Time: 3 hrs Max marks = 70

Section – 1 (1 marks each)

1. Draw Lewis dot structure of an odd electron molecule.

2. Why does molarity change with temperature whereas molality doesn't?

3. Identify the type of isomerism in $CH_3CH_2COCH_3$ and $CH_3CH_2CH_2CHO$.

4. Arrange the following in increasing order of acidic strength:-HC*l*, HBr, HI

5. In a process, 701 J of heat is absorbed by the system and 3941 of work is done by the system. What is the change in internal energy of the process?

Section – 2 (2 marks each)

6. What happens when : [Give chemical equations]

(i) Sodium metal is dropped in water.

(ii) Sodium metal is heated in free supply of air.

7. Predict oxidation state of the underlined element

(a) K_2MnO_4 (b) NaH_2PO_4

8. Complete the following reactions:

(a) $CH_3CH = CH_2 \xrightarrow[(ii)\,Zn/H_2O]{(i)\,O_3}$

(b) $HC \equiv CH + H_2O \xrightarrow{HgSO_4/H^+}$

9. What will be the pressure of the gaseous mixture when 0.5L of H_2 at 0.8 bar and 2.0L of O_2 at 0.7 bar are introduced in a 1L vessel at 27°C?

10. How many electrons in an atom may have the following quantum numbers?

1. n = 4 m_s = - ½

2. n = 3, *l* = 0

Section – 3 (3 marks each)

11. (a) The equilibrium constant for the reaction

$$I_2 + Cl_2 \rightleftharpoons 2ICl \text{ at } 740 \text{ K is } 640.$$

Write the equilibrium constant for the reverse reaction at the temperature?

(b) Write the conjugate acid of NH_3.

12. (a) On the basis of VSEPR theory predict the shape of ClF_3.

(b) Calculate bond order of O_2^- and N_2^+ and compare their stability also comment on their magnetic behavior.

13. (A) 5.6L of methane gas is ignited in oxygen gas. Calculate the number of moles of carbon dioxide formed.

(b) A compound containing C, H & O gave the following analytical data

C = 40%, H = 6.67%. Calculate molecular formula of compound if its molecular mass is 180.

14. (a) Write electronic configuration of Cu (atomic no. 29)

(b) Calculate energy associated with the third orbit of He^+, what is the radius of the orbit?

15. (a) Arrange the following in increasing order of stability.

CH_3^+, $CH_3CH_2CH_2CH_2^+$, $(CH)_3C^+$, $CH_3CH^+CH_2CH_3$ $CH_3CH_2CH_2CH^+{}_2$,

(b) Draw geometrical isomers of $CH_3CH = CHCH_3$

(c) Give IUPAC name of Cl_2CHCH_2OH.

16. Give the mechanism of addition of HBr to propene.

17. (a) Balance the following redox reaction by ion – electron method

$$MnO_4^- + Fe^{2+} \rightarrow Mn^{2+} + Fe^{3+} \text{ (acidic medium)}$$

(b) What is disproportionation reaction? Give an example.

18. **(i)** Give reason for :-

(a) Be has higher Ionization Energy than Boron.

(b) Electron gain enthalpy of fluorine is less negative than that of chlorine

(ii) Consider the following species: N^{-3}, O^{-2}, F^-, Na^+, Mg^{+2}, Al^{+3}

What is common in them and arrange them in increasing order of ionic radii.

19. Account for the following:

(a) BX_3 act as Lewis acid.

(b) $PbCl_4$ is a powerful oxidizing agent.

(c) Graphite act as a good lubricant.

20. Write short notes on –

(a) Wurtz reaction

(b) Friedel craft's alkylation reaction.

21. Give reason for the following:

(a) LiCl is more soluble in ethanol than KI.

(b) Ca imparts color to the flame while Mg does not.

(c) Lithium is the only alkali metal to form nitride directly.

22. A cell is prepared by dipping Cu rod in 1M $CuSO_4$ Solution and Ni rod in 1M $NiSO_4$ solution. The standard reduction potential of Cu is 0.34 V and that of Ni is – 0.25 V respectively.

(a) Write overall cell reaction.

(b) What is the function of salt bridge in this cell?

Section – 4 (4 marks each)

23. Ramesh, a science student and his friends decided to start a campaign to motivate people to reduce global warming by minimizing the use of automobiles, motivating them to use carpool, public transport, which is economical and should plant trees to increase the green cover, avoid burning of dry leaves, wood etc.

(a) Name the two greenhouse gases.

(b) What is global warming?

(c) What values are associated with Ramesh's campaign?

Section – 5 (5 marks each)

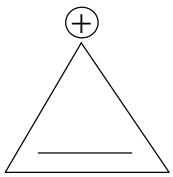
24. (a) What happens when: - [Give chemical equation]

Phenol is treated with Zn dust

(b) How would you convert Benzene into -

(i) p-nitrotoluene (ii) acetophenone.

(c) Explain whether the following are aromatic or not?



Or

(a) A hydrocarbon Y decolorizes bromine water. On ozonolysis it gives. 3-methylbutanal and formaldehyde. Write an equation for the reaction and give the name and formula of the compound Y

(b) Calculate the number of σ and π bond in the following compound

(c) Draw the structures of:

(i) 5-Oxohexanoic acid (ii) 2,4,6-Tribromophenol

25. (i) Define Hess's law of constant heat summation

(ii) Under what condition ΔG will be equal to ΔU.

(iii) Calculate free energy change for the following reaction.

$2NO_2(g) \rightarrow N_2O_4(g)$, If $\Delta H = -57.2$ kJ and $\Delta S = -175.6$ J/K at 298

Also, predict whether the reaction will be spontaneous or not?

Or

(a) The equilibrium constant Kc for hydrolysis of sucrose is 2×10^{13} at 300 K. Calculate ΔG^o at 300K.

(b) State second law of thermodynamic.

(c) One mole of acetone acquires less heat to vaporize than one mole of water. Which two liquid has higher enthalpy of vaporization.

26. (a) For an endothermic reaction

$$CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$$

What will be the effect on equilibrium on –

(i) Increasing the pressure.

(ii) Increasing the concentration of methane.

(b) Ionisation constant of propanonic acid is 1.32×10^{-5}. Calculate the degree of ionization of the acid in its 0.05M solution and also its pH.