



**DELHI PUBLIC SCHOOL : SURAT
CHEMISTRY (THEORY)**

Roll No :

Class : XI

Marks : 70

Time Allowed: 3 Hrs

Instructions:

1. All questions are compulsory.
2. Q.No.1 to 5 are very short answer questions, carrying 1 mark each.
3. Q.No. 6 to 12 are short answer questions carrying 2 marks each.
4. Q.No. 13 to 24 are also short answer questions carrying 3 marks each.
5. Q.No. 25 to 27 are long answer question carrying 5 marks .
6. No overall choice is given. However an internal choice has been provided in one question for two marks, one question of three marks and all the three questions of five marks weightage.
7. Use of Calculators is not allowed. However if required use of Log tables is permitted.

1. 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? [1]
2. Write the statement explaining "Spontaneity" . [1]
3. Given $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$: $\Delta_r H^\ominus = -92.4 \text{ kJ/mol}$ [1]
What is the standard enthalpy of formation of NH_3 gas?
4. The pK_a of acetic acid and pK_b of ammonium hydroxide are 4.76 and 4.75 respectively. Calculate the pH of ammonium acetate solution. [1]
5. $2\text{NO}_2(\text{g}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{NO}_2^-(\text{aq}) + \text{NO}_3^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$ [1]
Explain why the above reaction is called as disproportionation reaction?
6. A sample of NaNO_3 weighing 0.38 g is placed in a 50 ml measuring flask. The flask is then filled with water upto the mark on the neck. What is the molarity of the solution? [2]
(Atomic mass of Na = 23, N = 14, O = 16)
7. i) Which one of the two has a larger radius for the following pairs (Justify) : [2]
a) Mg or Ca b) S or Cl
ii) From amongst Be, B and C, choose the element with highest and lowest first ionization enthalpy.
8. Explain the terms with example: Diagonal relationship & Shielding effect. [2]
9. Explain the formation of NH_3 molecule explaining type of hybridisation, shape and and angle [2]

between the atoms. How many lone pairs are present in the molecule?

10. The equilibrium constant for the following reaction is 1.6×10^5 at 1024K
 $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightleftharpoons 2\text{HBr}(\text{g})$. Find the equilibrium pressure of all gases if 10 bar of HBr is introduced into a sealed container at 1024K. [2]

OR

At 700K, equilibrium constant for the reaction $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$ is 54.8. If 0.5 mol/L of HI(g) is present at equilibrium at 700K, what are the concentrations of $\text{H}_2(\text{g})$ and $\text{I}_2(\text{g})$ assuming that we initially started with HI(g) and allowed it to reach equilibrium at 700K.

11. Give condensed and bond line structural formulas for: [2]
a) 2,2,4-Trimethylpentane
b) $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)\text{CH}_3$
12. Write structures of all the alkenes which on hydrogenation give 2-Methylbutane. [2]
13. Answer the following: [3]
a) Potassium carbonate cannot be prepared by Solvay process. Explain.
Write the reagents which are used in the solvay process for preparation of Na_2CO_3 .
b) Starting with sodium chloride how would you proceed to prepare sodium hydroxide. Give reactions.

OR

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 ?
14. Answer the following: [3]
a) What are Oxo-acids? Give one example.
b) What is the oxidation state of K in KO_2 ?
c) Complete the reaction: $4\text{LiNO}_3 \xrightarrow{\Delta}$
15. a) In a reaction $\text{A} + \text{B}_2 \rightarrow \text{AB}_2$ Identify the limiting reagent, if any, in the following reaction mixtures: [3]
i) 300 atoms of A + 200 molecules of B
ii) 2 mol A + 3 mol B
b) Calculate the molarity of a solution of ethanol in water in which the mole fraction of ethanol is 0.040 (assume the density of water to be one)

16. Write the no. of electron pairs and molecular geometry for the following molecules: [3]
i) PCl_5
ii) NH_4^+
iii) SF_6

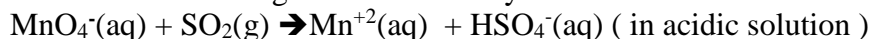
17. Answer the following: [3]
i) Calculate the entropy change in surroundings when 1 mol of $\text{H}_2\text{O}(\text{l})$ is formed under standard

conditions, $\Delta_f H^\ominus = -286 \text{ kJ/mol}$.

ii) What is Enthalpy of atomization?

