II PUC Chemistry (34)
Blue Print for Model Question Papers

Time : 3 Hrs. 15min.

Max. Marks: 70

Group	Unit	Title	Hours	Marks	Part-A I 10x1 mark	Part B II 8x2 mark	Part C III 8x3 mark	Part D IV & V 11x5 mark	Total
Group-I Physical	1	The Solid state	8	7		✓		✓	7
	2	Solution	9	8	✓✓			✓	7
	3	Electrochemistry	9	8	✓	✓		✓	8
	4	Chemical kinetics	9	8	✓	✓		✓	8
	5	Surface chemistry	6	5	✓			✓	6
		Total of Group-I	**41**	**36**					**36**
Group-II Inorganic	6	General principles and processes of isolation of elements	5	4	✓		✓		4
	7	The p-block elements	11	10	✓		✓✓✓		10
	8	The d and f-block elements	9	8		✓	✓✓		8
	9	Coordination compounds	7	6			✓✓		6
		Total of Group-II	**32**	**28**					**28**
Group-III Organic	10	Haloalkanes and haloarenes	7	6	✓			✓	6
	11	Alcohols, phenols and ethers	8	7		✓		✓	7
	12	Aldehydes, ketones and carboxylic acids	9	8	✓	✓		✓	8
	13	Amines	6	5				✓	5
	14	Biomolecules	7	6	✓			✓	6
	15	Polymers	5	5				✓	5
	16	Chemistry in everyday life	5	4		✓✓			4
		Total of Group-III	**47**	**41**					**41**
		TOTAL	**120**	**105**	**10**	**10**	**15**	**35**	**105**

CHEMISTRY

Time: 3 hr-15 min.   Batch-02   Max Marks: 70

Instructions:

i)   The question paper has four parts, A, B, C and D. All parts are compulsory
ii)   Part-A Carries 10 marks
       Part-B Carries 10 marks
       Part-C Carries 15 marks
       Part-D Carries 35 marks
iii)   Write balanced equations and draw diagrams wherever required
(Use log tables and the simple commercial calculator if necessary (use of scientific calculator is not allowed)

Part-A

I. Answer all questions,   **10 X 1=10**

1.   Define the term molality.
2.   How does the enthalpy change during the formation of a non-ideal solution two liquids showing positive deviation from Raoult's law?
3.   What is a primary electrochemical cell?
4.   For the reaction $2NH_{3(g)} \xrightarrow{\text{1130K/Mo}} N_{2(g)} + 3H_{2(g)}$ what is the order?
5.   What do you mean by selectivity of a catalyst?
6.   Give the chemical composition of Copper matte.
7.   Name the noble gas that is radioactive?
8.   Write the general equation of the preparation of alkyl chlorides from alcohols using $SOCl_2$.
9.   What are acetals?
10.   Name the water insoluble component of the starch?

Part-B

II. Answer any five of the following each questions carries two marks   5 X 2=10

11.   An element having atomic mass 60 amu. has FCC unit cell. The edge length of the unit cell is 4x 10^2 pm. Find the density of the unit cell.
12.   Write two applications of Kohlrausch law.
13.   The half-life period of a certain reaction is directly proportional to initial concentration of the reactant. predict the order of the reaction and write the expression to calculate the half-life period of the reaction**.**
14.   Give two consequences of lanthanoids contraction.
15.   Complete the following reaction;

i) $CH_3CH_2OH \xrightarrow{\text{Cu/300}^0\text{C}} ?$

ii) $R-COOH \longrightarrow RCH_2OH$. Name the reagent used in the conversion?

16.   How does ketone react with ethylene glycol. Write chemical equation for the reaction.
17.   What are analgesics? Give an example for non-narcotic analgesics.
18.   What are artificial sweeteners? Give an example.

