# CHEMISTRY PRACTICE PROBLEMS

# BITSAT

Exam from 16th to 26th May 2019

**1.** The correct order of acidic strength is
(a) $Cl_2O_7 > SO_2 > P_4O_{10}$ (b) $CO_2 > N_2O_5 > SO_3$
(c) $Na_2O > MgO > Al_2O_3$ (d) $K_2O > CaO > MgO$

**2.** The standard enthalpies of formation at 25°C for $CO_{2(g)}$, $H_2O_{(l)}$ and $CH_3OH_{(l)}$ are $-393.5$ kJ mol$^{-1}$, $-285.8$ kJ mol$^{-1}$, $-238.7$ kJ mol$^{-1}$ respectively. $\Delta H°$ for the combustion of 454 grams of methanol $CH_3OH_{(l)}$ is
(a) – 440.2 kJ (b) –726.4 kJ
(c) $-6.26 \times 10^3$ kJ (d) $-10.3 \times 10^3$ kJ

**3.** Electrode potential data are given below :

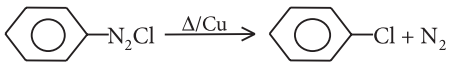
$Fe^{3+}_{(aq)} + e^- \longrightarrow Fe^{2+}_{(aq)}$; $E° = +0.77$ V

$Al^{3+}_{(aq)} + 3e^- \longrightarrow Al_{(s)}$; $E° = -1.66$ V

$Br_{2\ (aq)} + 2e^- \longrightarrow 2Br^-_{(aq)}$; $E° = +1.08$ V

Based on the data, the reducing power of $Fe^{2+}$, Al and $Br^-$ will increase in the order
(a) $Br^- < Fe^{2+} < Al$ (b) $Fe^{2+} < Al < Br^-$
(c) $Al < Br^- < Fe^{2+}$ (d) $Al < Fe^{2+} < Br^-$

**4.** The planar complex *Mabcd* gives
(a) two optical isomers
(b) two geometrical isomers
(c) three optical isomers
(d) three geometrical isomers.

**5.** 

(*A*)

Half-life is independent of concentration of *A*. After 10 minutes volume of $N_2$ gas is 10 L and after complete reaction 50 L. Hence, rate constant is
(a) $\frac{2.303}{10}\log 5\ \text{min}^{-1}$ (b) $\frac{2.303}{10}\log 1.25\ \text{min}^{-1}$
(c) $\frac{2.303}{10}\log 2\ \text{min}^{-1}$ (d) $\frac{2.303}{10}\log 4\ \text{min}^{-1}$

**6.** Three separate samples of a solution of a single salt gave these results. One formed a white precipitate with excess ammonia solution, one formed a white precipitate with NaCl solution and one formed a black precipitate with $H_2S$. The salt would be
(a) $AgNO_3$ (b) $Pb(NO_3)_2$
(c) $Hg(NO_3)_2$ (d) $MnSO_4$

**7.** An ester (*A*) with molecular formula, $C_9H_{10}O_2$ was treated with excess of $CH_3MgBr$ and the complex so formed was treated with $H_2SO_4$ to give an olefin (*B*). Ozonolysis of (*B*) gave a ketone with molecular formula $C_8H_8O$ which shows positive iodoform test. The structure of (*A*) is
(a) $C_6H_5COOC_2H_5$ (b) $C_6H_5COOC_6H_5$
(c) $CH_3OCH_2COC_6H_5$
(d) *p*-$CH_3OCOC_6H_4COCH_3$

**8.** A crystal lattice with alternate positive and negative ions has radius ratio 0.524. Its coordination number is
(a) 4 (b) 3 (c) 6 (d) 12

**9.** Consider the following statements :
1. Atomic hydrogen is obtained by passing hydrogen through an electric arc.
2. Hydrogen gas will not reduce heated aluminium oxide.
3. Finely divided palladium absorbs large volume of hydrogen gas.
4. Pure nascent hydrogen is best obtained by reacting Na with $C_2H_5OH$.

