16 PRACTICE PAPER

Time allowed: 45 minutes **Maximum Marks: 200**

General Instructions: *Same as Practice Paper–1.*

Choose the correct option.

1. A given metal crystallises out with a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, then the radius of one atom is

(*a*) 80 pm (*b*) 108 pm (*c*) 40 pm (*d*) 128 pm

2. Which of the following mixture will form maximum boiling azeotrope?

(*a*) conc. HNO_3 and water (*b*) Acetone and benzene

(*c*) Ethyl alcohol and water (*d*) Acetone and CS_2

3. Standard reduction potentials of three metals A, B and C are + 0.5 V, – 3.0 V and – 1.2 V, respectively. The correct order of reducing power of these metals will be

(*a*) B > C > A (*b*) A > B > C

(*c*) C > B > A (*d*) A > C > B

4. The rate of reaction for, $Cl_3C.CHO + NO \longrightarrow CHCl_3 + NO + CO$ is given by the expression

Rate = $k[Cl_3C.CHO]\,[NO]$

If concentration is expressed in mol/L, the unit of k is,

(*a*) litre^2 mol^{-2} s^{-1} (*b*) mol L^{-1} s^{-1}

(*c*) litre mol^{-1} s^{-1} (*d*) s^{-1}

5. With which one of the following elements silicon should be doped so as to give *p*-type of semiconductor?

(*a*) Selenium (*b*) Boron (*c*) Germanium (*d*) Arsenic

6. The Henry's law is applicable only when

(*a*) the gas undergoes association or dissociation in the solution.

(*b*) the gas undergoes any chemical change.

(*c*) the pressure of the gas is not too high and temperature is not too low.

(*d*) All of the above

7. The value of standard electrode potential for this reaction will be

$2H^+(aq) + 2e^- \longrightarrow H_2(g)$

(*a*) 0 (*b*) +1 (*c*) –1 (*d*) None of these

8. If the half lives of a first order and a zero order reaction is same, then the ratio of the initial rate of first order reaction to that of zero order reaction will be

(*a*) $\frac{2}{0.693}$ (*b*) 6.93 (*c*) $\frac{1}{0.693}$ (*d*) 2×0.693

9. **The first order rate constant for the decomposition of N_2O_5 is 6×10^{-4} s^{-1}. The half life period of this reaction is**

(*a*) 1155 s (*b*) 1117 s (*c*) 223.4 s (*d*) 160.9 s

10. **A compound formed by elements X and Y crystallises in a cubic structure in which the X atoms are at the corners of a cube and the Y atoms are at the face-centres. The formula of the compound is**

(*a*) XY_3 (*b*) X_3Y (*c*) XY (*d*) XY_2

11. **A solution has a 1:4 mole ratio of pentane to hexane. The vapour pressures of the pure hydrocarbons at 20°C are 440 mm Hg for pentane and 120 mm Hg for hexane. The mole fraction of pentane in the vapour phase is**

(*a*) 0.200 (*b*) 0.549 (*c*) 0.786 (*d*) 0.478

12. **Given below are two statements labelled as Assertion and Reason:**

Assertion (A) : Current stops flowing when $E_{cell} = 0$.

Reason (R) : Equilibrium of the cell reaction is attained.

(*a*) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(*b*) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(*c*) Assertion is correct statement but reason is wrong statement.

(*d*) Assertion is wrong statement but reason is correct statement.

13. **Peptization is a process of**

(*a*) precipitation of colloidal particles.

(*b*) purification of colloidal solution.

(*c*) dispersion of precipitate in colloidal particles.

(*d*) migration of colloidal particles towards oppositely charged electrode.

