


SUBJECTIVE TEST FOR XII

CHEMISTRY

SOLUTIONS

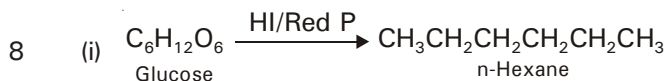
Section – A

All questions are compulsory. In case of internal choices, attempt any one of them.

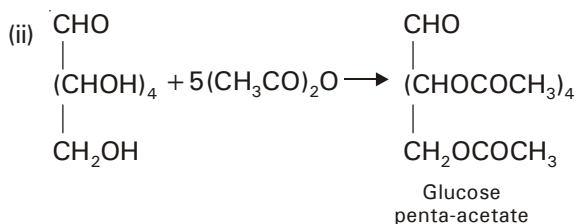
-  (5 carbon + 1 oxygen atom in a ring)
(pyranose)
- Rate constant = $2.0 \times 10^{-4} \text{ sec}^{-1}$
So, $n = 1$
Rate $\propto [\text{reactant}]^1$
If reactant is tripled then rate become three times.
- Only Ti^{+3} contain one unpaired electron in 3d orbital while Sc^{+3} , La^{+3} and Lu^{+3} do not contain any unpaired electron.
- All aldehydes could not be prepared by Rosenmund reduction reaction as we could not prepare formaldehyde from this reaction because HOCl is unstable.
- Sucrose is a disaccharide of α -D glucose and β -D fructose.
- $\text{pH} = 1$, so $[\text{H}^+] = 10^{-1}$.
For the reaction : $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$,
$$E_{\text{RP}} = E_{\text{RP}}^0 - \frac{0.0591}{2} \log \frac{P_{\text{H}_2}}{[\text{H}^+]^2}$$

 $E_{\text{RP}}^0 = 0$ (for hydrogen electrode), $P_{\text{H}_2} = 1$ (assumed), $[\text{H}^+] = 10^{-1}$
$$E_{\text{RP}} = 0 - \frac{0.0591}{2} \log \frac{1}{10^{-2}} = -0.059$$
- $\text{Cr}_2\text{O}_7^{--}$ get reduce to Cr^{+3} (green) while SO_3^{--} get oxidise to SO_4^{--} .

Section – B



This reaction indicates the presence of straight chain of six carbon atoms in glucose.



Formation of penta acetate of glucose indicates the presence of five –OH groups in glucose.

9. (i) Formula of rust is $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$. (Hydrated ferric oxide)
 (ii) a. Barrier protection i.e by applying oil or grease on the surface of iron, or by painting iron surface or by coating with zinc (Galvanisation), Chromium, nickel etc.
 b. Sacrificial protection – by coating iron surface with more active metal than iron

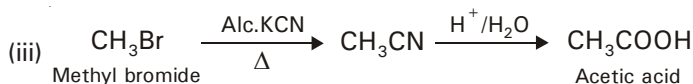
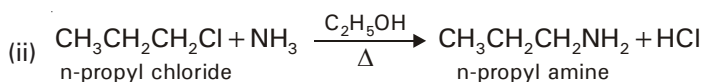
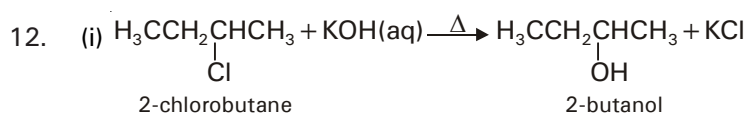
OR

At any given temperature the partial vapour pressure (p_A) of any component of a solution is directly proportional to its mole fraction (x_A) in the solution. Mathematically, $p_A = p_A^0 \times x_A$.

These are the mixtures formed by non-ideal solutions showing negative deviation. e.g. HNO_3 (68%) and H_2O (32%) by mass is an azeotropic mixture which boils at 393.5 K (b.pt. of pure $\text{HNO}_3 = 359.3$ K and of pure water is 373 K).