Which of the given statements is/are correct?
(a) 1 only (b) 2 only
(c) 1, 2 and 3 (d) 2, 3 and 4

**10.** The ease of liquefaction of noble gases decreases in the order
(a) He > Ne > Ar > Kr > Xe
(b) Xe > Kr > Ar > Ne > He
(c) Kr > Xe > He > Ar > Ne
(d) Ar > Kr > Xe > He > Ne

**11.** Two liquids $A$ and $B$ have vapour pressures in the ratio $p_A^\circ : p_B^\circ = 1 : 2$ at a certain temperature. Suppose that we have an ideal solutions of $A$ and $B$ in the mole fractions ratio $A : B = 1 : 2$, the mole fraction of $A$ in the vapour in equilibrium with the solution at the given temperature is
(a) 0.25 (b) 0.2 (c) 0.5 (d) 0.33

**12.** Pheromones are
(a) human hormones (b) animal hormones
(c) insect messenger chemicals
(d) insecticides.

**13.** The quantum numbers +1/2 and –1/2 for the electron spin represent
(a) rotation of the electron in clockwise and anticlockwise direction respectively
(b) rotation of the electron in anticlockwise and clockwise direction respectively
(c) magnetic moment of the electron pointing up and down respectively
(d) two quantum mechanical spin states which have no classical analogue.

**14.** The coagulation of 100 mL of colloidal solution of gold is completely prevented by addition of 0.25 g of a substance $X$ to it before adding 1 mL of 10% NaCl solution. The gold number of $X$ is
(a) 0.25 (b) 25 (c) 250 (d) 2.5

**15.** Which of the following statements is true?
(a) $\Delta G$ may be lesser or greater or equal to $\Delta H$.
(b) $\Delta G$ is always proportional to $\Delta H$.
(c) $\Delta G$ is always greater than $\Delta H$.
(d) $\Delta G$ is always less than $\Delta H$.

**16.** The percentage of hydrogen in $H_2O$ and hydrogen peroxide are respectively 11.2% and 5.94%. This illustrates
(a) law of multiple proportions
(b) conservation of mass
(c) law of definite proportions
(d) law of reciprocal proportions.

**17.** Which of the following alkenes is most reactive towards cationic polymerization?
(a) $CH_2{=}CHCH_3$ (b) $CH_2{=}CHCl$
(c) $CH_2{=}CHC_6H_5$ (d) $CH_2{=}CHCOOCH_3$

**18.** Arsenic drugs are mainly used in the treatment of
(a) jaundice (b) typhoid
(c) syphilis (d) cholera.

**19.** Elements $X$, $Y$ and $Z$ have atomic numbers 19, 37 and 55 respectively. Which of the following statements is true about them?
(a) Their ionization potential would increase with increasing atomic number.
(b) '$Y$' would have an ionization potential between those of '$X$' and '$Z$'.
(c) '$Z$' would have the highest ionization potential.
(d) '$Y$' would have the highest ionization potential.

**20.** The number of $sp^3 - s$, $sp^2 - s$, $sp^3 - sp^2$ and $sp^2 - sp^2$ bonds present in 2-butene respectively, are
(a) 2, 1, 1, 4 (b) 6, 2, 2, 1
(c) 2, 3, 4, 6 (d) 2, 2, 6, 1

**21.** Identify '$Z$' in the given reaction.

$$C_6H_5NH_2 \xrightarrow{(CH_3CO)_2O} X \xrightarrow{Br_2/CCl_4} Y \xrightarrow[H^+]{HOH} Z$$

(a) $p$-Bromoaniline (b) $p$-Bromoacetophenone
(c) $p$-Bromoacetanilide (d) $o$-Bromoacetanilide