14. **Which property of colloids is used to determine the nature of charge on colloidal particle?**

(*a*) Sedimentation (*b*) Electrophoresis

(*c*) Dialysis (*d*) Ultrafiltration

15. **For electrochemical cell $M/M^+||X^-/X$, $E^\circ_{M^+/M} = 0.44$ V and $E^\circ_{X/X^-} = 0.33$ V. From the data one can deduce that,**

(*a*) $M + X \rightarrow M^+ + X^-$ is spontaneous (*b*) $M^+ + X^- \rightarrow M + X$ is spontaneous

(*c*) $E^\circ_{cell} = 0.77$ V (*d*) $E^\circ_{cell} = -0.77$ V

16. **The anode in dry cell is**

(*a*) $MnO_2 + C$ (*b*) Carbon

(*c*) Zinc container (*d*) Graphite electrode

17. **The IUPAC name of $K_3[Al(C_2O_4)_3]$ is**

(*a*) potassium aluminooxatate (*b*) potassium alumino(III) oxalate

(*c*) potassium trioxalatoaluminate (*d*) potassium trioxalatoaluminate(III)

18. **In potassium manganate, the oxidation state of manganese is**

(*a*) +5 (*b*) +6

(*c*) +7 (*d*) +8

19. **Hall-Herault process for the extraction of aluminium is carried out**

(*a*) in the presence of NaCl.

(*b*) in the presence of fluorite.

(*c*) in the presence of cryolite which forms a melt with lower melting point.

(*d*) in the presence of cryolite which forms a melt with high melting point.

20. **Formula of copper pyrite is**

(*a*) Cu_2S (*b*) CuFeS

(*c*) $CuFeS_2$ (*d*) $Cu_2Fe_2S_2$

21. **The correct IUPAC name for diethyl bromomethane is**

(*a*) 1-Bromo-1,1-diethoxyethane (*b*) 3-Bromopentane

(*c*) 1-Bromo-1-ethylpropane (*d*) 1-Bromopentane

22. $C_6H_6 + (CH_3)_2CHCH_2Cl \xrightarrow{\text{Anhy. } AlCl_3}$ **'A'**

The product 'A' is

(*a*) cumene (*b*) *n*-butyl benzene

(*c*) $CH_3CH_2CH(CH_3)_2$ (*d*) *t*-butyl benzene

23. **Which of the following molecules does not possess permanent dipole moment?**

(*a*) H_2S (*b*) SO_2 (*c*) SO_3 (*d*) CS_2

24. **Which of the following elements of first series of transition element has highest density?**

(*a*) Ti (*b*) Cu (*c*) Mn (*d*) V

25. **The atomic number of V, Cr, Mn and Fe are respectively 23, 24, 25 and 26. Which one of these may be expected to have the highest second ionisation enthalpy?**

(*a*) V (*b*) Cr (*c*) Mn (*d*) Fe

26. **Which of the following general formula is associated with fac and mer isomerism?**

(*a*) $M(AA')_2$ (*b*) $M(AA)_3$

(*c*) MABCD (*d*) MA_3X_3

27. **XeF_2 is isostructural with**

(*a*) ICl_2^- (*b*) $SbCl_3$ (*c*) $BaCl_2$ (*d*) TeF_2

28. **Match the compounds of Column I with shape given in Column II.**

Column I	Column II
A. XeF_6	(*i*) Linear
B. XeO_3	(*ii*) Square pyramidal
C. $XeOF_4$	(*iii*) Distorted octahedral
D. XeF_2	(*iv*) Pyramidal

(*a*) A–(*iii*), B–(*iv*), C–(*ii*), D–(*i*) (*b*) A–(*iv*), B–(*ii*), C–(*i*), D–(*ii*)

(*c*) A–(*i*), B–(*ii*), C–(*iv*), D–(*iii*) (*d*) A–(*ii*), B–(*i*), C–(*iii*), D–(*iv*)

29. **Among the following complex ions, which one will not show optical isomerism?**

(*a*) $[Pt(Br)(Cl)(I)(NO_2)(C_5H_5N)(NH_3)]^-$ (*b*) *cis*-$[Co(en)_2Cl_2]^+$

(*c*) $[Co(en)(NH_3)_2Cl_2]^+$ (*d*) $[Cr(NH_3)_4Cl_2]^+$

30. **The reaction conditions leading to the best yield of C_2H_5Cl are**

(*a*) $C_2H_6 + \underset{\text{(Excess)}}{Cl_2} \xrightarrow{\text{uv light}}$ (*b*) $C_2H_6 + Cl_2 \xrightarrow[\text{Room temperature}]{\text{Dark}}$

