

Time allowed: 45 minutes

Maximum Marks: 200

General Instructions: Same as Practice Paper-1.

Choose the correct option.

- 96500 coulomb of current will deposit _____ of a substance.
(a) one gram (b) one gram molecular mass
(c) one electrochemical equivalent (d) one gram equivalent
- Lithium has a *bcc* structure. Its density is 530 kg m^{-3} and its atomic mass is 6.94 g mol^{-1} . The edge-length of a unit cell of ($N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$) lithium metal is-
(a) 527 pm (b) 264 pm
(c) 154 pm (d) 352 pm
- Under suitable conditions the following reaction
 $\text{M} + \text{Water} \longrightarrow \text{Metal oxide/hydroxide} + \text{H}_2 \uparrow$ may take place. Which of the following metal does not react?
(a) Aluminium (b) Sodium
(c) Mercury (d) Magnesium
- The correct statement regarding defects in crystalline solid is
(a) Frenkel defect decreases the density of crystalline solids.
(b) Frenkel defect is a dislocation defect.
(c) Frenkel defect is found in halides of alkali metals.
(d) Schottky defects have no effect on the density of crystalline solids.
- Zn-copper couple that can be used as a reducing agent is obtained by
(a) Mixing Zn dust and copper gauze.
(b) Zinc coated with copper.
(c) Copper coated with zinc.
(d) Zinc and copper wire welded together.
- In a *ccp* arrangement of spheres in three dimensions, the coordination number of each sphere is
(a) 3 (b) 6
(c) 9 (d) 12
- The minimum energy required for the reacting molecules to undergo reaction is
(a) potential energy (b) kinetic energy
(c) threshold energy (d) activation energy

8. Match the laws given in Column I with expressions given in Column II.

Column I	Column I
A. Raoult's law	(i) $\Delta T_f = K_f m$
B. Henry's law	(ii) $\pi = CRT$
C. Elevation of boiling point	(iii) $p = x_1 p_1^0 + x_2 p_2^0$
D. Depression in freezing point	(iv) $\Delta T_b = K_b m$
E. Osmotic pressure	(v) $p = K_H \cdot x$

(a) A-(i), B-(iv), C-(v), D-(ii), E-(iii)

(b) A-(iii), B-(v), C-(iv), D-(i), E-(ii)

(c) A-(ii), B-(iii), C-(iv), D-(i), E-(v)

(d) A-(iv), B-(i), C-(ii), D-(v), E-(iii)

9. The first order reaction has specific rate constant of 2 min. The half life of the reaction will be
 (a) 1.653 min (b) 0.347 min (c) 2.0 min (d) 0.0347 min
10. A solution of acetone in ethanol
 (a) obeys Raoult's law. (b) shows a negative deviation from Raoult's law.
 (c) shows a positive deviation from Raoult's law. (d) behaves like a near ideal solution.
11. Rate of reaction has the units for the reaction $A + 2B \longrightarrow C$,
 (a) mol L^{-1} (b) $\text{mol L}^{-1} \text{s}^{-1}$ (c) $\text{mol}^{-1} \text{s}^{-1}$ (d) $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$
12. The relationship between osmotic pressure at 273 K when 10 g glucose (π_1), 10 g urea (π_2), and 10 g sucrose (π_3) are dissolved in 250 mL of water is
 (a) $\pi_2 > \pi_1 > \pi_3$ (b) $\pi_2 > \pi_3 > \pi_1$ (c) $\pi_1 > \pi_2 > \pi_3$ (d) $\pi_3 > \pi_1 > \pi_2$
13. The standard electrode potentials for the reactions at 25°C
 $\text{Ag}^+(aq) + e^- \longrightarrow \text{Ag}(s)$
 $\text{Sn}^{2+}(aq) + 2e^- \longrightarrow \text{Sn}(s)$
 are + 0.80 V and - 0.14 V, respectively. The e.m.f. of the cell representing $\text{Sn}|\text{Sn}^{2+}||\text{Ag}^+|\text{Ag}$ will be
 (a) 0.66 V (b) 0.80 V (c) 0.94 V (d) 1.08 V
14. The free energy change for a reaction
 $\frac{1}{2}\text{Cu}(s) + \frac{1}{2}\text{Cl}_2(g) \longrightarrow \frac{1}{2}\text{Cu}^{2+} + \text{Cl}^-$
 taking place at 25°C in a cell with standard EMF 1.02 V is
 (a) 98430 J (b) - 98430 J (c) 96500 J (d) - 49215 J
15. Which of the following statements is correct?
 (a) Enzymes form a true solution in water.
 (b) A large quantity of enzyme is needed for a small change.
 (c) One catalyst cannot catalyze more than one reaction.
 (d) All of these
16. When dispersed phase is liquid and dispersion medium is gas, the colloidal solution is known as
 (a) Smoke (b) Emulsion (c) Aerosol (d) Gel
17. The formula of Mohr's salt is
 (a) $\text{Fe}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ (b) $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
 (c) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (d) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
18. Which one of the following oxides of manganese is amphoteric in nature?
 (a) MnO (b) MnO_2 (c) Mn_2O_7 (d) None of these
19. For H_3PO_3 and H_3PO_4 the correct choice is
 (a) H_3PO_3 is dibasic and reducing agent (b) H_3PO_3 is dibasic and non-reducing agent
 (c) H_3PO_4 is tribasic and reducing agent (d) H_3PO_3 is tribasic and reducing agent

