MARKING SCHEME
CHEMISTRY (043)
CLASS- XII - (2012-13)

Time Allowed : 3 Hrs Maximum Marks : 70

1. 3, 3 – Dimethyl butanoic acid. 1
2. PCl_5 gets hydrolysed in the presence of moisture and gives fumes of HCl
   $PCl_5 + 4H_2O \longrightarrow H_3PO_4 + 5\ HCl$ 1
3. On heating with HNO_3 glucose gives saccharic acid 1
   $CHO - (CHOH)_4 – CH_2OH + 3[O] \xrightarrow{HNO_3} COOH – (CHOH)_4 - COOH$
4. Due to the presence of an alkyl group higher electron density is found on alkoxide ion. 1
5. Ice creams are emulsions which get stabilized by emulsifying agents such as gelatin. 1
6. $[Co(NH_3)_4\ (H_2O)_2\ ]Cl_3$ 1
7. $3H_2S + SO_2 \longrightarrow 3S + 2H_2O$ 1
8. In white P, there is an angular strain in the P_4 molecules because the bond angels are 60^0. But in red P, P_4 tetrahedra have polymeric structure and is stable. 1
9. Rate = $K\ [A]^2$
   (i) When concentration of reactant is doubled the rate becomes 4 times.
   (ii) When concentration of reactant is reduced to ½ the rate becomes ¼ times. 1+1

   OR

   Ist Case :

   $$K = \frac{2.303}{t}\log\frac{[Ao]}{[A]}$$

   $$= \frac{2.303}{20}\log\frac{100}{85}$$

   $= 8.13 \times 10^{-3} min^{-1}$

   IInd Case

   $$t = \frac{2.303}{k}\log\frac{[Ao]}{[A]}$$

   $$= \frac{2.303}{8.13\times10^{-3}}\log\frac{[100]}{[40]}$$

   $= 112.7$ min 1+1

10. (a) $\Delta G^0 = -2.303RT \log Kc$
    (b) $\Delta G^0 = -nFE^0$ Cell $= -212300$ J 1+1
11. [Pt. $(NH_3)_2\ Cl_2$] does not ionize. Therefore it will be non conducting. 2
    [Pt. $(NH_3)_6$] Cl_4 ionises as
    $[Pt\ (NH3)_6]Cl_4$ □ $[Pt\ (NH_3)_6]^{4+} + 4Cl^-$
    It will conduct corresponding to 5 ions permole.
12. (i) $C_6H_5CH_2OH \xrightarrow{SOCl_2} C_6H_5CH_2Cl \xrightarrow{alcKCN} C_6H_5CH_2CN$
    $\longrightarrow \xrightarrow{H^+H_2O} C_6H_5CH_2COOH$

(ii) $C_2H_5Cl \xrightarrow{alcKCN} C_2H_5CN \xrightarrow{H^+H_2O} C_2H_5COOH$ 1+1

13. for bcc structure a = $\frac{4r}{\sqrt{3}}$

Packing efficienty = $\frac{\text{Volume of two spheres in the Unit Cell}}{\text{Total Volume of Unit Cell}} \times 100$

$= \frac{\frac{8}{3}\pi r^3 \times 100}{\frac{64}{3\sqrt{3}} r^3} = 68\%$ 2

14. $d = \frac{z \times M}{a^3 \times No}$

d = 7.80g cm^{-3} a= 290×10^{-10}cm M= 56 1

$7.8 = \frac{z \times 56}{(290 \times 10^{-10})^3 \times 6.02 \times 10^{23}}$

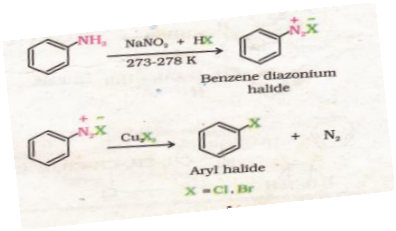
Z = 2. (It is bcc) 1

15. (i) Treat both of them separately with aqueous KOH followed by $AgNO_3$. The compound which give a white ppt with $AgNO_3$ is C_2H_5Cl and the one which gives light yellow ppt is C_2H_5Br.