10. (i) Stronger the electron withdrawing group, more is the acidic strength.
 $\text{CF}_3\text{CH}_2\text{OH} > \text{CCl}_3\text{CH}_2\text{OH} > \text{CH}_3\text{CH}_2\text{OH}$
 (ii) More is the acidic strength, faster the reactivity with Na.
 butan-1-ol > butan-2-ol > 2-methylpropan-2-ol
11. (i) The sum of first four ionisation energies for Pt is less than nickel. So +4 oxidation state of Pt is stable & K_2PtCl_6 is a well known compound, whereas +4 oxidation state of Ni is not stable.
 (ii) Transition elements can use their ns and (n–1)d orbital electrons for bond formation due to the very less energy difference between ns and (n–1)d subshells. Hence they show variable oxidation states.

Section – C

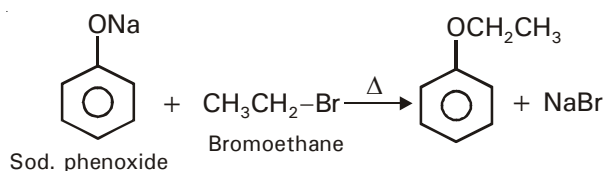


13. (i)
$$K = \frac{0.693}{t_{1/2}} = \frac{0.693}{10} = 0.0693 \text{ min}^{-1}$$

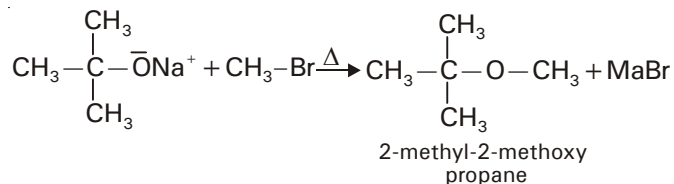
(ii) no. of half lives (n) in 1 hour = $\frac{60}{10} = 6$

$$[A] = \frac{[A]}{2^n} = \left(\frac{1}{2}\right)^6 = \frac{1}{64}$$

14. (i) The reagents are sodium phenoxide and bromoethane



- (ii) The reagents are sodium tertiary butoxide and bromomethane

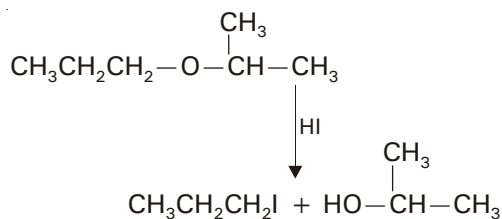


- (iii) The reagents are sodium propoxide and bromomethane

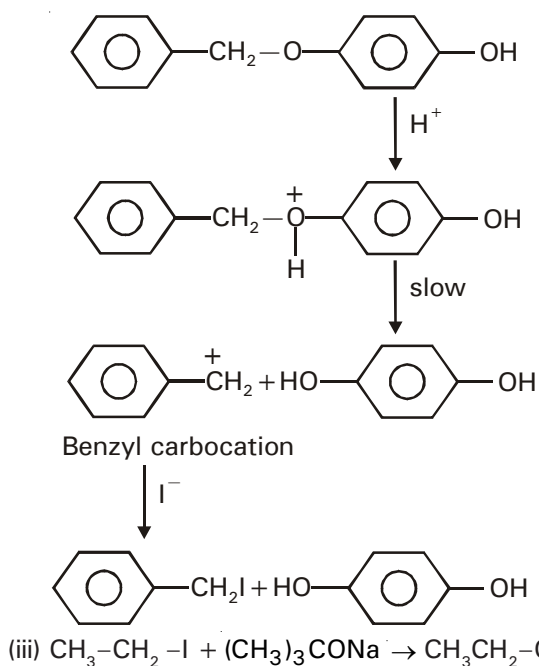


OR

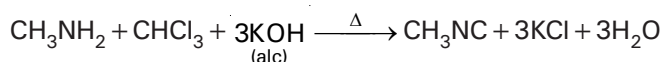
- (i) I^- will attack the smaller alkyl group of protonated ether or less sterically hindered carbon



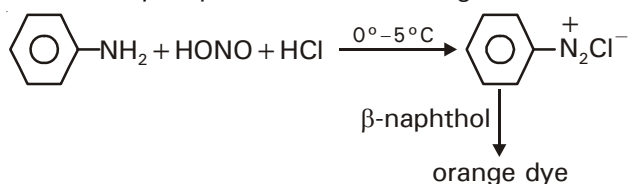
- (ii) Cleavage of protonated ether will occur in such a way that it will give more stable carbocation.