Part-B

III. Answer any five of the following each questions carries three marks   5 X 3=15

19. On the basis of Ellingham's diagram explain the principle of extraction of iron from its oxide ore.
20. Explain the principles involved in the manufacture of ammonia by Haber's process.
21. Complete the following equations;

a) $5SO_2 + MnO_4^- + 2H_2O \longrightarrow 5 SO_4^{2-} + 4H^+ + ?$

b) $5SO_3 + Conc.H_2SO_4 \longrightarrow ?$ **1+1+1**

c) $2KClO_3 \xrightarrow{MnO_2} ?$

22. a) Explain the action of Conc. HCl on $KMnO_4$ crystals   **2**
    b) Write the structure of perchloric acid.   **1**
23. a) Transition metals show variable oxidation states. Explain   **2**
    b) Which metal of 3d-series exhibit maximum number of oxidation state?   **1**
24. How is $K_2Cr_2O_7$ manufactured from chromite ore.   **3**
25. Using valence bond theory (VBT), account for the geometry, type of hybridization and magnetic property of $[NiCl_4]^{2-}$ **3**
26. Define linkage isomerism of co-ordination compounds. Give an example   **3**

Part-D

IV. Answer any three of the following, each question carries five marks   **5 X 3=15**

27. a) Calculate the packing efficiency in BCC lattice   **3**
    b) Calculate the number of particles per unit cell in FCC   **2**

28. a) Acetone boils at $56.38^\circ C$ and a solution of 1.41g of an organic compound in 20 g of acetone boils at $56.88^\circ C$. Calculate the molar mass of the organic compound (Given Kb for acetone =1.67 K kg/mol).   **3**
    b) what is reverse Osmosis, mention one important application of it.   **2**

29. a) Standard EMF of the cell; $Cu | Cu^{2+}_{(1M)} || Ag^+_{(1M)} | Ag$ is 0.46 V at 25 $^\circ C$. Find the value of standard free energy change for the reaction that occurs in the cell.   **3**
    b) Draw the neat labeled diagram of SHE and write its symbolic representation.   **2**
30. a) Derive the integrated rate equation for a zero order reaction   **3**
    b) Give any two differences between order and molecularity of reaction   **2**

31. a) Write any two differences between lyophilic sols and lyophobic sols   **2**
    b) What are the differences between physisorption and chemisorption   **2**
    c) Give an example for homogeneous catalysis   **1**

V. Answer any four of the following, each question carries five marks   **4 X 5=20**

32. a) i) Name the organic product formed when chloroalkane is heated with concentrated solution of sodium iodide (NaI) in acetone?
    ii) Write the chemical equation for the above reaction

    iii) Name the above reaction   **(1+1+1)**

    b) Explain Fittig's reaction with an equation   **2**

33. a) Organic compounds A, B and C are aliphatic saturated hydroxyl compounds when they react with Lucas reagent (anhyd.$ZnCl_2$ + conc. HCl), the following observations are made
    i) Compound A gave turbidity immediately   **(1+1+1)**

    ii) Compound B gave turbidity after five minutes

    iii) Compound C gave turbidity only on heating, Identify the type of compounds A, B and C.

b) Complete the equation: $C_6H_5COOH + HOC_6H_5 \xrightarrow{H^+} ?$ **1**

   c) Name the main organic product formed when anisole is reacted with HI **1**

34. a) Which of the following organic compound undergoes Cannizzaro's reaction? **1**
    i) CH_3CHO ii) HCHO

  b) Write the mechanism of addition of HCN to a carbonyl compounds **2**

  c) Explain the conversion of carboxylic acid into an acid amide. Give the general chemical equation
2

35. a) Explain Mendius reduction with an equation. **2**
    b)When aniline is treated with HNO_2 at 273-278 K, benzene diazonium chloride is formed. Write the equation and name the reaction. **2**

  c) What is Hinsberg's reagent?