- (a) a, b, c, d (b) b, c (c) a, d (d) a, b, c
- 31. Which of the following sequence would yield *m*-nitrochlorobenzene (B) from benzene?**
- (a) $\text{C}_6\text{H}_6 \xrightarrow{\text{H}_2\text{SO}_4/\text{HNO}_3} \text{A} \xrightarrow{\text{Anhy. FeCl}_3/\text{Cl}_2} \text{B}$ (b) $\text{C}_6\text{H}_6 \xrightarrow{\text{H}_2\text{SO}_4/\text{HNO}_3} \text{B}$
- (c) $\text{C}_6\text{H}_6 \xrightarrow[\text{Anhy. FeCl}_3]{\text{Cl}_2} \text{A} \xrightarrow[\text{H}_2\text{SO}_4]{\text{HNO}_3} \text{B}$ (d) $\text{C}_6\text{H}_6 \xrightarrow[\text{Anhy. FeCl}_3]{\text{CH}_3\text{COCl}} \text{A} \xrightarrow[\text{H}_2\text{SO}_4]{\text{HNO}_3} \text{B}$
- 32. Y-shaped protein molecules involved in the immune system are :**
- (a) immunoglobins (b) antigens
- (c) pathogens (d) lipase

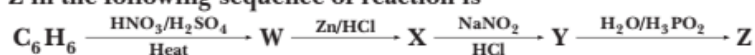
33. Which one of the following is correct order of acidity?

- (a) $\text{HCOOH} > \text{CH}_3\text{COOH} > \text{ClCH}_2\text{COOH} > \text{C}_2\text{H}_5\text{COOH}$
 (b) $\text{ClCH}_2\text{COOH} > \text{HCOOH} > \text{CH}_3\text{COOH} > \text{C}_2\text{H}_5\text{COOH}$
 (c) $\text{CH}_3\text{COOH} > \text{HCOOH} > \text{ClCH}_2\text{COOH} > \text{C}_2\text{H}_5\text{COOH}$
 (d) $\text{C}_2\text{H}_5\text{COOH} > \text{CH}_3\text{COOH} > \text{HCOOH} > \text{ClCH}_2\text{COOH}$

34. Which one of the following is the correct name for yellow dye?

- (a) *o*-amino benzene (b) *o*-hydroxy benzene
 (c) *p*-hydroxy azobenzene (d) *p*-amino azobenzene

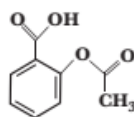
35. Z in the following sequence of reaction is



36. Neoprene is a polymer of

- (a) Butadiene (b) Ethylene
 (c) Isoprene (d) Chloroprene

37. Important function of the drug with the following structure is:



- (a) Reducing fever (b) Relieving pain
 (c) Anti-blood clotting action (d) All of these