18. Answer the following questions:

i) Balance the following redox reaction by ion-electron method: [2]



ii) What are the oxidation numbers of the underlined elements in each of the following: [1]



19. What do you understand by i) electron-deficient, ii) electron-precise and iii) electron rich compounds of hydrogen? Provide justification with suitable examples. [3]

20. Answer the following questions: [3]

i) State Heisenberg's Uncertainty principle. Write its mathematical expression.

ii) Using s,p,d and f notations, describe the orbital with the following quantum numbers:

a) $n=2, l=1$

b) $n=3, l=2$

21. Answer the following questions:

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

ii) Explain the terms 'nodal surfaces' and 'degenerate'. [1]

22. Answer the following questions: [3]

i) A student forgot to add the reaction mixture to the round bottomed flask at 27°C , but he/she placed the flask on the flame. After a lapse of time, he realized his mistake. Using a pyrometer, he found that the temperature of the flask was 477°C . What fraction of the air would have been expelled out ?

ii) What is coefficient of viscosity? What is its SI unit?

23. Answer the following questions: [3]

i) State Avagadro's Law (Volume - Amount relationship).

ii) Calculate the volume occupied by 8.8 g of CO_2 at 31.1°C and 1 bar pressure.

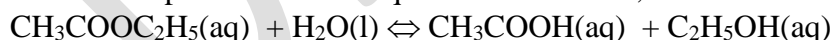
$$(R = 0.083 \text{ bar L / Kmol})$$

iii) What would be the SI unit for the quantity pV^2T^2/n ?

24. Answer the following:

i) The values of K_{sp} of two sparingly soluble salts $\text{Ni}(\text{OH})_2$ and AgCN are 2.0×10^{-15} and 6×10^{-17} respectively. Which salt is more soluble? Explain. [2]

ii) Write the expression for the equilibrium constant, K_c for each of the following reactions: [1]



25. A certain salt X, gives the following results, [5]

i) Its aqueous solution is alkaline to litmus.

ii) It swells up to a glassy material Y on strong heating.

iii) When conc. H_2SO_4 is added to a hot solution of X, white crystal of an acid Z separates out. Write all the reactions and identify X, Y and Z.

OR

What happens when:

a) Borax is heated strongly

b) Aluminium is treated with dilute NaOH

c) BF_3 is reacted with ammonia

26. Answer the following:

- i) In dumas method for the estimation of nitrogen, 0.3g of an organic compound gave 50ml of nitrogen collected at 300K temperature and 715mm pressure. Calculate the percentage composition of nitrogen in the compound. (aqueous tension at 300K =15mm) [2]
- ii) Give one example for functional group isomerism. [1]
- iii) Write resonance structures of $\text{CH}_2=\text{CH}-\text{CHO}$. Indicate the relative stability of the contributing structures. [2]

OR

Answer the following:

- i) During estimation of nitrogen present in organic compound by Kjeldahl's method, the ammonia evolved from 0.5g of the compound in Kjeldahl's estimation of nitrogen, neutralized 10 ml of 1 M H_2SO_4 . Calculate the percentage of nitrogen in the compound. [2]
- ii) Explain the terms Inductive and Electromeric effects. Which electron displacement effect explains the following correct orders of acidity of the carboxylic acids? [3]
 - a) $\text{Cl}_3\text{CCOOH} > \text{Cl}_2\text{CHCOOH} > \text{ClCH}_2\text{COOH}$
 - b) $\text{CH}_3\text{CH}_2\text{COOH} > (\text{CH}_3)_2\text{CHCOOH} > (\text{CH}_3)_3\text{C.COOH}$

27. Answer the following questions:

- i) Write structures for the following: [2]
 - a) 4-Phenyl but-1-ene
 - b) 4-Ethyldeca-1,5,8 triene
- ii) Write IUPAC names of the products obtained by the ozonolysis of the following compounds: [2]
 - a) 2-Ethylbut-1-ene
 - b) Pent-2-ene
- iii) Arrange benzene, n-hexane and ethyne in decreasing order of acidic behaviour. [1]

OR

Answer the following questions:

- i) How will you convert benzene into [2]
 - a) p-nitrotoluene
 - b) m-nitrochlorobenzene
- ii) Write IUPAC names of the products obtained by the ozonolysis of the following compounds: [2]
 - a) 3,4-Dimethylhept-3-ene
 - b) 1-phenylbut-1-ene
- iii) What are the necessary conditions for any system to be aromatic? [1]

END OF EXAMINATION