Sample Paper-03
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.

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1. Draw the structure of
   (a) 2, 3-Dimethylpentane

   (b) 4-Phenylbut-1-ene
2. If a tank is full of water coming in and out at the same rate, then what will happen to the level of water in a tank?
3. Express 32.392800 to four significant figures.
4. Write the correct symbol for the nucleus with:
   (i) Atomic number 56 and mass number 138

   (ii) Atomic number 26 and mass number 55.
5. Why is Ga smaller in size than Al?
6. The standard solution of NaOH cannot be prepared by weighing. Why?
7. Give reason: "Although geometries of ammonia and water molecules are distorted tetrahedral, bond angle in water is less than that of ammonia".

   Or

   Why is benzene extra-ordinary stable though it contains three double bonds?
8. In the estimation of sulphur by Carius method, 0.468 g of an organic sulphur compound afforded 0.668 g of barium sulphate. Find out the percentage of sulphur in the given compound.
9. (a) Is it possible to achieve equilibrium between water and its vapour in an open vessel?
   (b) Explain your answer and say what happens eventually.
10. How does electronegativity vary i) down the group and ii) across the period?
11. (i) Which of the two is more stable H_2^+ or H_2^- and why?
    (ii) All bonds in PCl_5 are not equal. Explain.

(iii) Which of the two is more ionic - NaCl or NaI and why?

12. Explain the following terms with an example each:
(i) Open system

(ii) Isolated system

(iii) Closed system

13. Draw the structure of the following IUPAC compounds:
(a) 2, 8-Dimethyl-3, 6-decadiene

(b) 4-Ethyl-2, 6-dimethyl-dec-4-ene

(c) 1,3,5,7 Octatetraene

(d) 4-Nitroso-N-dimethylbenzenamine

(e) Benzene 1, 4-dicarboxylic acid

(f) 1-Phenylpropanone

14. (i) Calculate the percentage of C and H in 0.2475 g of an organic compound gave on combustion 0.4950 g of carbon dioxide and 0.2025 g of water.
(ii) What will happen during Lassaigne's test for nitrogen if the compound also contains sulphur?

15. If water vapour is assumed to be a perfect gas, molar enthalpy change for vapourisation of 1 mol of water at 1bar and 100°C is 41kJmol^{-1}. Calculate the internal energy change, when
(i) 1 mol of water is vaporised at 1 bar pressure and 100°C

(ii) 1 mol of water is converted into ice.

16. Explain:
(i) Boron is unable to form BF_6^{3-} ion.

(ii) $[SiF_6]^{2-}$ is known whereas $[SiCl_6]^{2-}$ not known.

(iii) Conc. HNO_3 can be stored in aluminium container.

17. Identify the species undergoing oxidation and reduction in the reactions given below.
(i) $H_2S\ (g) + Cl_2\ (g) \rightarrow 2\ HCl\ (g) + S\ (s)$

(ii) $3Fe_3O_4\ (s) + 8\ Al\ (s) \rightarrow 9\ Fe\ (s) + 4Al_2O_3\ (s)$

(iii) $2\ Na\ (s) + H_2\ (g) \rightarrow 2\ NaH\ (s)$

18. What are the conclusions made by Rutherford w.r.t the structure of atom?

19. Define the following terms:
(i) Functional groups

(ii) Homologous series

Or

Predict about the formation of M^{3+} ion in solution and compare the electropositive character of the two metals given. The standard electrode potential values, E^{θ} for Al^{3+}/Al are –1.66 V and that of Tl^{3+}/Tl is +1.26 V.

20. Give reasons:
(a) HCl is predominantly covalent in gaseous state.

(b) KHF_2 exists while $KHCl_2$ does not.

(c) Sigma bond is stronger than the pi bond.

(d) NaCl gives white precipitate with silver nitrate solution.

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..626×10^{-34} Js and mass of electron = 9.11×10^{-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. Three students, A, B and C were asked to prepare the Lassaigne's extract independently by fusing the compound with sodium. Then, they added solid ferrous sulphate and dilute sulphuric acid to a part of Lassaigne's extract. Both A and B got Prussian blue colour but C got red colour. Can you help them with equations and reasons? Write the chemical equations to explain the formation of compounds of different colours.

Or

(a) What is the principle of chromatography?

(b) How can forgery be detected with the help of chromatography?

(c) Is it possible to separate components of orange ink by chromatography?

(d) Name the stationary and mobile phase in paper chromatography.

(e) What is the suitable adsorbent in the process of column chromatography?

25. Give reasons:
(a) Why silicones are used for nipples of feeding bottles?

(b) Why are silicones used in cosmetic plants?

(c) Why silicones are water-repellant?

(d) Why are silicones thermally stable?

(e) Are silicones safe for environment?

Or

(i) If a salt 'A' gives the following results:

(a) Its aqueous solution is alkaline to litmus.

(b) On strong heating, 'A' swells up to a glassy material 'B'.

(c) When concentrated HCl is added to a hot solution of 'A' white crystals of an acid 'C' separates out.

(d) Write the chemical equations for the reactions and identify 'A', 'B' and 'C'.

(i) Complete the equations:

(a) $2Al + 6HCl \rightarrow$

(b) $8BF_3 + 6LiH \rightarrow$

26. (i) What is the change in internal energy in a process, 701 J of heat is absorbed by a system and 394 J of work is done by the system.
(ii) The equilibrium constant for the reaction is 10. Calculate the value of ΔG^{θ}. Given R = 8.0 J/mol, T = 300 K.

Or

Calculate the lattice energy for the change of $Li^+(g) + Cl^-(g) \rightarrow LiCl(s)$,

$\Delta_{sub}H^{\theta}$ of Li = 160.67 kJ/mol, $\Delta_{diss}H^{\theta}$ of Cl_2 = 244.34 kJ/mol,

$\Delta_{le}H^{\theta}$ of Li (g) = 520.07 kJ/mol, $\Delta_{eg}H^{\theta}$ of Cl (g) = - 365.26 kJ/mol,

Δ_rH^{θ} of LiCl (s) = - 401.66 kJ/mol.

Is the reaction spontaneous or not?