(*c*) $C_2H_6 + \underset{\text{(Excess)}}{Cl_2} \xrightarrow{\text{uv light}}$ (*d*) $C_2H_6 + Cl_2 \xrightarrow{\text{uv light}}$

31. **Helium is used as diluent for modern diving apparatus. This is because**

(*a*) It has very low solubility in blood. (*b*) It has high solubility in blood.

(*c*) It is a light gas. (*d*) Both (*a*) and (*c*)

32. **When 2-hydroxy benzoic acid is distilled with zinc dust, it gives**

(*a*) Phenol (*b*) Benzoic acid

(*c*) Benzaldehyde (*d*) A polymeric compound

33. **Benzene diazonium chloride on reaction with phenol in weakly basic medium gives:**

(*a*) diphenyl ether (*b*) *p*-hydroxyazobenzene

(*c*) chlorobenzene (*d*) benzene

34. **Which of the following amines will give carbylamine reaction?**

(*a*) $(C_2H_5)_3N$ (*b*) $(C_2H_5)_2NH$

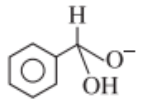
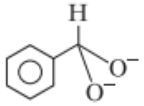
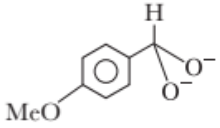
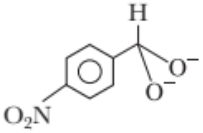
(*c*) $C_2H_5NH_2$ (*d*) $C_3H_7NHC_2H_5$

35. **The chemical name of vitamin B_{12} is**

(*a*) Ascorbic acid (*b*) Thiamine

(*c*) Riboflavin (*d*) Cobalamin

36. **In a cannizzaro reaction, the intermediate that will be best hydride donor is**

(*a*)  (*b*)  (*c*)  (*d*) 

37. **Which of the following polymer are the correct pair of copolymer?**

(*a*) Polythene, PVC (*b*) Nylon-6, Nylon-6,6

(*c*) Buna-S, Buna-N (*d*) None of these

38. **Williamson's synthesis is used to prepare**

(*a*) alcohols (*b*) ethers

(*c*) aldehydes (*d*) amines

39. **Given below are two statements labelled as Statement P and Statement Q:**

Statement P : Receptors are crucial to body's communication process.

Statement Q : Receptors are proteins.

(*a*) P is true, but Q is false (*b*) P is false, but Q is true

(*c*) Both P and Q are true (*d*) Both P and Q are false

40. **Each polypeptide in a protein has amino acids linked with each other in a specific sequence. This sequence of amino acids is said to be _____.**

(*a*) primary structure of proteins. (*b*) secondary structure of proteins.

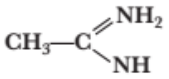
(*c*) tertiary structure of proteins. (*d*) quaternary structure of proteins.

41. ***n*-Butylbenzene on oxidation will give**

(*a*) Benzoic acid (*b*) Butanoic acid

(*c*) Benzyl alcohol (*d*) Benzaldehyde

42. **The correct order of basicity of the following compound is:**



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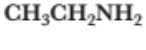

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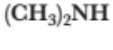

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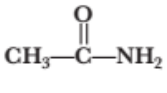


4

(*a*) 2 > 1 > 3 > 4 (*b*) 1 > 3 > 2 > 4

(*c*) 3 > 1 > 2 > 4 (*d*) 1 > 2 > 3 > 4

43. $CH_3CH_2COOH \xrightarrow[\text{Red P}]{Cl_2} [A] \xrightarrow[KOH]{\text{Alcoholic}} [B]$