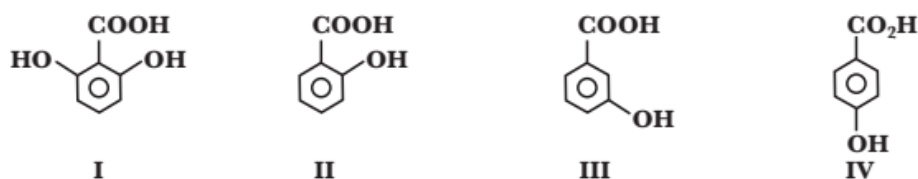
38. Toluene $\xrightarrow{\text{KMnO}_4}$ A $\xrightarrow{\text{SOCl}_2}$ B $\xrightarrow{\text{H}_2/\text{Pd}}$ C. The product 'C' is

- (a) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ (b) $\text{C}_6\text{H}_5\text{CHO}$
 (c) $\text{C}_6\text{H}_5\text{COOH}$ (d) $\text{C}_6\text{H}_5\text{CH}_3$

39. The C—O bond length in phenol is less than that in methanol due to

- (a) partial double bond character in aromatic ring (b) sp^2 hybridised carbon
 (c) sp^3 hybridised carbon (d) both (a) and (b)

40. The correct order of acidity for the following compounds is



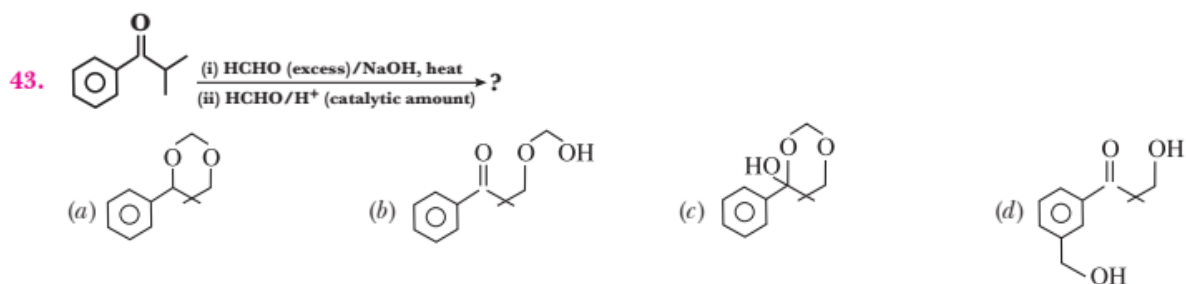
- (a) $\text{I} > \text{II} > \text{III} > \text{IV}$ (b) $\text{III} > \text{I} > \text{II} > \text{IV}$
 (c) $\text{III} > \text{IV} > \text{II} > \text{I}$ (d) $\text{I} > \text{III} > \text{IV} > \text{II}$

41. Nitration of aniline in strongly acidic medium results in the formation of *m*-nitroaniline also. This is because:

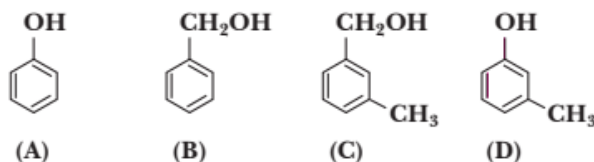
- (a) amino group is meta directing during electrophilic substitution reaction.
 (b) nitro group goes to meta position irrespective of the substituents.
 (c) nitration of aniline is a nucleophilic reaction in strongly acidic medium.
 (d) in strongly acidic medium aniline is present as anilinium ion.

42. Which of the following acids is a vitamin?

- (a) Aspartic acid (b) Ascorbic acid (c) Adipic acid (d) Saccharic acid



44. Which of the following compounds is aromatic alcohol?



(a) A, B, C, D

(b) A, D

(c) B, C

(d) A

45. IUPAC name of the compound $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{OCH}_3$ is _____.

(a) 1-methoxy-1-methylethane

(b) 2-methoxy-2-methylethane

(c) 2-methoxypropane

(d) isopropylmethyl ether

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

Assertion (A) : Cationic addition polymerisation is facilitated in monomers containing electron-releasing groups.