**22.** If all the following four compounds were sold at the same price, which would be cheapest for preparing an antifreeze solution for a car radiator?
(a) $CH_3OH$ (b) $C_2H_5OH$
(c) $C_2H_4(OH)_2$ (d) $C_3H_5(OH)_3$

**23.** If $M$ is the element of actinide series, the degree of complex formation decreases in the order
(a) $M^{4+} > M^{3+} > MO_2^{2+} > MO_2^{+}$
(b) $MO_2^{+} > MO_2^{2+} > M^{3+} > M^{4+}$
(c) $M^{4+} > MO_2^{2+} > M^{3+} > MO_2^{+}$
(d) $MO_2^{2+} > MO_2^{+} > M^{4+} > M^{3+}$

**24.** The open-chain glucose, (an aldohexose) and fructose (a 2-oxohexose) have ..... and ..... chiral carbons respectively
(a) 4, 4 (b) 4, 3 (c) 3, 3 (d) 3, 4

**25.** $N_2$ and $O_2$ are converted into monocations, $N_2^+$ and $O_2^+$ respectively. Which of the following is wrong?
(a) In $N_2^+$, N – N bond weakens.
(b) In $O_2^+$, the O – O bond order increases.
(c) In $O_2^+$, paramagnetism decreases.
(d) $N_2^+$ becomes diamagnetic.

**26.** All the following substances react with water. The pair that gives the same gaseous product is
(a) K and $KO_2$ (b) Na and $Na_2O_2$
(c) Ca and $CaH_2$ (d) Ba and $BaO_2$

**27.** Gabriel phthalimide synthesis can be used for the preparation of amine from
(a) $CH_3CH_2Br$ (b) $(CH_3)_3CBr$
(c) $p$-$CH_3OC_6H_4Br$ (d) $p$-$CH_3C_6H_4Br$

**28.** Secondary structure of protein refers to
(a) mainly denatured proteins and structure of prosthetic groups
(b) three - dimensional structure, especially the bond between amino acid residues that are distinct from each other in the polypeptide chain

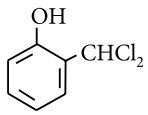
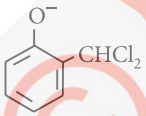
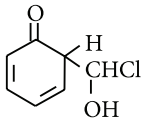
(c) linear sequence of amino acid residues in the polypeptide chain
(d) regular folding patterns of continuous portions of the polypeptide chain.

**29.** Heat of neutralisation of CsOH with all strong acids is 13.4 kcal $mol^{-1}$. The heat released on neutralisation of CsOH with HF (weak acid) is 16.4 kcal $mol^{-1}$. $\Delta H°$ of ionisation of HF is
Heat of neutralisation of strong acid with strong base = 13.7 kcal
(a) 3.0 kcal (b) – 3.0 kcal
(c) 6.0 kcal (d) none of these.

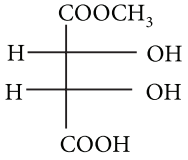
**30.** The value of $pK_w$ of water
(a) increases with increase in temperature
(b) decreases with rise in temperature
(c) does not change with variation in temperature
(d) increases till 50°C and there after decreases.

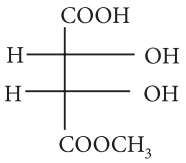
**31.** Which of the following statements is correct regarding the ions, $Zn^{2+}$, $Ni^{2+}$ and $Cr^{3+}$ ?
(At. nos. Zn = 30, Ni = 28, Cr = 24)
(a) Only $Zn^{2+}$ is colourless, $Ni^{2+}$ and $Cr^{3+}$ are coloured.
(b) All three are colourless.
(c) All three are coloured.
(d) Only $Ni^{2+}$ is coloured, $Zn^{2+}$ and $Cr^{3+}$ are colourless.