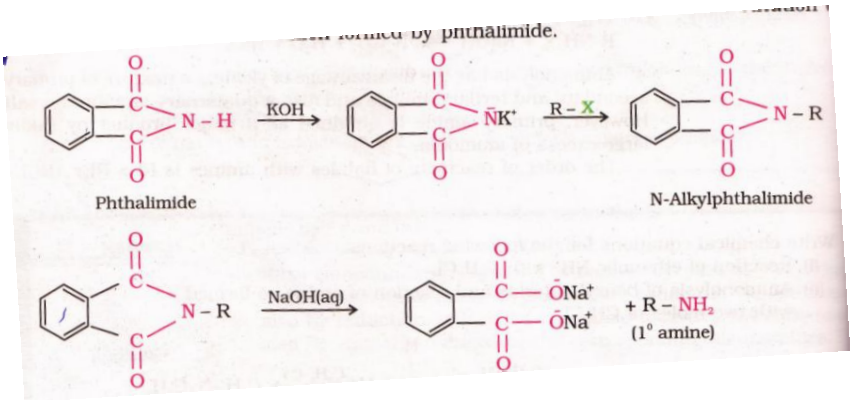
(ii) Phenol + neutral $FeCl_3$ solution – Voilet Colour

Chloro benzene+ neutral FeCl3 Solution – No colour 1+1

16. (i)



(ii)



1+1

17. $NH_3 \longrightarrow$ ½ N_2 + 3/2 H_2

Rate Reaction = $\frac{d[NH_3]}{dt} = 1/2 \frac{d[N_2]}{dt} = 3/2 \frac{d[H_2]}{dt}$

Rate = K = $2.5 \times 10^{-4} MS^{-1}$

Rate of production of N2 = $1.25 \times 10^{-4} MS^{-1}$

Rate of production of H2 = 3.75×10^{-4} MS^{-1} 1+1

18. (i) Ethyl amine is more basic than water and therefore. Accepts a proton from water forming OH- ions

$C_2H_5NH_2 + H - OH - C_2H_5NH_3^+ + OH^-$

(ii) Primary amines are polar compounds and form associated molecules due to intermolecular hydrogen bonding. But tertiary amines do not have intermolecular association. 1+1

19. (i) $XeF_6 + 3\ H_2O \longrightarrow XeO_3 + 6HF$

(ii) $P_4 + 20\ HNO_3 \longrightarrow 4\ H_3PO_4 + 20\ NO_2 + 4H_2O$

(iii) $4\ H_3PO_3 \xrightarrow{heat} 3H_3PO_4 + PH_3$ 1+1+1

20. (i) River water is muddy and contains colloidal particles. Sea water contains number of dissolved electrolytes. When the river water comes in contact with the sea water coagulation takes place.

(ii) When direct current is passed through the colloidal solution electro pherosis occurs.

(iii) The Fe $(OH)_3$ sol is prepared by the hydrolysis of $FeCl_3$ in which Fe^{3+} ionsare adsorbed on the surface from solution.

$FeCl_3 \longrightarrow Fe^{3+} + 3Cl^-$

Fe $(OH)_3 + Fe^{3+} \longrightarrow$ Fe $(OH)_3\ Fe^{3+}$ Sol 1+1+1

21. a) Harmful effects of lead on the human being – as well as on the environment

It is wise to choose sustained long term benefit than short term with regard to health/ money.

Knowledge of chemistry and its relation to environment.

b) Knowledge is useful only when put topractise, awareness of lead free petrol – legal aspect of pollution free environment. Less usage of lead batteries to keep ourselves and the environment health. 2+1

22. (a) Zinc is more electro positive and therefore a highly reactive metal. Hence it can not be easily displace from its solution of $ZnSO_4$.

(b) Cryolite is added to bauxite because of following reasons.

(i) It act as a solvent

(ii) It lowers the melting point of alumina.

(iii) Addition of cryolite to alumina increases its electrical conductivity. 1+2

OR

(a) The depresents are used to prevent certain types of particles from forming the froth with bubbles in froth floatation process. This helps to separate two sulphide Ores.