15. (i) a. Methylamine and dimethylamine can be distinguished by **Carbylamine** test. Methylamine is a primary amine. So methylamine when heated with an alcoholic solution of KOH and CHCl_3 , it gives an offensive smell of methylisocyanide

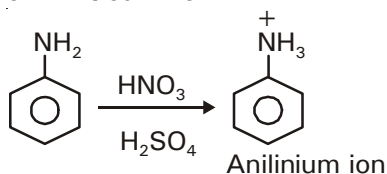


- b. Methylamine and aniline can be distinguished by **Azodye** test. Aniline is an aromatic amine so when it is treated with NaNO_2 + dil. HCl at 273–278 K followed by treatment with an alkaline solution of β -naphthol, a brilliant orange or red coloured dye, is formed

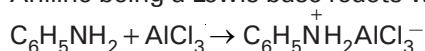


Methylamine when treated with NaNO_2 -HCl evolves N_2 gas

- (ii) Order of pK_b values $\text{C}_6\text{H}_5\text{NH}_2 > \text{C}_6\text{H}_5\text{NHCH}_3 > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH}$
OR
(i) Nitration is carried out with a mixture of conc. HNO_3 + conc. H_2SO_4 . In the presence of these acids, aniline gets protonated to form anilinium ion which is m-director, thus we get substantial amount of m-nitroaniline



- (ii) Aniline being a Lewis base reacts with Lewis acid AlCl_3 to form a salt.



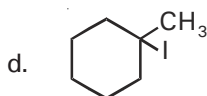
Due to the presence of positive charge on N atom in this salt, it acts as a strongly deactivating group. As a result it reduces the electron density in the benzene ring and hence aniline does not undergo Friedel-Craft reaction.

- (iii) Gabriel phthalimide synthesis is a $\text{S}_{\text{N}}2$ reaction in which phthalimide behaves as a nucleophile and displaces halide ion from alkyl halides. Since aryl halides do not undergo $\text{S}_{\text{N}}2$ reaction easily, thus aromatic amines can not be prepared by Gabriel phthalimide synthesis.

Section – D

16. (i) c. diethyl ether
(ii) a. $\text{S}_{\text{N}}1$ mechanism
(iii) c. $\text{RNR}'\text{R}''$

OR



- (iv) b. pent-2-ene

17. (i) $\text{Cu}_2[\text{Fe}(\text{CN})_6]$ can act as a semipermeable membrane.

(ii) Given $\pi = 600 \text{ mm} = \frac{600}{760} \text{ atm}$, $i = 1$

$V_{\text{ml}} = 821 \text{ ml}$, $T = 127^\circ\text{C} = 400 \text{ K}$

$\pi = iCRT$

$$\frac{600}{760} = \frac{20 \times 1000 \times 0.0821 \times 400}{M \times 821}$$

$M = 1013 \text{ g}$

OR

Since solvent move from low concentration to high concentration of solution, solvent move towards NaCl solution i.e. exo-osmosis will occur.

