Time: 3 hrs Max marks = 70

Section – 1 (1 marks each)

1. How many significant figures are present in π (pie)?

2. Why $[AlF_6]^{3-}$ exits but $[BF_6]^{3-}$ does not exist ?

3. Write down two difference between sigma bond and pie bond.

4. Give one example with intramolecular hydrogen bonding.

5. Mention the SI unit of viscosity coefficient (ɳ).

Section – 2 (2 marks each)

6. a. What is the function of salt-bridge in an electrochemical cells?

b. Example of one-redox decomposition reaction.

7. Describe the hybridization of case of PCl_5. Why are the axial bonds longer as compared to equatorial bonds?

8. Although fluorine is the most electronegative element of the periodic table still its electron gain enthalpy is lower than chloride?

9. A sample of drinking water was found to be severely contamination with chloroform, $CHCl_3$ supposed to be carcinogenic in nature. The level of contamination was 15 ppm (by mass). [Molar mass of $CHCl_3$ = 119.5 g]. Determine the molarity of chloroform in the water sample.

10. Write down the electronic configuration of Cr (Z = 24) and copper (Z = 29) in the ground state.

Section – 3 (3 marks each)

11. a. What is the basic difference between the terms electron gain and enthalpy and electro negativity?

b. Define vander Waal radii.

12. Differentiate between molarity and molality of a solution. What is the effect of change in temperature of solution on its molarity?

13. a. The molecular mass of an organic compound is 78 and its percentage composition is 92.4% C and 7.6%H. Determine the molecular formula of the compound.

b. Define law of constant proportion.

14. Suppose an element whose atomic number is 120 is discovered in future. On the basic of its electrode configuration predict:

a. Group b. Period c. IUPAC nomenclature with symbol

15. Chlorine is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloride acte according to the reaction

$$4HCl(aq) + MnO_2(s) \rightarrow 2H_2O(l) + MnCl_2(aq) + Cl_2(g)$$

How many grams of HCl react with 5.0 of manganese dioxide?

[Given : Molecular mass MnO_2, HCl, Cl_2 and $MnCl_2O$ are 87 g, 36.5 g, and 126 g respectively]

16. Define Heisenberg's uncertainty principle. On the basis of Heisenberg's principle prove that an element cannot exists within the nucleus?

17. On the basis of Molecular orbital theory, calculate the bond order of N_2, O_2 and O_2^-.

18. Calculate the formula charge on O_3 molecular and draw its actual structure on the basis of the calculated formal charge?

b. Which of the two has the highest dipole moment and why: NH_3 or NF_3 ?

19. a. A golf ball has a mass of 40g, and a speed of 45 m/s. If the speed can be measured within accuracy of 2% calculate the uncertainty in the position.

b. Define photoelectric effect.

20. 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

21. a. Explain the physical significance of Van der Waals paramenets.

b. Explain London dispersion forces with one example

Or

a. In terms of Charles law explain why-273°C is the lowest possible temperature.

b. Why glass is considered as super cooled liquid?

22. While sulphur dioxide and hydrogen peroxide can act as oxidizing as well as reducing agents in their reactions, ozone and nitric acid act only as oxidants. Explain with suitable reactions ?

Section – 4 (4 marks each)

23. Arun asked Indresh that why people are undergoing medical check-up before going on AMARNATH YATRA. Arun explained the reason to Indresh and he got satisified meanwhile Rahul told that liquid bells at low temperature at a Hilly station than in a plane area.

(i) What reason was explained by Arun to satisfy Indresh ?

(ii) Why does liquid boil at lower temperature at Hilly station?

(iii) What value is associated with Arun ?

(iv) Mention the value Associated with concept of Rahul?

Section – 5 (5 marks each)

24. a. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition a = 4, n = 2 of He^+ spectrum?

b. Which of the following are isoelectronic species i.e., those having the same number of electron?

25. a. Is there any change in the hybridization of Al and Cl atoms as result of the following reaction?

$$AlCl_3 + Cl^- \rightarrow AlCl_4^-$$

b. Although geometries of NH_3 and H_2O molecules are distorted tetrahedral, bond angle in water is less than of ammonia. Discuss.

c. Draw the resonating structure of CO_3^{2-} molecule.

26. a. Calculate the no. of sigma and pie bonds in the following :

a. Ethene b. But-1-ene

b. What is octet rule? Name few molecules that do not obey the octet rule?

c. Although CCl_4 contains four chlorine atoms; still it does not produce while ppt. of AgCl on reaction with $AgNO_3$ but NaCl does. Why?