(b) $Ni + 4CO \xrightarrow{350k} Ni\ (Co)_4$

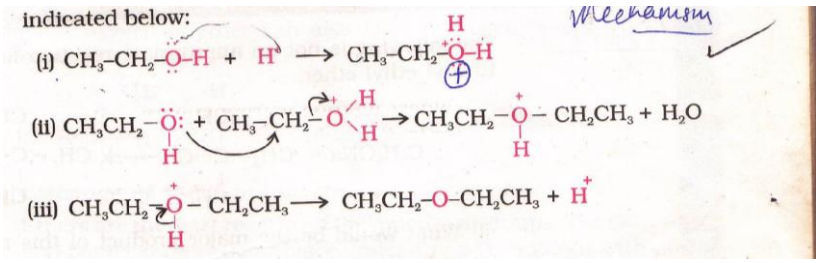
$Ni\ (CO)_4 \xrightarrow{470k} Ni + 4\ CO$ 1+2

23. (a) (i) Asprin

(ii) Phenol

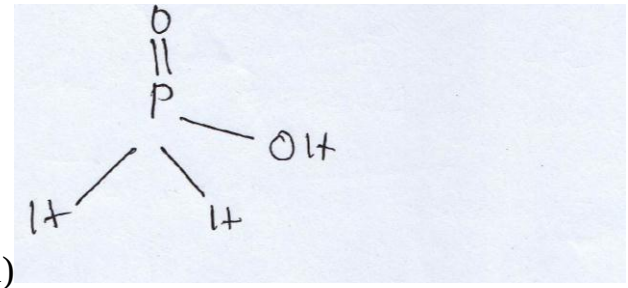
(c) Chloroxylenol and terpineol 1+1+1

24.



1+1+1

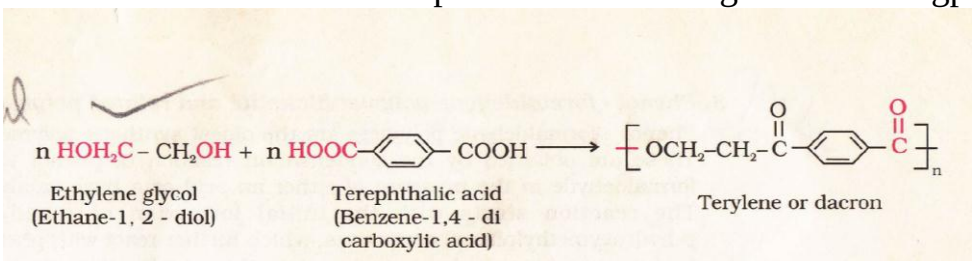
25. (i)



(ii) H_3PO_2 reduces Ag+ ion to Ag which shows its reducing nature.
$H_3PO_2 + 4AgNO_3 + 2H_2O \longrightarrow 4Ag + 4HNO_3 + H_3PO_4$
(iii) The gas which protects us from UV rays of the Sun is Ozone. It reacts with I ions to give iodine as
$O_3 + 2I^- + H_2O \longrightarrow O_2 + I_2 + 2OH^-$
I_2 liberated is titrated against Sodium thiosulphate solution and amount of O_3 can be estimated. 1+1+1

26. (i) Keratin is a fibrous protein while insulin is a globular protein.
(ii) Essential amino Acid – Valine
Non essential amino Acid – glycine
(iii) Despite the presence of –CHO group glucose does not give 2, 4 DNP test. Therefore it does not have open structure having free – CHO gp. 1+1+1

27. (a)



(b) Buna N
(c) Buna S ∠ Polythene ∠ Nylon 6 1+1+1

28. (i) Silver can exhibit + 2 oxidation state in which it has incomplete d orbital where as Zn in its +2 oxidation state has completely filled 3 d orbitals.
(ii) This is due to
(i) Small size of the atoms
(ii) High nuclear charge
(iii) Availability of vacant d orbitals.
(iii) The oxidation state of Mn is MnO is+2 while in Mn_2O_7 its is +7. As the oxidation number of metal increases its acidic character increases
(iv) This is due to comparable energies of 5 f, 6 d and 7 s Subshells.

(v) This is due to strong metallic bonding. 1+1+1+1+1

OR

I. (i) $3\ MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(ii) $2K_2CrO_4 + 2H^+ \longrightarrow K_2Cr_2O_7 + 2K^+ + H_2O$

(iii) $5NO^{2-} + 2MnO^{4-} + 6H^+ \longrightarrow 2Mn^{2+} + 3H_2O + 5NO_3^-$

II. (i) Cr^{2+} is a stronger reducing agent than Fe^{2+}. This is become the configuration of Cr^{2+} changes from d^4 to stable d^3 configuration on changing from Cr^{2+} to Cr^{3+} than d^6 to d^5 in Fe^{2+} to Fe^{3+} change.