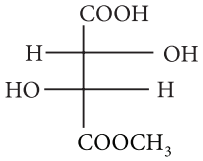
**32.** When phenol is reacted with $CHCl_3$ and NaOH followed by acidification, salicylaldehyde is obtained. Which of the following species are involved in the above mentioned reaction as intermediate?

(a) 
(b) 
(c) 
(d) None of these.

**33.** The correct statement about the compounds *A*, *B* and *C* is


(*A*)


(*B*)


(*C*)

(a) *A* and *B* are identical
(b) *A* and *B* are diastereomers
(c) *A* and *C* are enantiomers
(d) *A* and *B* are enantiomers.

**34.** On passing a current of 1.0 ampere for 16 min and 5 sec through one litre solution of $CuCl_2$, all copper of the solution is deposited at cathode. The strength of $CuCl_2$ solution is (Molar mass of Cu = 63.5, Faraday constant = 96500 C $mol^{-1}$)
(a) 0.07 M (b) 0.2 N
(c) 0.005 M (d) 0.02 N

**35.** The nodal plane in the π - bond of ethene is located in
(a) the molecular plane
(b) a plane parallel to the molecular plane
(c) a plane perpendicular to the molecular plane which bisects the carbon-carbon σ- bond at right angle
(d) a plane perpendicular to the molecular plane which contains the carbon - carbon σ- bond.

**36.** Which of the following solutions will have pH close to 1.0?
(a) 100 mL of M/100 HCl + 100 mL of M/100 NaOH
(b) 55 mL of M/10 HCl + 45 mL of M/10 NaOH
(c) 10 mL of M/10 HCl + 90 mL of M/10 NaOH
(d) 75 mL of M/5 HCl + 25 mL of M/5 NaOH

**37.** Phosphate fertilizers when added to water leads to
(a) increased growth of decomposers
(b) reduced algal growth
(c) increased algal growth
(d) nutrient enrichment (eutrophication).

**38.** Consider the following haloalkanes :
(1) $CH_3I$ (2) $CH_3F$
(3) $CH_3Cl$ (4) $CH_3Br$
The correct sequence of increasing order of dipole moments is
(a) 1 < 2 < 3 < 4 (b) 4 < 3 < 2 < 1
(c) 1 < 4 < 2 < 3 (d) 3 < 4 < 1 < 2

**39.** The most satisfactory method to separate mixture of sugars is
(a) fractional crystallisation
(b) sublimation (c) chromatography
(d) Benedict's reagent.

**40.** Which of the following is most reactive towards electrophilic substitution?
(a) Nitrobenzene
(b) Aniline
(c) Aniline hydrochloride
(d) *N*-Acetylaniline

## SOLUTIONS

**1. (a) :** In a period, acidity of oxides increases from left to right.

**2. (d) :** $CH_3OH_{(l)} + 3/2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}; \Delta H = ?$

$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}; \Delta H_1 = -393.5 \text{ kJ mol}^{-1}$

$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}; \Delta H_2 = -285.8 \text{ kJ mol}^{-1}$

$C_{(s)} + \frac{1}{2}O_{2(g)} + 2H_{2(g)} \rightarrow CH_3OH_{(l)}; \Delta H_3 = -238.7 \text{ kJ mol}^{-1}$

$\Delta H = 2\Delta H_2 + \Delta H_1 - \Delta H_3 = -726.4 \text{ kJ mol}^{-1}$

Mol. wt. = 32 g $\text{mol}^{-1}$ ; 32 g of $CH_3OH$ gives 726.4 kJ

$\therefore$ 454 g of $CH_3OH$ gives 10305.8 kJ

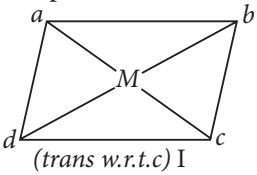
$\therefore \Delta H = -10.3 \times 10^3$ kJ

**3. (a) :**

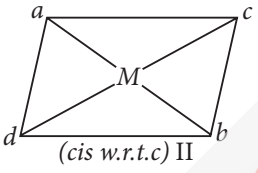
| Fe | Al | Br | |
|---|---|---|---|
| 0.77V | −1.66V | 1.08V | $E°_{Red}$ |
| −0.77V | 1.66V | −1.08V | $E°_{Oxi}$ |

Hence, reducing power is Al > $Fe^{2+}$ > $Br^-$.