The compound [B] is

(*a*) CH_3CH_2OH (*b*) CH_3CH_2COCl

(*c*) $CH_2 = CHCOOH$ (*d*) $CH_3CHClCOOH$

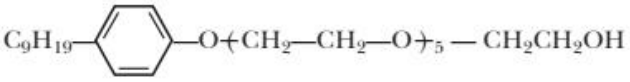
44. **The IUPAC name of $C_6H_5—O—C_2H_5$ is**

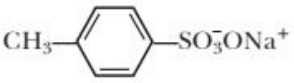
(*a*) ethoxy benzene (*b*) 1-phenyl ethane

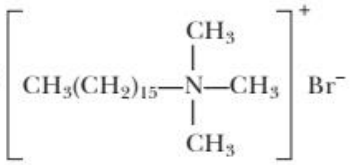
(*c*) 1-phenoxy ethane (*d*) 2-ethoxy butane

45. Which of the following is the structure of a non-ionic detergent?

(*a*) $CH_3(CH_2)_{10} - CH_2OSO_3^-Na^+$

(*b*) 

(*c*) 

(*d*) 

46. Lucas test is used to distinguish

(*a*) Alcohols
(*b*) Alkyl halide
(*c*) Amines
(*d*) Carbonyl compound

47. Propan-1-ol and propan-2-ol can be best distinguished by

(*a*) Oxidation with alkaline $KMnO_4$ followed by reaction with Fehling solution.
(*b*) Oxidation with acidic dichromate followed by reaction with Fehling solution.
(*c*) Oxidation by heating with Cu followed by reaction with Fehling solution.
(*d*) Oxidation with concentrated H_2SO_4 followed by reaction with Fehling solution.

48. The monomers of Buna-S are

(*a*) Styrene and butadiene
(*b*) Isoprene and butadiene
(*c*) Vinyl chloride and sulphur
(*d*) Butadiene

49. Which of the following orders of relative strength of acids is correct?

(*a*) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH$
(*b*) $ClCH_2COOH > BrCH_2COOH > FCH_2COOH$
(*c*) $BrCH_2COOH > ClCH_2COOH > FCH_2COOH$
(*d*) $ClCH_2COOH > FCH_2COOH > BrCH_2COOH$

50. Which amino acid has phenolic–OH group as its backbone?

(*a*) Glycine
(*b*) Leucine
(*c*) Tyrosine
(*d*) Serine

Answers

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1. (*d*)	**2.** (*a*)	**3.** (*a*)	**4.** (*c*)	**5.** (*b*)	**6.** (*c*)	**7.** (*a*)
8. (*d*)	**9.** (*a*)	**10.** (*a*)	**11.** (*d*)	**12.** (*a*)	**13.** (*c*)	**14.** (*b*)
15. (*b*)	**16.** (*c*)	**17.** (*d*)	**18.** (*b*)	**19.** (*c*)	**20.** (*c*)	**21.** (*b*)
22. (*d*)	**23.** (*d*)	**24.** (*b*)	**25.** (*b*)	**26.** (*d*)	**27.** (*a*)	**28.** (*a*)
29. (*d*)	**30.** (*a*)	**31.** (*a*)	**32.** (*b*)	**33.** (*b*)	**34.** (*c*)	**35.** (*d*)
36. (*d*)	**37.** (*c*)	**38.** (*b*)	**39.** (*c*)	**40.** (*a*)	**41.** (*a*)	**42.** (*b*)
43. (*c*)	**44.** (*a*)	**45.** (*b*)	**46.** (*a*)	**47.** (*c*)	**48.** (*a*)	**49.** (*a*)
50. (*c*)						

Solutions

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1. (*d*) Z = 4, *i.e.*, structure is *fcc*

Hence,

$$r = \frac{a}{2\sqrt{2}} = \frac{361}{2\sqrt{2}} = 127.65 \text{ pm} \simeq 128 \text{ pm}$$

3. (*a*) The more negative is the standard reduction potential value, greater will its reducing power. Thus the correct order of reducing power of the given metals will be B > C > A.