Reason (R) : The electron-releasing groups stabilise the intermediate cation.

(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.

47. A synthetic material used for washing clothes, even when water is hard is

(a) Soap

(b) Detergent

(c) Both (a) and (b)

(d) None of the above

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

Statement P : Addition reaction of water to but-1-ene in acidic medium yields butan-1-ol.

Statement Q : Addition of water in acidic medium proceeds through the formation of secondary carbocation.

(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

49. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable mass. It is due to their

(a) More extensive association of carboxylic acid via van der Waal's force of attraction.

(b) Formation of carboxylate ion.

(c) Formation of intra-molecular H-bonding.

(d) Formation of inter-molecular hydrogen bonding.

50. Tocopherol or vitamin E deficiency leads to :

(a) damage to the reproductive system

(b) rickets

(c) pyorrhea

(d) deformation of Jaws and Teeth



Answers

PRACTICE PAPER – 13

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

Solutions

PRACTICE PAPER – 13

2. (d) For *bcc*, $Z = 2$, $\rho = 530 \text{ kg m}^{-3}$
 Atomic mass of Li = 6.94 g mol^{-1} ,
 $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$
 $\rho = 530 \text{ kg m}^{-3} = \frac{530 \times 1000 \text{ g}}{1 \times (100)^3 \text{ cm}^3} = 0.53 \text{ g cm}^{-3}$
 $\therefore \rho = \frac{Z \times M}{N_A \times a^3}$
 $\Rightarrow 0.53 = \frac{2 \times 6.94}{6.022 \times 10^{23} \times a^3}$
 $a^3 = \frac{2 \times 6.94}{6.022 \times 10^{23} \times 0.53} = 43.5 \times 10^{-24} \text{ cm}^3$
 $a = 352 \times 10^{-10} \text{ cm} = 352 \text{ pm}$
3. (c) Mercury does not react with water because it is least reactive than hydrogen. Therefore, it cannot displace hydrogen from water.
4. (b) Frenkel defect is a dislocation defect as smaller ions (usually cations) are dislocated from normal sites to interstitial sites. Frenkel defect is shown by compounds having large difference in the size of cations and anions. In case of alkali metal halides, the size alkali metal ions is large and therefore it cannot be fit into the interstitial site and hence do not show frenkel defect. Also, Schottky defect decreases the density of crystal while Frenkel defect has no effect on the density of crystal.
5. (b) Zinc-copper couple, which can be used as a reducing agent, is obtained by coating zinc with copper. Zinc is dipped in a solution of copper salt. It displaces copper and copper gets deposited over the surface of zinc.
6. (d) A *ccp* arrangement consists of three repeating layers (ABCABC...) of hexagonally arranged spheres. Spheres in a *ccp* structure have a coordination number of 12 because they contact six spheres in their layer, three atoms in the layer above and three spheres in the layer below.
7. (c) Threshold energy is the minimum energy required for the reacting molecules to undergo reaction.
9. (b) For first order reaction, $t_{1/2} = \frac{0.693}{k}$
 Therefore, $t_{1/2} = \frac{0.693}{2} = 0.347 \text{ min}$
10. (c) In case of pure ethanol, the molecules are held together by hydrogen bond. On adding acetone, the molecules of acetone gets in between the host molecules causing breaking of hydrogen bonds. Thus, A-B interaction < A-A or B-B interaction. Therefore, it shows positive deviation from Raoult's law.

12. (a) n_1 (for glucose) = $\frac{10}{180} = 0.05$

n_2 (for urea) = $\frac{10}{60} = 0.17$

n_3 (for sucrose) = $\frac{10}{342} = 0.03$

$\therefore \pi V = nRT$

So, $\therefore \pi \propto n$

So, $\pi_2 > \pi_1 > \pi_3$

13. (c) $\text{Sn}|\text{Sn}^{2+}||\text{Ag}^+|\text{Ag}$

$E_{\text{cell}}^{\circ} = E_{\text{right}} - E_{\text{left}}$

= $0.80 - (-0.14)$

= $+0.80 + 0.14$

= $+0.94 \text{ V}$

14. (b) $\Delta G = -nFE_{\text{cell}}^{\circ}$
= $-1 \times 96500 \times 1.02 = -98,430 \text{ J}$

15. (c) Catalysts are highly specific in nature, i.e., one catalyst cannot catalyse more than one reaction.