36. a) Write the Haworth's structure of sucrose **2**
  b) What are non-essential amino acids? **1**

  c) Name the heterocyclic N-containing base present only in DNA but not in RNA. **1**

  d) Vitamin-C cannot be stored in the body. Give reason. **1**

37. a) Which among the following is a homopolymer and a co-polymer, **2**
  i) Nylon-6,6   ii) PVC

  b) How is Buna-N prepared ?. Write the equation **2**

      c) Give one example for a non-biodegradable polymer

PART-A

1.	No. of moles solute present in 1 kg of solvent	1
2.	ΔH= +Ve or Enthalpy increases or heat is absorbed	1
3.	A primary cell is one that cannot be recharged	1
4.	Zero	1
5.	It is the ability of catalyst to direct a reaction to yield a particular product	1
6.	Cu_2S + traces of FeS or Cuprous sulphide + traces of ferrous sulphide	1
7.	Radon	1

8.
$$R\text{-}OH + SOCl_2 \xrightarrow[\text{Pyridine}]{\triangle} R\text{-}Cl \ + \ SO_2 \ + \ HCl$$

<div align="right">1</div>

9. Acetals are gem-alkoxy alkanes in which two alkoxy groups are present   1
on the terminal carbon atom

10. Amylopectin   1

II.

<div align="right">1</div>

11. $d = \dfrac{ZM}{a^3 N_A}$

$$d = \frac{60 \times 4}{(400 \times 10^{-10})^3 \times 6.022 \times 10^{23}}$$

$d = 6.226 \text{ g/cm}^3$

<div align="right">1</div>

12.	i)The degree of dissociation and dissociation constant of weak electrolyte (AB) Type can be calculated	1
	ii) Using this law, Λ^o_m for both weak and strong electrolytes can be calculated	1
13.	a) Zero order	1

b) $t_{1/2} = \dfrac{[Ro]}{2K}$

<div align="right">1</div>

14.	Due to lanthanide contraction	
	i) Similarity in atomic sizes of elements of second and third transition series	1
	ii) The separation of lanthanides in pure state become difficult	1

15. i) $CH_3\text{-}CH_2\text{-}OH \xrightarrow{Cu/300^OC} CH_3\text{-}CHO \ + \ H_2$

<div align="right">1</div>

ii) $LiAlH_4$ in the presence of THF   1

16. Ketal is formed,

$$\underset{R^1}{\overset{R}{>}}C=O + \underset{CH_2OH}{\overset{CH_2OH}{|}} \xrightarrow[\text{dil HCl}]{\text{dry HCl (g)}} \underset{R_1}{\overset{R}{>}}C\underset{O-CH_2}{\overset{O-CH_2}{|}} + H_2O$$

<div align="right">1</div>

17. Analgesics are the chemical substances which relieve body pains   1

	Ex. Aspirin or paracetamol	1
18.	These are low calorie substances used as sweetening agents to replace sugar	1
	Ex. Saccharin/ Aspartame/ Alitame/ Sucralose	1

