SAMPLE PAPER-01 (unsolved)

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. Explain Heinsenberg Uncertainty Principle?
2. What are electrochemical cells?
3. Why is diamond harder than graphite? What is the hybridization of C in graphite?
4. In what type of system could equilibrium be attained between liquid and its vapours?
5. Write the structural formula of 2-methylcyclohexanone
6. Balance the following reactions:

$$a. MnO_4^- + I^- \rightarrow MnO_2 + I_2$$

$$b. Cr_2O_7^{2-} + Fe^{2+} \rightarrow Cr^{3+} + Fe^{3+}$$

7. Describe the method of measurement ΔU .
8. What is meant by VSEPR theory? Predict the shape of water using VSEPR theory.

Or

a) Define Standard Enthalpy of formation.
b) Define Standard enthalpy of neutralization.

9. A 100 watt bulb emits monochromatic light of wavelength 400nm. Calculate the number of photons emitted per second by the bulb.
10. Derive the relationship between K_P and K_C.
11. Explain the terms:
    (i) Screening effect
    (ii) Diagonal relationship
    (iii) Metallic character
12. A) What is greenhouse effect?
    B) How is photochemical smog formed?
    C) What is COD and BOD?
13. A) Calculate pH solution in which 25.0 mL of 0.10M NaOH is added to 35.0 mL of 0.1M HCl.

B) Calculate the degree of dissociation and concentration of $[H_3O]^+$ in 0.01M solution of formic acid . [$K_a = 2.1 \times 10^{-4}$ at 298 K].

Or

Define the following terms:

a) Critical temperature
b) Avogadro law
c) Charles law

14. What do you mean by Quantum numbers? What information is conveyed by (i) Principal, (ii) Azimuthal, (iii) Magnetic (iv) Spin quantum number?
15. Define Boyle's Law. A gas occupies a volume of 250 mL at 745 mm Hg and 25^0 C. What additional pressure is required to reduce the gas volume to 200 mL at the same temperature?
16. Why is entropy of a substance taken as zero at 0 k? Calculate the standard Gibbs free energy change for the reaction

$$N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)} \text{ at 298 K}$$

The value of equilibrium constant for the above reaction is 6.6×10^5 [R = 8.314 J/k mol]

17. A) What is the effect of heating on (i) $CaCO_3$ (ii) $CaSO_4\ 2H_2O$.
    B) Explain common ion effect.
18. Write short notes on:
    a) Grignard Reaction
    b) Wurtz Reaction
    c) Decarboxylation Reaction
19. Explain with suitable examples
    a) Resonance effect
    b) Inductive effect
20. A) Why are group 2 elements harder than group1 elements?
    B) Write balanced equations for the following when
        a) KO_2 reacts with H_2O
        b) K_2O reacts with CO_2
21. Draw the structures of: (i) $BeCl_2$ (Vapour) (ii) $BeCl_2$ (Solid).
22. Balance the following by ion electron method:

$$a. CrO_3 + H_2O_2 \rightarrow CrO_4^{2-} + H_2O \text{ in basic solution}$$

$$b. Al(s) + NO_3 \rightarrow Al(OH)_4^- + NH_3 \text{ in basic solution}$$

23. Scientists have discovered a new way to produce hydrogen to off a solution to global energy problems. The scientists unlocked the potential of hydrogen as a clean, cheap and reliable power source. Hydrogen can be burned to produce energy without producing emissions like fossil fuels. Hydrogen is produced by electrolysis of water. Scientists have separated water into hydrogen and oxygen like plants use sun's energy to spilt H_2O molecules into H_2 and O_2. This research offers promise in making storage of green energy cheaper.
    a) Name the most abundant element in the universe.
    b) What are the values possesses by these scientists?
    c) Why is hydrogen, an ideal fuel?
    d) What are the disadvantages of using hydrogen as a fuel?

24. A. why is the organic compound fused with sodium metal before testing for nitrogen or halogen? What will happen during the Lassaigne's test for nitrogen if contains sulphur also? Write the chemical equations involved?
B. 0.246 g of an organic compound gave 0.198 g of CO_2 and 0.1414 g of H_2O on complete combustion 0.37 g of compound gave 0.631 g of AgBr. What is the molecular formula of the compound if its vapour density is 55.4? (Given At. mass of C=12, H=1, Br=80).

Or

a) What is the total number of sigma bonds in 3-methyl phenol
b) Explain with a suitable equation the S_N1 mechanism
c) How will you separate the following mixtures? Name the process
   (i) Sugar and Salt
   (ii) Blue ink and red ink
   (iii) Benzene and Toluene

Explain the principle involved.

25. A. Why do Boron halides form addition compound with NH_3? Show diagrammatically the bond formation.
B. Assign appropriate reason for each of the following:
a) Anhydrous $AlCl_3$ is used as a catalyst in many organic reactions.
b) The tendency to show +2 oxidation state increases as we go down the 14^{th} group.
c) Explain the formation of producer gas.

Or

A. Give the reasons for the following:
   i. The tendency of catenation decreases down the group 14.
   ii. The decreasing stability of +3 oxidation state increases with increasing atomic number in group 13.
B. Draw the structures of the following species
   i. $(Si_2O_7)^{-8}$
   ii. $(SiO_3^{-2})_n$
C. Explain the formation of water gas.

26. A. Convert:
a) Benzene to Acetophenone
b) Ethane to ethane 1,2-diol
B. What is a functional group?
C. Draw the structure of the compound 4-nitro-1-pentyne.
D. Write the IUPAC name of the following

$$CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - NH - CH_3$$

Or

A. What are the necessary conditions for any compound to show aromaticity?
B. Convert – 2-Butyne from ethyne and Benzene to benzyl chloride ($C_6H_5CH_2Cl$).