(iii) $\pi \propto T$

$$\frac{\pi_1}{T_1} = \frac{\pi_2}{T_2}$$

(Given $\pi_1 = 1 \text{ atm}$, $T_1 = 300 \text{ K}$, $T_2 = 600 \text{ K}$)

$\pi_2 = 2 \text{ atm}$

(iv) Since solvent move from low concentration to high concentration of solution, so water flows into red blood cells causing them to swell and burst

18. (i) Molar conductivity (\wedge_m) is the conductance of all the ions produced by 1 mole of electrolyte dissolved in $V \text{ cm}^3$ of the solution $\wedge_m = \kappa \times V$

\wedge_m increases with decrease in concentration both for strong and weak electrolyte. This is because decrease in κ on dilution is more than compensated by increase in volume

(ii) a. $\text{Ca}^{2+} + 2e^- \rightarrow \text{Ca}$

1 mole of Ca i.e. 40 g of Ca required = 2F

20 g of Ca require = 1F

(ii) $\text{Al}^{3+} + 3e^- \rightarrow \text{Al}$

1 mol of Al i.e. 27 g of Al require = 3F

40 g of Al require = 4.44 F

19. (i) Hybridisation of Co in $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$ is d^2sp^3 .

(ii) IUPAC name of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is hexaamminecobalt (III) chloride

(iii) Mn in +2 state has the configuration $3d^5$. In presence of H_2O as ligand, the distribution of these five electrons is $t_{2g}^3 e_g^2$, i.e. all the electrons remain unpaired. In presence of CN^- as ligand, the distribution of electrons is $t_{2g}^5 e_g^0$, two t_{2g} orbitals contain paired electrons while the third t_{2g} orbital contains one unpaired electron.

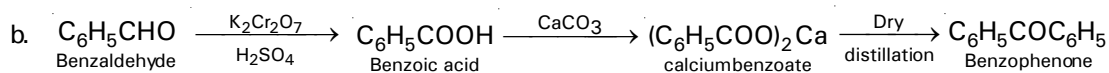
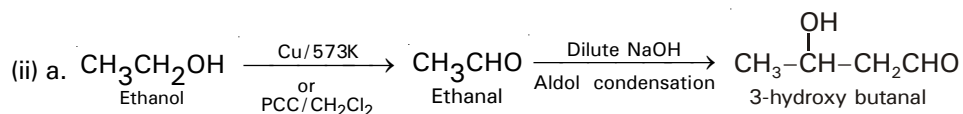
(iv) In both the complexes, Fe is in +3 oxidation state with the configuration $3d^5$. H_2O is a weak ligand, in its presence, electrons do not pair up. The hybridisation is sp^3d^2 forming an outer orbital complex containing five unpaired electrons. Hence it is strongly paramagnetic. CN^- is a strong ligand in its presence, 3d electrons pair up leaving only one unpaired electron the hybridisation is d^2sp^3 forming inner orbital complex. So it is weakly paramagnetic.

Section – E

20. (i) a. 85% H_2SO_4 at 440 K

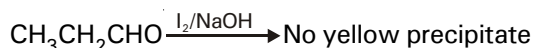
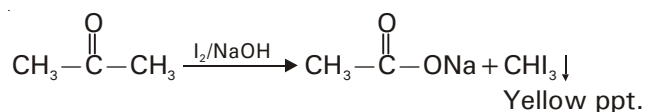
b. Acidified or alkaline KMnO_4

c. Ni/H_2 or NaBH_4 or LiAlH_4

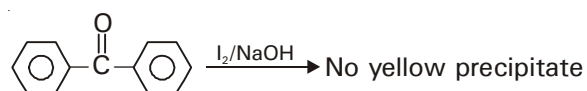
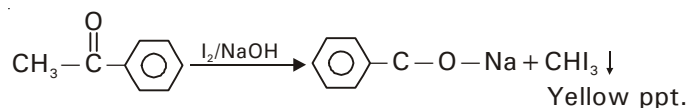


OR

(i) a. Propanal and propanone can be distinguished by Iodoform test



b. Acetophenone and Benzophenone can be distinguished by Iodoform test



c. Phenol and benzoic acid can be distinguished by effervescence test. Benzoic acid on treatment with baking soda will lead to evolution of CO_2 (effervescence) but phenol does not.

(ii) Due to strong electron withdrawing nature of $-\text{NO}_2$ groups, both 2,4-dinitrophenol and 2,4,6-trinitrophenol are more acidic than carbonic acid and hence dissolve in aq. Na_2CO_3 solution to form the corresponding sodium salts with the evolution of CO_2 .