(ii) cu^+ is not stable in equation solution because of its less negative enthalpy of hydration as compound to Cu^{2+} 1+1+1+1+1

29. (a) Correct statement with 2 applications. 2

(b) .1 M NaCl will have higher boiling point because it dissociates in solution and gives greater number of particles per unit volume whereas glucose does not dissociate. 1

29 (c) $M_B = \dfrac{K_f \times 1000 \times W_B}{\Delta T_f \times W_A}$

$= \dfrac{1.86 \times 1000 \times 19.5}{1 \times 500} = 72.54\ g/mole$

Mole mass of $CH_2FCOOH = 78$

$i = \dfrac{\text{Normal molecular mass}}{\text{Observed molecular mass}} = \dfrac{78}{72.54} = 1.075$

(2)

OR

(a) Correct statement with mathematical expression (1+1).

(b) $M_B = \frac{K_f \times W_B \times 1000}{\Delta T_f \times W_A}$

$\Delta T_f = 0 - (-.24) = .24^\circ C$

$M_B = \frac{1.86 \times .5 \times 1000}{.24 \times 100} = 38.75$

Normal Molar mass of KCl = 74.5

Vant Hoff factor $i^\circ = \frac{74.5}{38.75} = 1.92$.

KCl dissociates as

$KCl \rightleftharpoons K^+ + Cl^-$

No of moles after dissociation = $1 - \alpha + \alpha + \alpha = 1 + \alpha$

$i^\circ = \frac{1+\alpha}{1} = 1.92$

$\alpha = 1.92 - 1 = .92$

degree of dissociation = 92% (1+1+1).

30 (a) Cannizzaro's rn.

$2HCHO \xrightarrow{NaOH} CH_3OH + HCOONa$.

(1) .

(b) Cross aldol condensation

$HCHO + CH_3CHO \xrightarrow{dil\ NaOH} HO-CH_2-CH_2CHO$. (1)

(b) (i) $CH_3CN \xrightarrow{H_2O} CH_3-\overset{O}{\overset{\|}{C}}-NH_2$. (1)

(ii) $CH_3CHO + CH_3CHO \xrightarrow{OH^-} CH_3-\underset{OH}{\underset{|}{CH}}-\underset{H}{\underset{|}{CH}}-CHO$

$\xrightarrow[-H_2O]{\Delta}$

$CH_3-CH=CH-CHO$

(1)

(iii) $C_6H_5-C_2H_5 \xrightarrow[[O]]{alk\ KMnO_4} C_6H_5-COOH$ (1)

OR

(3 c)

(a) The compd B $C_2H_4O_2$ is an acid and therefore A is aldehyde $CH_3-\overset{O}{\overset{\|}{C}}-H$

The chemical reactions are

$$CH_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow{[O]} CH_3-\overset{O}{\overset{\|}{C}}-OH$$

[A] $\qquad C_2H_4O_2$ [B]

$$CH_3CHO + CH_3CHO \xrightarrow{NaOH} CH_3-\underset{OH}{\underset{|}{CH}}-CH_2-CHO$$

$$\downarrow \Delta$$

$$CH_3CH=CH-CHO$$

(C)

$$CH_3-CH=CH-CHO \xrightarrow{H_2/Ni} CH_3CH_2CH_2CHO$$

(C) $\qquad$ (D)

(3)

(b) Aldehydes and Ketones can be reduced to corresponding hydrocarbons by using Zinc amalgum and conc HCl

$$CH_3CHO + 4[H] \xrightarrow[HCl]{Zn/Hg} CH_3CH_3$$ (1)

(iii) HVZ rn

Carboxylic acids having an α hydrogen react with chlorine or bromine in the presence of red P to give compounds in which α hydrogen atom get replaced by halogen

$$R-CH_2COOH \xrightarrow{X_2/Red\ P} R-\underset{\underset{X}{|}}{CH}-COOH \quad (1)$$