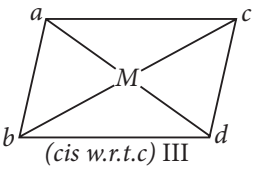
**4. (d) :** The three geometrical isomers of *Mabcd* planar complex are



*(trans w.r.t.c)* I



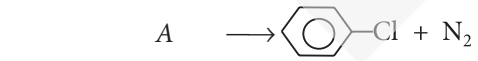
*(cis w.r.t.c)* II



*(cis w.r.t.c)* III

Isomers may be obtained by fixing the position of one ligand *e.g.*, *a*, and placing at the *trans* position any one of the remaining three ligands one by one.

**5. (b) :** It follows first order kinetics since half-life is independent of concentration.




Hence, $x$ = 10 L, $a$ = 50 L $\therefore k = \frac{2.303}{10}\log\frac{50}{40}\text{ min}^{-1}$

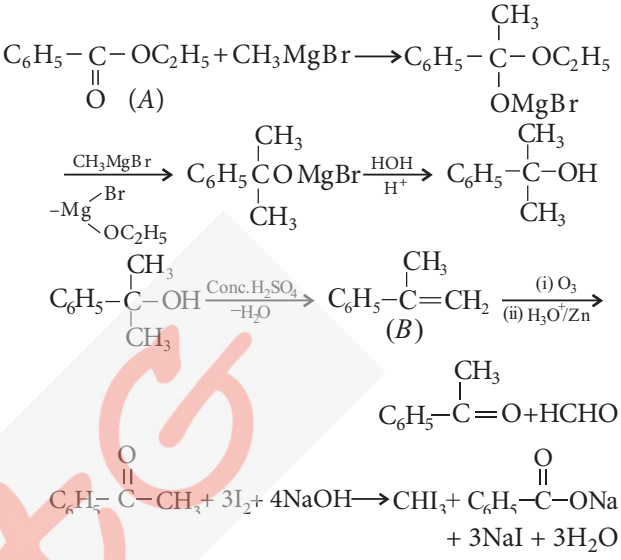
$k = \frac{2.303}{10}\log 1.25 \text{ min}^{-1}$

**6. (b) :** $Pb(NO_3)_2 + 2NH_4OH \rightarrow \underset{\text{white ppt.}}{Pb(OH)_2} + 2NH_4NO_3$

$Pb(NO_3)_2 + 2NaCl \rightarrow \underset{\text{white ppt.}}{PbCl_2} + 2NaNO_3$

$Pb(NO_3)_2 + H_2S \rightarrow \underset{\text{black ppt.}}{PbS} + 2HNO_3$

**7. (a) :** Since ketone with molecular formula $C_8H_8O$ shows positive iodoform test, therefore, it must be a methyl ketone *i.e.*, $C_6H_5COCH_3$. Since this ketone is obtained by the ozonolysis of an olefin (*B*) which is obtained by the addition of excess of $CH_3MgBr$ to an ester (*A*) with molecular formula $C_9H_{10}O_2$, therefore, ester (*A*) is $C_6H_5COOC_2H_5$ and the olefin (*B*) is $C_6H_5C(CH_3) = CH_2$ as explained below :




**8. (c) :** $\frac{r^+}{r^-} = 0.524$. It is in between 0.414 – 0.732. Hence, coordination number is 6.

**9. (c) :** Pure hydrogen is evolved by reacting absolute alcohol and Na.

$C_2H_5OH + Na \rightarrow C_2H_5ONa + 1/2H_2$

Other statements are correct.