7. (*a*) The given reaction is of standard hydrogen electrode and therefore $E^{\circ}_{2H^{\oplus}/H_2(g)} = 0.00$ V

8. (*d*) $t_{1/2}$ for zero order reaction $= \frac{[A]_0}{2k}$

$t_{1/2}$ for first order reaction $= \frac{0.693}{k}$

Rate of zero order reaction,

$$r_0 = k\frac{[A]_0}{2t_{1/2}}$$

Rate of first order reaction,

$$r_1 = k(A_0) = \frac{0.693}{k}[A_0]$$

$$\Rightarrow \frac{r_1}{r_0} = \frac{0.693[A]_0}{t_{1/2}} \times \frac{2 \times t_{1/2}}{[A]_0} = 2 \times 0.693$$

9. (*a*) For first order reaction, $t_{1/2} = \frac{0.693}{k}$

Therefore, $t_{1/2} = \frac{0.693}{6 \times 10^{-4}}$

$t_{1/2} = 1155$ s

10. (*a*) In a unit cell, X atoms at the corners $= \frac{1}{8} \times 8 = 1$

Y atoms at the face centres $= \frac{1}{2} \times 6 = 3$

Ratio of X and Y = 1 : 3. Hence formula is XY_3.

11. (*d*) $\frac{n_{\text{pentane}}}{n_{\text{hexane}}} = \frac{1}{4}$

So, $\chi_{\text{pentane}} = \frac{1}{5}$

$\chi_{\text{Hexane}} = \frac{4}{5}$

$$P_{\text{Total}} = p^{\circ}_{\text{pentane}} \times \chi_{\text{pentane}} + p^{\circ}_{\text{Hexane}} \times \chi_{\text{Hexane}}$$

$$= 440 \times \frac{1}{5} + 120 \times \frac{4}{5} = 184 \text{ mm of Hg}$$

By Raoult's law

Now $p_{\text{pentane}} = p^{\circ}_{\text{pentane}} \times \chi_{\text{pentane}}$ ...(*i*)

χ_{pentane} is mole fraction of pentane in solution.

By Dalton's law

$p_{\text{pentane}} = P_T \times \chi'_{\text{pentane}}$ ...(*ii*)

χ'_{pentane} is mole fraction of pentane in vapour phase.

From (*i*) and (*ii*), we get

$$p^{\circ}_{\text{pentane}} \times \chi_{\text{pentane}} = P_T \times \chi'_{\text{pentane}}$$

$$\chi'_{\text{pentane}} = \frac{p^{\circ}_{\text{pentane}} \times \chi_{\text{pentane}}}{P_T}$$

$$= \frac{440 \times \frac{1}{5}}{184} = \frac{88}{184} = 0.478$$

14. (*b*) The movement of colloidal particles towards oppositely charged electrode in an electric field is called electrophoresis. It occurs due to the presence of positive or negative charge on colloids.

15. (*b*) $E^{\circ}_{M^+/M} = 0.44$ V; $E^{\circ}_{X/X^-} = 0.33$ V

E°_{RP} for M > E°_{RP} for X

Thus,

$M^+ + e^- \longrightarrow M$ Reduction (Cathode)

$X^- \longrightarrow X + e^-$ Oxidation (Anode)

$E^{\circ}_{\text{cell}} = E^{\circ}_{R} - E^{\circ}_{L}$

$= 0.44 - (0.33) = 0.44 - 0.33 = 0.11$ V

As electrode potential of cell is positive and therefore forward reaction is spontaneous.

16. (*c*) Leclanche or dry cell consists of a zinc container which acts as the anode. Carbon (graphite) rod surrounded by a mixture of powdered manganese dioxide and carbon acts as a cathode.

17. (*d*) The correct IUPAC name of $K_3[Al(C_2O_4)_3]$ is potassiumtrioxalatoaluminate(III). Let oxidation number of Al be *x*.

$+3 + x + 3(-2) = 0$

$+3 + x - 6 = 0$

$x - 3 = 0$

$x = +3$

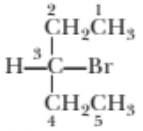
18. (*b*) Let oxidation state of Mn is *x* in K_2MnO_4.

