Time: 2.30 hrs
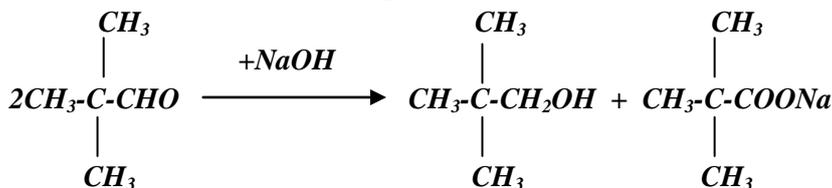ROLL NO : ……………   Marks: 70

I Choose the correct answer: **15X1=15**

1. The set with correct order of acidity is ---------
   a. **$HClO < HClO_2 < HClO_3 < HClO_4$**
   b. $HClO_4 < HClO_3 < HClO_2 < HClO$
   c. $HClO < HClO_4 < HClO_3 < HClO_2$
   d. $HClO_4 < HClO_2 < HClO3 < HClO$

2. An electron has a speed of 60m/s with an accuracy of 0.005%. the certainty with which the position of the electron can be located is
   a. $1.96X10^{-3}$ b. $1.058X10^{-3}$ c. $2.69X10^{-2}$ d. $3.85X10^{-2}$

3. Radioactive lanthanide is -----------
   a. **Promethium**   b. Cerium   c. Gadolinium   d. Lutetium

4. How many ions are produced from $[Co(NH_3)_6]Cl_2$ in solution?
   a. 6   b. 4   **c. 3**   d. 2

5. The half life period of a radioactive substance is 87.5% of it disintegrates in 40min is
   a. 160min   b. 10min   c. 20min   d. **13min**

6. Given $C+2S \rightarrow CS_2$ $\Delta H=117kJ$
             $C+ O_2 \rightarrow CO_2$ $\Delta H= -393kJ$
             $S+O_2 \rightarrow SO_2$ $\Delta H= -297kJ$
   The heat of combustion of CS_2 to form CO_2 and SO_2 is
   a. **-1104**   b. -807   c. -1911   d. +807

7. The pH of a solution that contains 0.10M CH_3COONa and 0.03M CH_3COOH is ---------
   (P_{ka} $CH_3COOH=4.57$)
   a. 4.09   b. 6.09   **c. 5.09**   d. 7.09

8. Which of the following compounds can exist in optically active form?
   a. But-1-ene   b**. butan-2-ol**   c. pentan-3-ol   d. heptan-4-ol

9. An organic compound A reacts with Na metal and forms B on heating with conc. H_2SO_4. A gives diethyl ether. A and B are
   a. **C_2H_5OH & C_2H_5ONa**   b. CH_3OH & CH_3ONa c. C_2H_5OH & CH_3ONa d. C_4H_9OH & C_4H_9ONa

10. In a solid AB having the NaCl structure, A atoms occupy the corners of the cube unit cell. If all the face centered atoms along one the axes are removed then the resultant stoichiometry of the solid is-------
    a. AB_2 b. A_2B c. A_4B_3 **d. A_3B_4**

11. If $_{90}Th^{228}$ disintegrates to $_{83}Bi^{212}$, then the number of α & β particles emitted is ----------
    a. 4α & 7β   b. **4α & 1β**   c. 4α   d. 7β

12. Which of the following in geometrical isomerism form
    a. But-1-ene   b. **But-2-ene**   c. propene   d. 1-1dichloro butane

13. Which one of the following sols is hydrophobic?
    a. **Sulphur**   b. Sugar   c. Gum   d. Gelatin

14. $\lambda_c = \mu_c$ for,
    a. **NaCl**   b. K_2SO_4 c. $Ba(OH)_2$ d. $Al_2(SO_4)_3$

15. Schiff's reagent gives pink colour with
a. Acetone   b. **Acetaldehyde**   c. Ethyl alcohol   d. Methyl alcohol.

II Answer any six. Question No.19 is compulsory: 6X2=12

16. *Explain on the basis of Molecular Orbital theory that Ne_2 does not exists.*
   Ne- 2,8 Ne_2- 20 electrons(½ m) , $\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \Pi 2p_x^2 = \Pi 2p_y^2, \Pi^* 2p_x^2 = \Pi^* 2p_y^2, \sigma^* 2p_z^2$ (½ m)
   Bo=8-8/2=0, since BO is zero molecule does not exist