**III.**   **PART-C**

19.   1
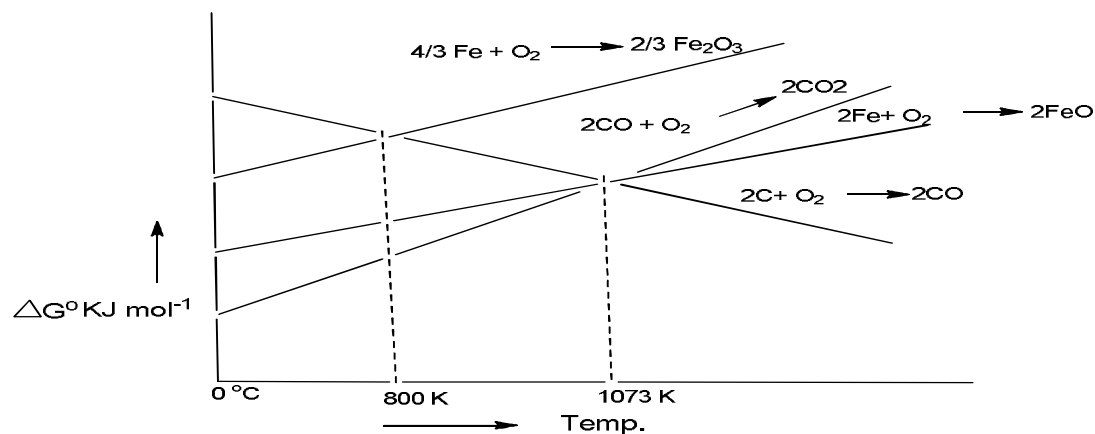
a) At 1073 K, ΔG°VsT line for $C \longrightarrow CO$ Intersects the $Fe \longrightarrow FeO$ 1
Line. Above 1073K, ΔG° of $C \longrightarrow CO$ becomes less than ΔG° of $Fe \longrightarrow FeO$
and hence carbon itself is oxidized to CO. Therefore, carbon becomes very good
reducing agent for the reduction of FeO to Fe at the temperature range of   900K-1500K.

$$FeO\,(s) + C \longrightarrow Fe\downarrow + CO\,(g)$$

b) At temperature, below 800 K, ΔG° for $CO \longrightarrow CO_2$ is less than   1
$Fe \longrightarrow Fe_2O_3$, therefore, CO is a better reducing agent for the reduction of Fe_2O_3 to FeO
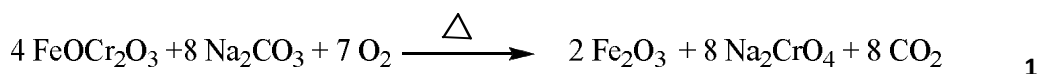
$$Fe_2O_3 + CO \longrightarrow 2FeO + CO_2$$

20.   i) $N_2\,(g) + 3H_2\,(g) \rightleftharpoons 2NH_3\,(g)$ 1

ii) According to Le-Chaterlier's principle, the forward reaction is favored by   1
low temperature and high pressure

iii) Optimum conditions in the process are 700 K atm. And Fe catalyst containing   1
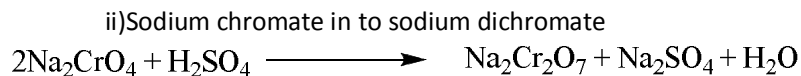K_2O and Al_2O_3 promoter

21.   a) $5\,SO_2 + 2\,MnO_4^- + 2H_2O \longrightarrow 5\,SO_4^{2-} + H^+ + 2\,Mn^+$

b) $SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$

c) $2KClO_3 \xrightarrow{MnO_2, \triangle} 2KCl + 3O_2$

22.   a) When $KMnO_4$ is treated with conc. HCl. Chlorine is liberated

$$2KMnO_4 + 16\,HCl \longrightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2$$ 1

b)   1
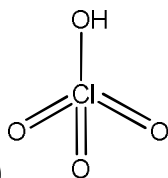
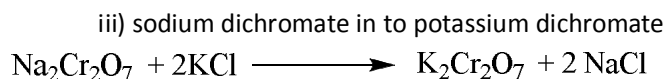**23.**   a)i) ns and (n-1)d subshells have almost same energy   1
ii) Both) ns and (n-1)d electrons involve in bonding   1
b) Mn or Manganese   1
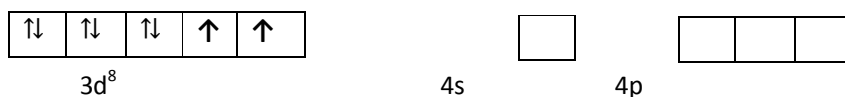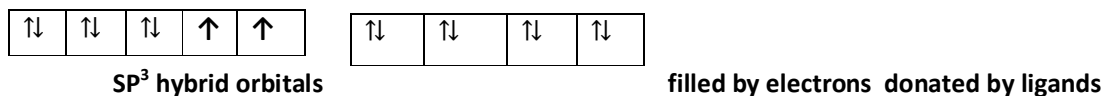
24.   i) Chromite ore in to sodium chromate