**10. (b) :** Ease of liquefaction of noble gases increases down the group since van der Waals forces of attraction increase down the group with increasing atomic size. Thus, order of ease of liquefaction of noble gases is Xe > Kr > Ar > Ne > He.

**11. (b) :** Since the ratio of $p_A^\circ$ and $p_B^\circ$ is 1 : 2 and mole fraction is 1 : 2 therefore,

partial pressure of *A* $(p_A') = p_A^\circ x_A$ and

partial pressure of *B* $(p_B') = p_B^\circ x_B$ are related as

$p_B' = 4p_A'$

$P = p_A' + p_B' = p_A' + 4p_A' = 5p_A'$

The mole fraction of *A* in the vapour in equilibrium with solution (according to Dalton's law of partial pressure) is

$$x'_A = \frac{p'_A}{P} = \frac{p'_A}{5p'_A} = \frac{1}{5} = 0.2$$

**12. (c)**

**13. (d):** Magnetic moment for an electron exists even if the orbital angular momentum is zero. This is explained by the spin magnetic moment because it is the spin which produces magnetic moment.

**14. (b):** 250 mg of *X* is present in 100 mL of colloidal sol of gold. By definition, gold number of *X* is that amount of it in mg which is present in 10 mL of colloidal gold solution. Hence, in 10 mL the amount of *X* present is 25 mg, which is the gold number of *X*.

**15. (a):** Depending upon the value of $T\Delta S$, $\Delta G$ can be lesser, equal or greater than $\Delta H$.

**16. (a)**

**17. (c):** In cationic polymerization, carbocations are formed. Greater the stability of the carbocation, more reactive is the alkene. Since the stability of the intermediate carbocations follows the order :

$CH_3-\overset{+}{C}H-C_6H_5 > CH_3\overset{+}{C}HCH_3 > CH_3\overset{+}{C}HCl > CH_3\overset{+}{C}HCOOCH_3$

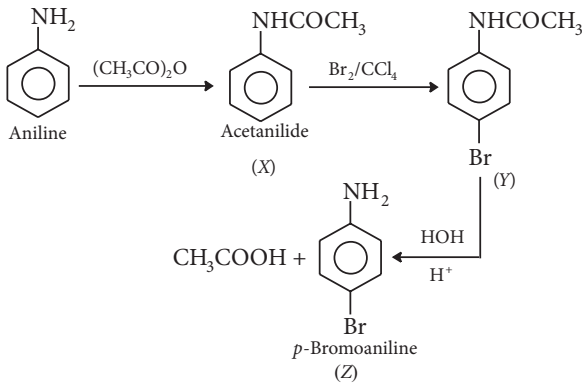
Therefore, reactivity decreases in the same order. Thus, styrene is most reactive.

**18. (c):** Arsenic drugs, also called arsenicols (like atoxyl, salvarsan, neoarsphenamine etc.) are mainly used in sleeping, sickness, syphilis etc.

**19. (b):** Elements *X*, *Y*, *Z* with atomic numbers 19, 37, 55 lie in group 1 (alkali metals). Within a group, IE decreases from top to bottom. Therefore, *IE* of *Y* could be between those of *X* and *Z*.

**20. (b)**

**21. (a):**




**22. (a):** $\Delta T_f = \frac{K_f \times w \times 1000}{M \times W}$

Other factors being constant the only factor *M* affects the $\Delta T_f$. The smaller the molecular weight (*M*), the more is the $\Delta T_f$.

**23. (c):** The higher the charge on the metal ion, smaller is the ionic size and more is the complex forming ability. Thus, the degree of complex formation decreases in the order :

$$M^{4+} > MO_2^{2+} > M^{3+} > MO_2^{+}$$

The higher tendency of complex formation of $MO_2^{2+}$ as compared to $M^{3+}$ is due to high concentration of charge on metal atom *M* in $MO_2^{2+}$.

