SAMPLE PAPER-05 (solved)

CHEMISTRY (Theory)

Class – XI

Time allowed: 3 hours Maximum Marks: 70

General Instructions:

a) All the questions are compulsory.
b) There are **26** questions in total.
c) Questions **1** to **5** are very short answer type questions and carry **one** mark each.
d) Questions **6** to **10** carry **two** marks each.
e) Questions **11** to **22** carry **three** marks each.
f) Questions **23** is value based question carrying **four** marks.
g) Questions **24** to **26** carry **five** marks each.
h) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such questions.
i) Use of calculators is **not** permitted. However, you may use log tables if necessary.

1. What is the maximum number of electrons in f subshell with same spin?
2. Two litres of an ideal gas at a pressure of 10 atm expands isothermally into a vacuum until its total volume is 10 litres. How much heat is absorbed and how much work is done in the expansion?
3. "BeH_2 molecule has zero dipole moment although the Be-H bonds are polar" Explain.
4. Give water gas shift reaction.
5. Arrange the following metals in the order in which they displace each other from the solution of their salts. Al, Cu, Fe, Mg and Zn.
6. What is hydride gap? Why is heavy water used in nuclear reactors?
7. Though carbon dioxide is inert and harmless gas, it is thought to be a serious pollutant. Why?
8. Which of these electrons experience lowest effective nuclear charge?
   a) The Br atom containing 35 electrons in which 6 electrons are in 2p orbital or
   b) 6 electrons in 3p orbital and 5 electrons in 4p orbital.
9. Write structural formulas of the following compounds :
   a) 3, 4, 4, 5–Tetramethylheptane
   b) 2,5-Dimethyhexane

   Or

   Write the structural formula of:
   a) O-Ethylanisole
   b) 2,3 - Dibromo -1 - phenylpentane
10. a) How change in velocity of a moving particle change the wavelength of the particle?

b) Give the difference in the angular momentum of an electron present in 3p and 4p orbitals?

11. A liquid is in equilibrium with its vapour in a sealed container at a fixed temperature. The volume of the container is suddenly increased.
    a) How do rates of evaporation and condensation change initially?
    b) What is the initial effect of the change on vapour pressure?

12.
    a) How would you distinguish between $BeSO_4$ and $BaSO_4$?
    b) Which is thermally most stable alkaline earth metal carbonate among $MgCO_3$, $CaCO_3$, $SrCO_3$, $BaCO_3$? Give reasons.

13. Derive the structure of :
    a) 2-Chlorohexane
    b) Pent-4-en-2-ol
    c) 3- Nitrocyclohexene
    d) Cyclohex-2-en-1-ol

Or

Why NH_3 has a higher dipole moment than NF_3?

14. Why is the entropy of a substance taken as zero at 0 K? calculate the standard Gibbs free energy change for the reaction
$N_2(g)+3H_2(g) \Leftrightarrow 2NH_3(g)$ at 298 K.

The Value of equilibrium constant for the above reaction is 6.6×10^5. [R=8.314 J K^{-1} mol^{-1}]

15. Define the following:
    a) Critical temperature
    b) Avogadro law
    c) Charles Law

16. What happens when
    a) Sodium metal is dropped in water?
    b) Sodium metal is heated in free supply of air?
    c) Sodium peroxide dissolves in water?

17. Justify giving reactions that among halogens, fluorine is the best oxidant and among hydrohalic compounds, hydroiodic acid is the best reductant?

18. Write the balance equation for the following:
    i) $BF_3 + LiH \rightarrow$
    ii) $B_2H_6 + H_2O \rightarrow$
    iii) $NaH + B_2H_6 \rightarrow$
    iv) $H_3BO_3 \xrightarrow{\Delta}$
    v) $Al + NaOH \rightarrow$
    vi) $B_2H_6 + NH_3 \rightarrow$

19. Explain the principle of paper chromatography?

20. Write a brief note on the following environmental terms:
    i) Acid rain
    ii) Eutrophication
    iii) Green Chemistry

21.
    i) List two differences between Orbit and Orbital
    ii) If an electron is moving with a velocity 600 m/s which is accurate up to 0.005%nthen calculate the uncertainty in its position. [h=6.626 x 10^{-34} Js and mass of electron = 9.11 x 10^{-31} kg]

22. Explain in brief for the following:
    i) Anions are bigger in size than their parent atom.
    ii) Oxygen has lesser first ionization enthalpy than nitrogen
    iii) Fluorine has less negative electron gain enthalpy than chlorine

23. John was arrested by the custom officials as he was smuggling drugs and caught by x-ray machines. According to Roentgen when electrons strike a material in the cathode ray tube, it produces a ray which can cause fluorescence in the fluorescent material placed outside the cathode ray tubes. These rays were called x-rays. These were not deflected by electric and magnetic field. It was used as diagnostic tool in the treatment of diseases and bone fractures.
    a) What is the approx. wavelength of x-rays?
    b) Why x-rays are used to screen luggage's in airports?
    c) How would you prevent smuggling?

24.
a) The species H_2O, HCO_3, HSO_4^- and NH_3 can act both as Bronsted acids and bases. For each case give the corresponding conjugate acid and base.

b) Consider the following endothermic reaction: $CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$
    i) Write expression for Kp for the above reaction.
    ii) How will the equilibrium be affected by?
    1. Increasing the pressure 2. Using a catalyst

Or

a) Predict the acidic, basic or neutral nature of the following salt: NaCN, KBr, $NaNO_2$, NH_4NO_3.
b) How many grams of KBr are added to 1 L of 0.05 M solution of silver nitrate just to start the precipitation of AgBr? Ksp of AgBr = 5.0 x 10^{-13}

25. With the help of structures, give the IUPAC names of different chain isomers of alkanes corresponding to the molecular formula C_6H_{14}.

Or

The preparation of acetaldehyde by passing mixture of ethene and oxygen under pressure into aqueous solution of $PdCl_2$ and $CuCl_2$ as a catalyst is called Wacker's process. Acetalydehyde is a useful chemical which is used for silvering of mirror. It can be prepared by various methods. It is used in the commercial preparation of acetic acid, ethyl acetate etc. Paraldehyde, a trimer of aldehyde is used as hypnotic.

a) Give the best method to prepare acetaldehyde. Give two reasons.
b) Give the chemical equation for Wacker's process of preparation of acetaldehyde.
c) Give the disadvantage of preparing it from ethyne.

26. Give the net ionic equation for the reaction of potassium dichromate (VI) with sodium sulphite in an acid solution to give chromium (III) ion and the sulphate ion.

Or

Explain the reason for the following reactions to proceed differently.

$Pb_3O_4 + 8\ HCl \rightarrow 3\ PbCl_2 + Cl_2 + 4\ H_2O$ and

$Pb_3O_4 + 4\ HNO_3 \rightarrow 2\ Pb(NO_3)_2 + PbO_2 + 2\ H_2O$