$$4\,FeOCr_2O_3 + 8\,Na_2CO_3 + 7\,O_2 \xrightarrow{\triangle} 2\,Fe_2O_3 + 8\,Na_2CrO_4 + 8\,CO_2$$ 1

ii)Sodium chromate in to sodium dichromate

$$2Na_2CrO_4 + H_2SO_4 \longrightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$$ **1**

iii) sodium dichromate in to potassium dichromate

$$Na_2Cr_2O_7 + 2KCl \longrightarrow K_2Cr_2O_7 + 2\,NaCl$$ **1**

25.   i) Ni^{2+} ; [Ar] $3d^8\ 4s^o$

⇅	⇅	⇅	↑	↑					

$3d^8$ 4s   4p

ii) On approach of Cl⁻ ligands;

⇅	⇅	⇅	↑	↑					

SP³ hybridization   **1**

iii) $[NiCl_4]^{2-}$ formation;

⇅	⇅	⇅	↑	↑		⇅	⇅	⇅	⇅

SP³ hybrid orbitals   **filled by electrons donated by ligands**

Geometry; Due to SP³ hybridization, the complex has tetrahedral structure   **1**

Magnetic propery; The complex is paramagnetic due to the presence of two   **1**
unpaired electrons

26. Linkage isomerism is one in which two co-ordination compounds have the same   **2**
molecular composition but differ in the mode of attachment of ligands to the central
metal atom/ion.

Ex: [Co (NH₃)₅ (NO₂)] Cl₂   and   [Co (NH₃)₅ (ONO)] Cl₂   **1**

PART-D

27. a) Edge length a=4r/√3 r = radius of sphere   **1**

Packing efficiency = (volume of the sphere x 2 ÷ volume of unit cell) x 100   **1**

$= (4/3\ \pi r^3\ x\ 2\ x\ 100) \div a^3$

$= (4/3\ \pi r^3\ x\ 2\ x\ 100) \div 4r/√3$ **1**

= 68%

b) No. of particles per unit cell of FCC

$= \dfrac{1}{8}$ (No. of corner particles) $+ \dfrac{1}{2}$ (No. of facial particles)   **1**

$= \dfrac{1}{8}$ x 8 $+ \dfrac{1}{2}$ x 6 = 1 + 3 = 4   **1**

28. a) ΔT_b= K_b x molality

ΔT_b= K_b x (m solute/ M solute) x 1000 / m solvent   **1**

(56.88-56.38) = 1.67 x (1.41/ M solute) x 1000/20   **1**

M solute = 235.47   **1**

b)   It is the process of movement of solvent molecules from higher concentration to
lower concentration by applying pressure greater than osmotic pressure   **1**

Application; It is used in desalination of sea water   **1**

29. a) ΔG^o = -nFE° cell n = 2   = -2 x 96500 x 0.46   F = 96500 C, E° = 0.46 V

= -108080 joules or -108.08 kjoules   **2**

b) For diagram   **1**

SHE: Pt, H₂ (1 bar) / H⁺ (1M)

30. a) Consider a zero order reaction

R→P

Rate = K $[R]^0$

Rate = K x 1   where K- rate constant or velocity constant   **1**

Rate = -d[R]/dt

-d[R]/dt = K   => d[R] = - K dt

∫d [R] = - K ∫ dt

[R] = - Kt + I.......................(1)

I- integration constant   **1**

To find I, when t=0, [R] = $[R_0]$

$[R_0]$ = -K x 0 + I

I = $[R_0]$

Substituting in eq (1)

[R] =- Kt + $[R_0]$

K= $[R_0]$ – [R]/ t   **1**

b)**Molecularity**   **Order of a reaction**   **2**

i)It isalways related to reaction   i) It may or may not related to reaction

stoichiometry   stoichiometry

  ii) It isalways whole number   ii) It can be whole number or fraction or even zero