$\therefore 2(+1) + x + 4(-2) = 0$

$\therefore \quad x = +6$

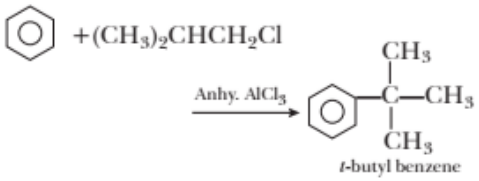
19. (*c*) In Hall-Herault process, purified Al_2O_3 is mixed with Na_3AlF_6 or CaF_2 which lowers the melting point of mixture and brings electrical conductivity. Fused mixture is electrolysed using graphite rod as anode and carbon lining as cathode.

21. (*b*)



3-Bromopentane

22. (*d*)

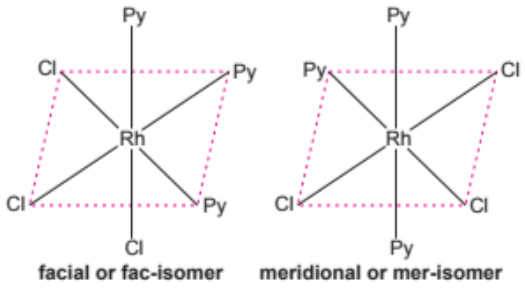


23. (*d*) CS_2 does not possess permanent dipole moment as it is a linear molecule.

24. (*b*) The decrease in atomic radius coupled with increase in atomic mass results in increase in the density along the series.

25. (*b*) The electronic configuration of Cr^+ is [Ar] $3d^5$ which is extra stable due to half filled configuration. Therefore it has highest second ionisation enthalpy.

26. (*d*) MA_3X_3 represents two isomeric forms referred as fac and mer isomers.



Type $[MA_3X_3]$

27. (*a*) ICl_2^- has sp^3d hybridisation with linear structure as of XeF_2 containing 3 lone pairs and 2 bond pairs.

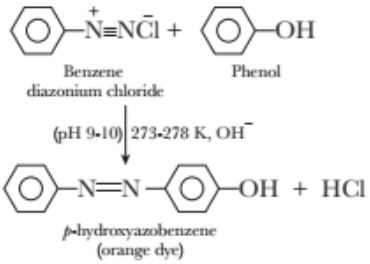
29. (*d*) The complex $[Cr(NH_3)_4Cl_2]^+$ will not show optical isomerism as it does not possesses chiral centre.

30. (*a*) $\underset{\text{(excess)}}{C_2H_6} + Cl_2 \xrightarrow{\text{UV light}} C_2H_5Cl + HCl$

In this reaction, if we use Cl_2 in excess, then mono, di, tri and tetra chloroalkanes are formed as product and if ethane is used in excess, then ethyl chloride forms as major product.

32. (*b*) On distilling 2-hydroxy benzoic acid with zinc dust, benzoic acid is formed as Zn dust reduces alcoholic group.

33. (*b*)



p-hydroxyazobenzene is formed as a result of coupling reaction.

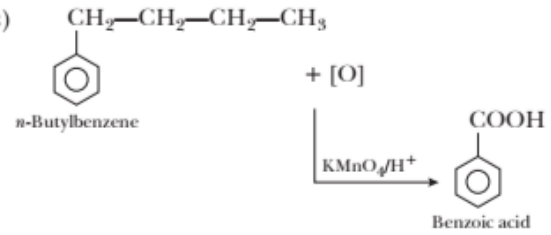
34. (*c*) Only primary aromatic and aliphatic amines give this reaction.

36. (*d*) Due to presence of $-NO_2$ (electron withdrawing group), molecule stabilizes after release of hydride.