**24. (b)**

**25. (d):** ($O_2$ = 16 electrons)

$\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2, \pi 2p_y^2, \pi^* 2p_x^1, \pi^* 2p_y^1$

($N_2^+$ =13 electrons)

$\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \pi 2p_x^2, \pi 2p_y^2, \sigma 2p_z^1$

Thus, it contains one unpaired electron, hence paramagnetic.

**26. (c):** Ca and $CaH_2$ both react with $H_2O$ to form $H_2$ gas.

$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

$CaH_2 + 2H_2O \rightarrow Ca(OH)_2 + 2H_2$

Whereas, K gives $H_2$ while $KO_2$ gives $O_2$ and $H_2O_2$.

$2K + 2H_2O \rightarrow 2KOH + H_2$

$2KO_2 + 2H_2O \rightarrow 2KOH + O_2 + H_2O_2$

Similarly, Na gives $H_2$ while $Na_2O_2$ gives $H_2O_2$.

$2Na + 2H_2O \rightarrow 2NaOH + H_2$

$Na_2O_2 + 2H_2O \rightarrow 2NaOH + H_2O_2$

Likewise Ba gives $H_2$ while $BaO_2$ gives $H_2O_2$.

$Ba + 2H_2O \rightarrow Ba(OH)_2 + H_2$

$BaO_2 + 2H_2O \rightarrow Ba(OH)_2 + H_2O_2$

**27. (a):** By the use of Gabriel phthalimide synthesis, 1° alkyl halides can be converted into corresponding 1° amines.

**28. (d)**

**29. (b):** $CsOH + H^+ \rightarrow Cs^+ + H_2O$; $\Delta H = -13.4$ kcal

Heat of ionisation of CsOH = +0.3 kcal

$CsOH + HF \rightleftharpoons CsF + H_2O$; $\Delta H = -16.4$ kcal Heat of ionisation of HF = *x* kcal

Heat of ionisation of CsOH = 0.3 kcal

Heat of neutralisation = –13.7 kcal

$-13.7 + x + 0.3 = -16.4$ or, $x = -3.0$ kcal

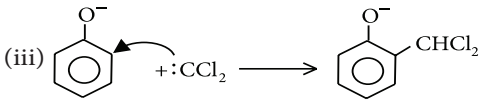
**30. (b):** On increasing temperature, $K_w$ of water increases and hence $pK_w$ decreases.

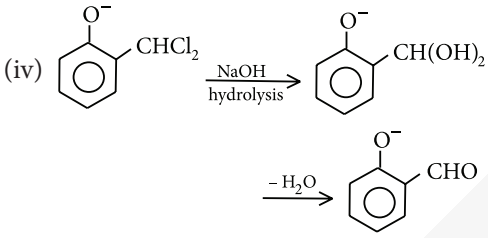
**31. (a):** Electronic configuration of
$Zn^{2+} = [Ar]3d^{10}4s^0$; $Ni^{2+} = [Ar]3d^8 4s^0$; $Cr^{3+} = [Ar]\,3d^3\,4s^0$.
Hence, $Zn^{2+}$ is colourless (no unpaired electrons), $Ni^{2+}$ and $Cr^{3+}$ are coloured due to unpaired electrons.

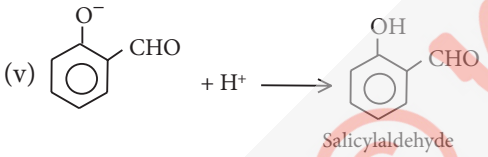
**32. (b):** The given reaction is known as Reimer-Tiemann reaction. The formation of intermediates can be explained through its mechanism.

