Question 26. What are major differences between metals and non-metals?
Answer:

Metals	Non-Metals
1. Have a strong tendency to lose electrons to form cations. 2. Metals are strong reducing agents. 3. Metals have low ionization enthalpies. 4. Metals form basic oxides and ionic compounds.	1. Non-metals have a strong tendency to accept electrons to form anions. 2. Non-metals are strong oxidising agent. 3. Non-metals have high ionization enthalpies. 4. Non-metals form acidic oxides and covalent compounds.

Question 27. Use periodic table to answer the following questions:
(a) Identify the element with five electrons in the outer subshell.
(b) Identify the element that would tend to lose two electrons.
(c) Identify the element that would tend to gain two electrons.
Answer:
(a) Element belonging to nitrogen family (group 15) e.g., nitrogen.
(b) Element belonging to alkaline earth family (group 2) e.g., magnesium.
(c) Element belonging to oxygen family (group 16) e.g., oxygen.

Question 28. The increasing order of reactivity among group 1 elements is Li < Na < K < Rb < Cs whereas that of group 17 is F > Cl > Br > I. Explain?
Answer: The elements of Group I have only one electron in their respective valence shells and thus have a strong tendency to lose this electron. The tendency to lose electrons in turn, depends upon the ionization enthalpy. Since the ionization enthalpy decreases down the group therefore, the reactivity of group 1 elements increases in the same order Li < Na < K < Rb < Cs. In contrast, the elements of group 17 have seven electrons in their respective valence shells and thus have strong tendency to accept one more electron to make stable configuration. It is linked with electron gain enthalpy and electronegativity. Since both of them decreases down the group, the reactivity therefore decreases.

Question 29. Write the general electronic configuration of s^- p^- d^-, and f-block elements?
Answer:
(i) s-Block elements: ns^{1-2} where n = 2 - 7.
(ii) p-Block elements: $ns^2\ np^{1-6}$ where n = 2-6.
(iii) d-Block elements:$(n - 1)\ d^{1-10}\ ns^{0-2}$ where n = 4-7.
(iv) f-Block elements: $(n - 2)\ f^{0-14}\ (n -1)\ d^{0-1}\ ns^2$where n = 6 - 7.

Question 30. Assign the position of the element having outer electronic configuration,
(i) $ns^2\ np^4$ for n = 3
(ii) $(n - 1)\ d^2\ ns^2$ for n = 4 and
(iii) $(n - 2)\ f^7\ (n - 1)\ d^1\ ns^2$ for n = 6 in the periodic table?
Answer:
(i) n = 3
Thus element belong to 3rd period, p-block element.
Since the valence shell contains = 6 electrons, group No = 10 + 6 = 16
configuration $=1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$ element name is sulphur.
(ii) n = 4

Means element belongs to 4th period belongs to group 4 as in the valence shell (2 + 2) = 4 electrons.
Electronic configuration.=$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^2$ $4s^2$, and the element name is Titanium (T_i).
(iii) n = 6
Means the element belongs to 6th period. Last electron goes to the f-orbital, element is from f-block.
group = 3
The element is gadolinium (z = 64)
Complete electronic configuration = [X_e] 4 f^7 $5d^1$ $6s^2$.

Question 31.
The first ($\Delta_i H_1$) and the second ($\Delta_i H_2$) ionization enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg} H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below:

Element	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_{eg} H$
I	*520*	*7300*	*– 60*
II	*419*	*3051*	*– 48*
III	*1681*	*3374*	*– 328*
IV	*1008*	*1846*	*– 295*
V	*2372*	*5251*	*+ 48*
VI	*738*	*1451*	*– 40*

Which of the above elements is likely to be:
(a) the least reactive element
(b) the most reactive metal
(c) the most reactive non-metal
(d) the least reactive non-metal
(e) the metal which can form a stable binary halide of the formula MX_2 (X = halogen)
(f) the metal which can form a predominantly stable covalent halide of the formula MX (X = halogen)?
Answer:
(a) The element V has highest first ionization enthalpy ($\Delta_i H_1$) and positive electron gain enthalpy ($\Delta_{eg}H$) and hence it is the least reactive element. Since inert gases have positive $\Delta_{eg}H$, therefore, the element-V must be an inert gas. The values of $\Delta_i H_1$, $\Delta_i H_2$ and $\Delta_{eg}H$match that of He.
(b) The element II which has the least first ionization enthalpy ($\Delta_i H_1$) and a low negative electron gain enthalpy ($\Delta_{eg}H$) is the most reactive metal. The values of $\Delta_i H_1$, $\Delta_i H_2$ and $\Delta_{eg}H$ match that of K (potassium).
(c) The element III which has high first ionization enthalpy ($\Delta_i H_1$) and a very high negative electron gain enthalpy ($\Delta_{eg}H$) is the most reactive non-metal. The values of $\Delta_i H_1$, $\Delta_i H_2$ and $\Delta_{eg}H$ match that of F (fluorine).
(d) The element IV has a high negative electron gain enthalpy ($\Delta_{eg}H$) but not so high first ionization enthalpy ($\Delta_{eg}H$). Therefore, it is the least reactive non-metal. The values of $\Delta_i H_1$, $\Delta_i H_2$ and $\Delta_{eg}H$ match that of I (Iodine).
(e) The element VI has low first ionization enthalpy ($\Delta_i H_1$) but higher than that of alkali metals. Therefore, it appears that the element is an alkaline earth metal and hence will form binary halide of the formula MX_2(where X = halogen). The values of $\Delta_i H_1$, $\Delta_i H_2$ and $\Delta_{eg}H$ match that of Mg (magnesium).
(f) The element I has low first ionization ($\Delta_i H_1$) but a very high second ionization enthalpy ($\Delta_i H_2$), therefore, it must be an alkali metal. Since the metal forms a predominarly stable covalent halide of the formula MX (X = halogen), therefore, the alkali metal must be least reactive. The values of $\Delta_i H_1$, $\Delta_i H_2$ and $\Delta_{eg}H$ match that of Li (lithium).