17. What is Schottky defect?
   Explanation ($1^{1/2}$m) diagram (½ m)

18. *Predict the sign of entropy change for the following reactions: (4X ½ =2m)*
   a. $Hg_{(l)} \rightarrow Hg_{(g)}$ **(+ve)**
   b. $AgNo_{3(s)} \rightarrow AgNo_{3(Aq)}$ **(+ve)**
   c. $I_{2(g)} \rightarrow I_{2(s)}$ **(-ve)**
   d. $H_2O_{(l)} \rightarrow H_2O_{(s)}$ **(-ve)**

19. *Calculate the degree of dissociation of 0.02M acetic acid if its $Ka=1.8X10^{-5}$?*
   $\alpha = \sqrt{Ka/C}$ (½ m) $= \sqrt{(1.8X10^{-5}/0.02} = 0.03$ (½ m) substitution= 1m

20. Show that half life period is independent of initial concentration?
   $K_1 = (2.303/t) \log (a/a-x)$, if amount reacted x= a/2 then t= $t_{1/2}$ (½ m) $t_{1/2} = (2.303/k_1) \log$ (a/ a-a/2) (½ m) $t_{1/2} = 2.303 \log 2.0/k_1$ (½ m) $t_{1/2} = 0.693/k_1$ secs (½ m)

21. Explain Gabriel pthalimide synthesis?
   3 steps X ½ = 1 ½ m + names = ½ m

22. What type of aldehydes will undergo
   a) Cannizaro reaction
   b) Aldol Condensation
   Give an example for each type.
   Aldol- Aldehydes with α hydrogen atom. Eg: CH_3CHO (½ + ½)
   Cannizaro- Aldehydes with no α hydrogen atom. Eg: HCHO, C_6H_5CHO (½ + ½)

23. Give E,Z isomer of Cinnamic acid **(1+1=2m)**

24. Give the structure of sucrose. Is it a reducing or non-reducing sugar?
   Structure= 1m, Non-reducing sugar= 1m

III Answer any six of the following. Question No.29 is compulsory   6X3=18

25. Give the reduction of nitro benzene in various medium?
   Acidic medium= ½ m, alkaline medium= 1 ½ m, neutral medium= ½ m, catalytic reduction= ½ m

26. *An organic compound $C_5H_{10}O$ forms chain isomers B and C. B undergoes Cannizaro reaction and C undergoes Aldol condensation to form 3-hydroxy2-propylheptnal. Identify A, B, C and give their IUPAC names. Outline the mechanism of Cannizaro reaction applicable to B.*

   A= CH_3-CH_2-CH-CHO CH_3-CH-CH_2-CHO (½ m)

   ** | |**

   ** CH_3 (2 methyl butanal)   (OR) CH_3 (3 methyl butanal)**

   B is an aldehyde with no α hydrogen atom (undergoes Cannizaro reaction)

   B= CH_3

   ** |**

   CH_3-C-CHO (1m)

   ** |**

   ** CH_3(2,2 dimethyl propanal)**

   C is an aldehyde with α hydrogen atom (undergoes aldol condensation)

$C = CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CHO$ *(pentanal) (1m)*

$$2CH_3\text{-}\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}\text{-}CHO \xrightarrow{+NaOH} CH_3\text{-}\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}\text{-}CH_2OH + CH_3\text{-}\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}\text{-}COONa$$

Reaction = ½ m

27. What is a peptide bond. Illustrate its formation with an example.
Defn= 1m, Eg= 2m

28. *A coordination compound has the formula $CoBrSo_4.5H_2O$. the compound gives a white colour precipitate with Barium Chloride. Give the IUPAC name of the complex and write its structural formula?*
Structural formula= $[Co (H_2O)_5 Br] SO_4$ (1m) IUPAC= Pentaaquabromocobaalt(III)sulphate (2m)

29. Write the nuclear reaction for the following:
a. $_7N^{14}(\alpha,p)$　　b. $_3Li^7(p,n)$　　c. $_{17}Cl^{35}(n,p)$
$_7N^{14} + _2He^4 \rightarrow _8O^{17} + _1H^1$ **(1m)**
$_3Li^7 + _1H^1 \rightarrow _4Be_7 + _0n^1$ **(1m)**
$_{17}Cl^{35} + _0n^1 \rightarrow _{16}S^{35} + _1H^1$ **(1m)**

30. Explain: a. Peptisation　　b. Brownian movement　　c. Dialysis **(1+1+1)**

31. An element A of group number 15 and period number 3 reacts with limited supply of air to give B which reacts with cold water to give C a dibasic acid. B with the hot water reacts vigorously to form D a tribasic acid and E which has rotten fish odour. Identify A,B,C,D,E and write the reaction.
A- Phosphorus
B- Phosphorus trioxide
C- Phosphorus acid
D- Ortho phosphoric acid
E- Phosphine (2 ½ m)

3 equations- ½ m

32. a) Which is more basic $La(OH)_3$ or $Lu(OH)_3$. Justify your answer.
b) +3 oxidation state of Lanthanides is the most stable.
A= Comparison= ½ m, Justification =1m; B= 1 ½ m.