(i) $OH^- + CHCl_3 \rightleftharpoons HOH + :CCl_3^- \longrightarrow Cl^- + :\underset{\text{Dichloro-carbene}}{CCl_2}$

(ii) $C_6H_5OH \xrightarrow[-H^+]{OH^-} C_6H_5O^-$

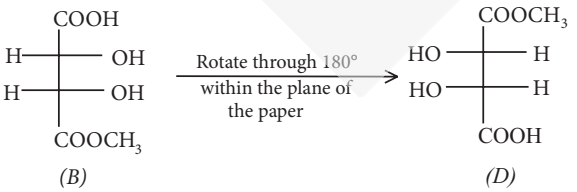
(iii) 

(iv) 

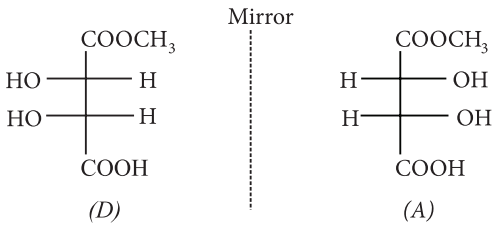
(v) 

Salicylaldehyde

**33. (d):** Rotation of *B* through 180° within the plane of the paper gives *D* which is an enantiomer of (*A*).



*(B)* *(D)*



*(D)* *(A)*

Thus, *A* and *B* are enantiomers.

**34. (c):** Weight $= \dfrac{\text{Eq.wt.} \times It}{96500}$ [16 min 5 sec = 965 sec]

Eq. wt. $= \dfrac{63.5}{2} = 31.75$

Mass deposited $= \dfrac{31.75 \times 1 \times 965}{96500} = 0.3175$ g

Moles in one litre $= \dfrac{0.3175}{63.5} = 0.005$ M

**35. (a):** The molecular plane does not contain π-electron density, hence nodal plane in the π-bond is in the molecular plane.

**36. (d):** (a) Mixture of 100 mL of M/100 HCl and 100 mL of M/100 NaOH is an exact neutralisation. Hence pH = 7.
(b) After neutralisation, M/10 HCl left = 10 mL
Total volume = 100 mL, dilution = 10 times
$\therefore\ [H^+] = 10^{-2}$ or pH = 2
(c) After neutralisation, M/10 NaOH left = 80 mL
Total volume = 100 mL ; pH > 7
(d) After neutralisation, M/5 HCl left = 50 mL
Total volume = 100 mL, dilution = 2 times
$\therefore\ [H^+] = \dfrac{1}{10} = 10^{-1}$ or pH = 1

**37. (d):** Addition of phosphate fertilizers to water leads to nutrient enrichment (eutrophication).

**38. (c):** $\underset{1.6\text{ D}}{CH_3I} < \underset{1.79\text{ D}}{CH_3Br} < \underset{1.84\text{ D}}{CH_3F} < \underset{1.94\text{ D}}{CH_3Cl}$

The charge separation in C – *X* bond decreases in the order :

C – F > C – Cl > C – Br > C – I

due to decrease in the electronegativity as we move from F → Cl → Br → I. $CH_3Cl$ has higher dipole moment than $CH_3F$ because of larger bond length of C – Cl bond. The larger C – Cl bond length causes dipole moment (μ) = $q \times d$ to be larger for $CH_3Cl$ than $CH_3F$. In case of other haloalkanes, the effect of larger C – *X* bond length cannot out weight the effect of decreased charge separation.

**39. (c):** The mixture of sugars is a homogeneous one. Homogeneous mixtures of a solvent and one or more solutes (dissolved substances) are often separated by chromatography. Chromatography works to

separate a mixture because the components of a mixture distribute themselves differently when they are in contact with a "two phase system". One phase is stationary and the other is moving or mobile. The stationary phase may be a solid packed in a tube or a piece of paper. The mobile phase may be liquid or gaseous.

**40. (b):** Amongst nitrobenzene, aniline, aniline hydrochloride and *N*-acetylaniline only aniline has electron donating $-NH_2$ group. As a result, electron density on the benzene ring increases and hence it becomes reactive towards electrophilic substitution reactions.