Question 32. Predict the formulas of the stable binary compounds

that would be formed by the combination of the following pairs of elements:
(a) Lithium and oxygen
(b) Magnesium and nitrogen
(c) Aluminium and iodine
(d) Silicon and oxygen
(e) Phosphorous pentafluoride
(f) Element 71 and fluorine.
Answer:
(a) LiO_2 (Lithium oxide)
(b) Mg_3N_2 (Magnesium nitride)
(c) AlI_3(Aluminium iodide)
(d) SiO_2 (Silicon dioxide)
(e) Phosphorous and fluorine
(f) Z = 71
The element is Lutenium (Lu). Electronic configuration $[X_e]$ 4 f^7 $5d^1$ $6s^2$.with fluorine it will form a binary compound = Lu F_3.

Question 33. In the modem periodic table, the period indicates the value of
(a) atomic number
(b) mass number
(c) principal quantum number
(d) azimuthal quantum number?
Answer: In the modern periodic table, each period begins with the filling of a new shell. Therefore, the period indicates the value of principal quantum number. Thus, option (c) is correct.

Question 34. Which of the following statements related to the modem periodic table is incorrect?
(a) The p-block has six columns, because a maximum of 6 electrons can occupy all the orbitals in a p-subshell.
(b) The d-block has 8 columns, because a maximum of 8 electrons can occupy all the orbitals in a d-subshell.
(c) Each block contains a number of columns equal to the number of electrons that can occupy that subshell.
(d) The block indicates value of azimuthal quantum number (l)for the last subshell that received electrons in building up the electronic configuration.
Answer: Statement (b) is incorrect.

Question 35. Anything that influences the valence electrons will affect the chemistry of the element. Which one of the following factors does not affect the valence shell?
(a) Valence principal quantum number (n)
(b) Nuclear charge (Z)
(c) Nuclear mass
(d) Number of core electrons.
Answer: (c) Nuclear mass.

Question 36. The size of isoelectronic species - F^-, Ne and Na^+ is affected by
(a) nuclear charge (Z)
(b) valence principal quantum number (n)
(c) electron-electron interaction in the outer orbitals
(d) none of the factors because their size is the same
Answer: (a) Nuclear charge (Z).

Question 37. Which of the following statements is incorrect in relation to ionization enthalpy?
(a) ionization enthalpy increases for each successive electron.
(b) The greatest increase in ionization enthalpy is experienced on removal of electrons from core noble gas configuration.
(c) End of valence electrons is marked by a big jump in ionization enthalpy.

(d) Removal of electron from orbitals bearing lower n value is easier than from orbital having higher n value.
Answer: (d) is incorrect.

Question 38. Considering the elements B, Al, Mg and K, the correct order of their metallic character is:
(a) B > Al > Mg > K
(b) Al > Mg > B > K
(c) Mg > Al > K > B
(d) K > Mg > Al> B
Answer: In a period, metallic character decreases as we move from left to right. Therefore, metallic character of K, Mg and Al decreases in the order: K > Mg > Al. However, within a group, the metallic character, increases from top to bottom. Thus, Al is more metallic than B. Therefore, the correct sequence of decreasing metallic character is: K > Mg > Al > B, i.e., option (d) is correct.

Question 39. Considering the elements B, C, N, F and Si, the correct order of their non-metallic character is:
(a) B > C > Si > N > F
(b) Si > C > B > N > F
(c) F > N > C > B > Si
(d) F > N > C > Si > B
Answer: In a period, the non-metallic character increases from left to right. Thus, among B, C, N and F, non-metallic character decreases in the order: F > N > C > B. However, within a group, non-metallic character decreases from top to bottom. Thus, C is more non-metallic than Si. Therefore, the correct sequence of decreasing non-metallic character is: F > N > C > B > Si, i.e., option (c) is correct.

Question 40. Considering the elements F, Cl, O and N, the correct order of their chemical reactivity in terms of oxidising property is:
(a) F > Cl > O > N
(b) F > O > Cl > N
(c) Cl > F > O > N
(d) O > F > N > Cl
Answer: Within a period, the oxidising character increases from left to right. Therefore, among F, O and N, oxidising power decreases in the order: F > O > N. However, within a group, oxidising power decreases from top to bottom. Thus, F is a stronger oxidising agent than Cl. Further because O is more electronegative than Cl, therefore, O is a stronger oxidising agent than Cl. Thus, overall decreasing order of oxidising power is: F > O > Cl > N, i.e., option (b) is correct.

********** END **********