31. a) Lyophilic sols   **Lyophobic sols**   **2**

  i) Dispersed phase has greater   i) Dispersed phase has no

affinity for dispersion medium   affinity for dispersion medium

  ii) Reversible   ii) irreversible
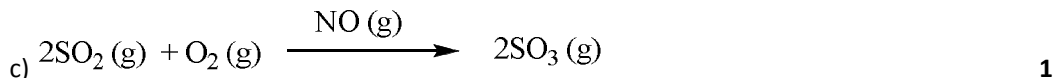
    or any other differences……………

  b) **Physisorption**   **Chemisorption**

    i) Adsorbate and adsorbent   i) Adsorbate and adsorbent   **2**

    are held together by weak van der   are held together by strong chemical

    waals forces   bonds

    ii) Reversible   ii) irreversible
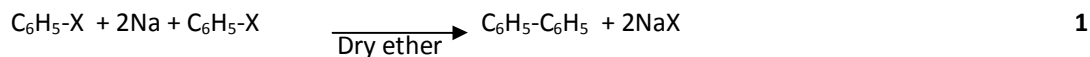
      or any two suitable differences

c) $2SO_2 \text{ (g) } + O_2 \text{ (g) } \xrightarrow{\quad NO \text{ (g) } \quad} 2SO_3 \text{ (g)}$ **1**

    or any other suitable examples

32.a) i) Iodoalkane is formed   **1**

ii) $R\text{-}Cl + NaI \xrightarrow{\quad Acetone \quad} R\text{-}I + NaCl$ **1**
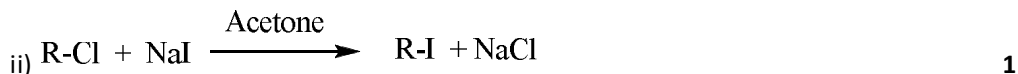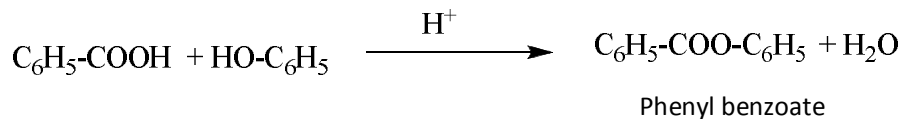
      Finkelstein reaction   **1**

b) When haloarene is heated with sodium metal in dry ether medium, higher   **1**

aromatic hydrocarbons is formed

  $C_6H_5\text{-}X + 2Na + C_6H_5\text{-}X \xrightarrow{\quad Dry \ ether \quad} C_6H_5\text{-}C_6H_5 + 2NaX$ **1**

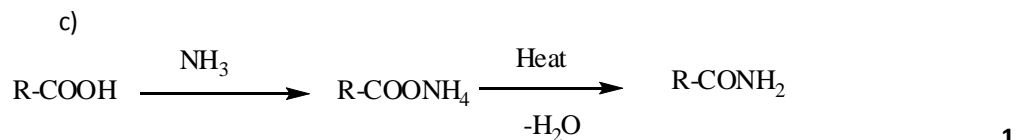**33.** a) i) A = Tertiary alcohol

    B = Secondary alcohol

    C = Primary alcohol   **1 + 1 + 1**

$C_6H_5\text{-}COOH + HO\text{-}C_6H_5 \xrightarrow{\quad H^+ \quad} C_6H_5\text{-}COO\text{-}C_6H_5 + H_2O$

      Phenyl benzoate

  c) Phenol   **1**

34. a) HCHO   **1**

b) $HCN + OH^- \rightleftharpoons CN^- + H_2O$ 1

c)   1

$$R\text{-COOH} \xrightarrow{NH_3} R\text{-COONH}_4 \xrightarrow[-H_2O]{Heat} R\text{-CONH}_2$$