33. Calculate the momentum of a particle which has a de-Broglie wavelength of $1A^0$.
6 steps X ½ = 3m

IV. Answer all the questions:　　　　　5X5=25

34. a) (i) Explain the formation of O_2 molecule by MO theory. **Diag=2m, BO+Exp= 1m**
　　(ii) Derive de-Broglie equation. **All steps=2m**
　　　　　　　　(OR)
b) (i) Discuss the anomalous nature of fluorine. **Any 4 points X ½ = 2m**
　　(ii) How are noble gases separated by Dewar's method. **Exp= 2 ½ m, Diag= ½ m**

35. a) (i) What are super conductors. Give its applications. **1+ 1 ½ = 2 ½ m**
　　(ii) State Braggs law and write its significance. **1+ 1 ½ = 2 ½ m**
　　　　　　　　(OR)
b) (i) Explain why $[Ni(NH_3)_4]^{2+}$ is para magnetic while $[Ni(CN_4)_4]^{2-}$ is dia magnetic? **3m**

(ii) Give the IUPAC name, Central metal, ion coordination number and geometry of the complex $K_3[Cr(C_2O_4)_3].3H_2O$. **2m**

36. a) Write the various statements of II law of thermodynamics. **5m**

(OR)

b) Explain Ostwalds dilution law. **Exp=1m, Derivation= 4m**

37. a) Write the possible isomers of the formula $C_4H_{10}O$. **3+2=5m (functional isomers, metamers)**

(OR)

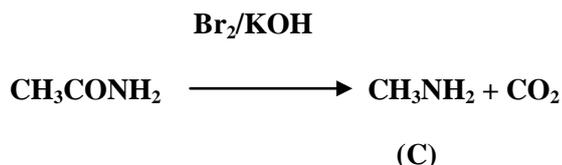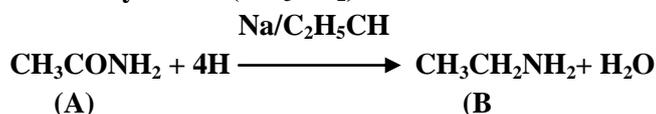b) Explain the optical activity in tartaric acid. **d= 1m, l= 1m, meso= 2m, racemic= 1m**

38. a) (i) An organic compound A of molecular formula C_2H_5NO on treatment with Na/C_2H_5OH give B (C_2H_7N). Compound A with Br_2/KOH gives C (CH_5N). Identify A,B,C and explain the equation.

3 compounds X 1 with equn = 3m

A= Acetamide (CH_3CONH_2)

B= Ethylamine ($CH_3CH_2NH_2$)

C= Methylamine (CH_3NH_2)

$$CH_3CONH_2 + 4H \xrightarrow{Na/C_2H_5CH} CH_3CH_2NH_2 + H_2O$$
$$\text{(A)} \qquad\qquad\qquad\qquad \text{(B}$$

$$CH_3CONH_2 \xrightarrow{Br_2/KOH} CH_3NH_2 + CO_2$$
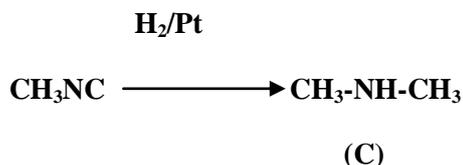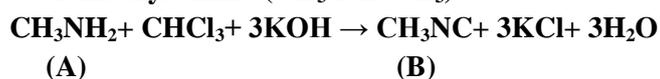$$\qquad\qquad\qquad\qquad\qquad \text{(C)}$$

(ii) An alkyl amine A (CH_5N) undergoes carbylamines reaction to give B. Identify A and B. Explain the reaction.

2 compounds X 1 with equation= 2m

A= Methyl amine (CH_3NH_2)

B= Methyl isocyanide (CH_3NC)

C= Dimethyl amine (CH_3-NH-CH_3)

CH_3NH_2+ $CHCl_3$+ 3KOH → CH_3NC+ 3KCl+ $3H_2O$
$$\text{(A)} \qquad\qquad\qquad\qquad\qquad \text{(B)}$$

$$CH_3NC \xrightarrow{H_2/Pt} CH_3\text{-NH-}CH_3$$
$$\qquad\qquad\qquad \text{(C)}$$

(OR)

b) Derive the rate constant equation for a first order reaction. **Exp=1m, Derivation= 4m.**

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