule and combines with hydrogen at 773 K in presence of the catalyst to form a compound, ammonia which has a characteristic pungent smell.
    - (a) Identify the element X. How many valence electrons does it have?
    - (b) Draw the electron dot structure of the diatomic molecule of X. What type of bond is formed in it?
    - (c) Draw the electron dot structure for ammonia and what type of bond is formed in it?

12. Which group of elements could be placed in Mendeleev's Table without disturbing the original order? Give reason.
13. Give an account of the process adopted by Mendeleev for the classification of elements. How did he arrive at "Periodic Law"?