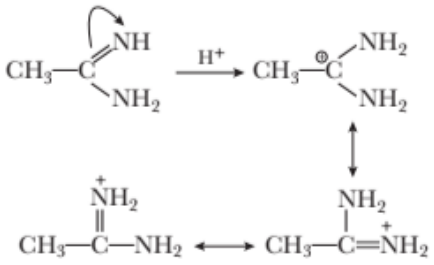
37. (*c*) Buna-S is a copolymer of 1,3-Butadiene and styrene and Buna-N is a copolymer of 1,3-Butadiene and acrylonitrile.

40. (*a*) Each polypeptide in a protein has amino acids linked with each other in a specific sequence and it is this sequence of amino acids that is said to be the primary structure of that protein. Any change in this primary structure *i.e.*, the sequence of amino acids creates a different protein.

41. (*a*)



42. (*b*) Compound (1) is maximum basic because the conjugate acid formed by addition of proton is resonance stabilized.



Compound (3) is more basic than compound (2) because the former is secondary amine while latter is primary amine. The compound (4) is the least basic in nature due to delocalisation of lone pair of electrons of N over the CO group. The correct order is, therefore, as given in (*b*).

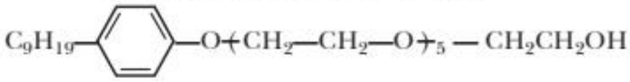
43. (*c*) $CH_3CH_2COOH \xrightarrow[\text{Red P}]{Cl_2} \underset{\substack{|\\ Cl}}{CH_3CHCOOH}$

α-Chloropropionic acid [A]

$\xrightarrow[\text{Alcoholic}]{KOH} CH_2{=}CHCOOH$

Prop-2-enoic acid

45. (*b*) Non-ionic detergents do not contain any ion in their constitution. Liquid dishwashing detergents are the non-ionic type.



46. (*a*) **Lucas test:** In this test, the alcohol is treated with Lucas reagent which is an equimolar mixture of conc. HCl and $ZnCl_2$. Alcohols are soluble in Lucas reagent and form a clear solution. On reaction, alkyl chlorides are formed which being insoluble result in turbidity in the solution.

$$\text{Alcohol} \xrightarrow[ZnCl_2]{\text{conc. HCl}} \text{Alkyl chloride} + H_2O$$

If turbidity appears immediately, tertiary alcohol is indicated.

If turbidity appears within five minutes, secondary alcohol is indicated.

If turbidity appears only upon heating, primary alcohol is indicated.

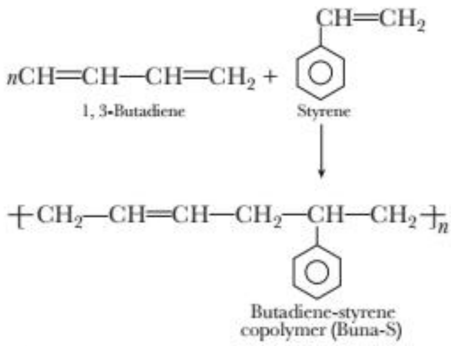
47. (*c*)

$\underset{\text{Propan-1-ol}}{CH_3{-}CH_2{-}CH_2OH} \xrightarrow[\Delta,\ 300°C]{Cu} CH_3{-}CH_2{-}CHO$

$\xrightarrow[\text{Fehling solution}]{2CuO} \underset{\text{red ppt.}}{Cu_2O\downarrow} + CH_3CH_2{-}COOH$

$\underset{\text{Propan-2-ol}}{CH_3{-}\underset{\substack{|\\ OH}}{CH}{-}CH_3} \xrightarrow[\Delta,\ 300°C]{Cu} CH_3{-}CO{-}CH_3$

$\xrightarrow[\text{Fehling solution}]{2CuO} \text{No reaction}$

48. (*a*) 

49. (*a*) The –I effect of the halogens decreases in the order: F > Cl > Br > I.

Therefore, the acidic strength of the given halogen acids follow the order:

$FCH_2COOH > ClCH_2COOH > BrCH_2COOH$

50. (*c*) Tyrosine or 4-hydroxyphenylalanine is a non-essential amino acid with a polar side group.