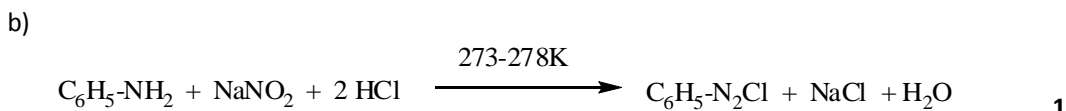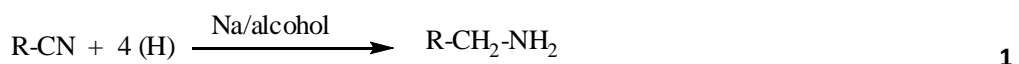   1   Explanation:
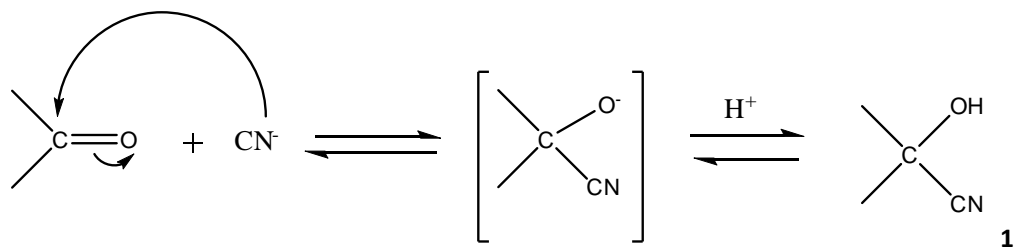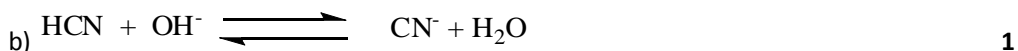
When carboxylic acid is heated with ammonia it gives acid amide.   1
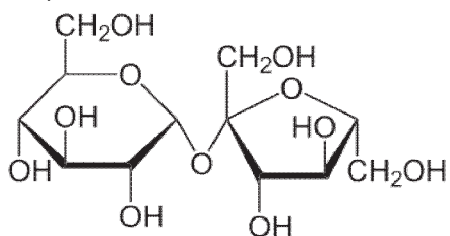
35. a) Reduction of nitriles by sodium in alcohol to get a primary amine is called
Mendius reduction.
                                                                                1

$$R\text{-CN} + 4\,(H) \xrightarrow{Na/alcohol} R\text{-CH}_2\text{-NH}_2$$
                                                                                1

b)
$$C_6H_5\text{-NH}_2 + NaNO_2 + 2\,HCl \xrightarrow{273\text{-}278K} C_6H_5\text{-N}_2Cl + NaCl + H_2O$$
                                                                                1

   Diazotization   1

   c) Benzene sulphonyl chloride or $C_6H_5SO_2Cl$ 1

36. a)   2

   b) Amino acids which can be synthesized by human body are called non-essential   1
amino acids

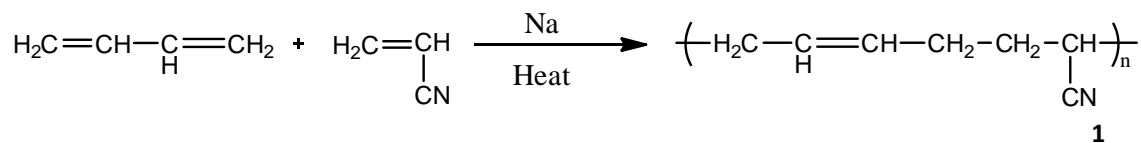   c) Thymine   1

d)   Excess of vitamin-C is excreted through urine   1

37. i) Nylon-6,6   Copolymer   1

ii)   PVC   Homopolymer   1

  b) When 1, 3-butadiene is heated with acrylonitrile in presence of sodium, Buna-N
     is formed.   1

                                                                                1

  c) PVC or any suitable example   1