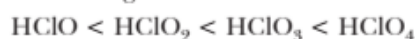
The other statements in correct form are as follows:

1. Enzymes form a colloidal solution in water.
2. A small quantity of enzyme catalyst is sufficient for a large change.

16. (c) Aerosol is a type of colloid having solid or liquid as dispersed phase and gas as dispersion medium. For example, fog, mist, cloud, insecticide spray.

18. (b) Acidic character of oxides increases with increase in its oxidation state. Thus, MnO is basic. MnO_2 is amphoteric and Mn_2O_7 is acidic in nature.

20. (c) Acidic strength of oxo-acids containing the same halogen are in the order:



This is because in solution, ClO_4^- is the most stable due to dispersal of -ve charge on four O-atoms.

21. (b) A flux is a substance which when mixed with calcinated or roasted ore, chemically combine with impurities present to form an easily fusible material called slag.

22. (a) In the complex $[\text{Zn}(\text{NH}_3)_4]^{2+}$, Zn has no unpaired electrons and therefore is colourless in nature.

24. (a) XeF_4 is expected to be oxidising in nature. It oxidises $\text{Pt}(0)$ to $\text{Pt}(\text{IV})$, $\text{Hg}(0)$ to $\text{Hg}(\text{I})$ and I^- to I_2 . Moreover, it disproportionates to give XeO_3 and O_2 .

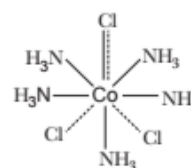
25. (a) The halogens X and I are exchanging their position in this reaction:



26. (c) $(n-1)d^{10}ns^2$ is the general electronic configuration of Zn, Cd, Hg of the 1st, 2nd and 3rd transition series respectively.

27. (a) The main postulates of this theory are:

- (i) In coordination compounds, metals show two types of valencies: primary and secondary.
- (ii) The primary valencies are normally ionisable and are satisfied by negative ions.
- (iii) The secondary valencies are non ionisable and are satisfied by neutral molecules or negative ions. The secondary valency is equal to the coordination number and is fixed for a metal.



----- Primary valency (corresponds to O.S.)
 ——— Secondary valency (corresponds to C.N.)
 ===== Both primary and secondary valencies (satisfy both the O.S. and C.N.)

Representation of $[\text{CoCl}(\text{NH}_3)_5]\text{Cl}_2$ on the basis of Werner's theory

(iv) The ions or groups bound by secondary linkage to the metal have characteristic spatial arrangements corresponding to different coordination number.

28. (d) Bessemer converter is used in the manufacture of steel from pig iron.

29. (b) Fe^{3+} ($Z = 26$): $[\text{Ar}] 3d^5$

Mn^{2+} ($Z = 25$): $[\text{Ar}] 3d^5$

Co^{3+} ($Z = 27$): $[\text{Ar}] 3d^6$

Cr^{3+} ($Z = 24$): $[\text{Ar}] 3d^3$

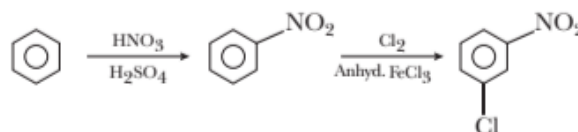
Sc^{3+} ($Z = 21$): $[\text{Ar}] 3d^0$

Thus, Fe^{3+} and Mn^{2+} has same electronic configuration.

30. (b) They are sp^3 hybridised carbon and attached to different substituents.

Assymmetric carbon atom is the chiral carbon which is sp^3 hybridised and attached to different substituents. Here, carbon atom (b) and (c) are assymmetric.

31. (a)



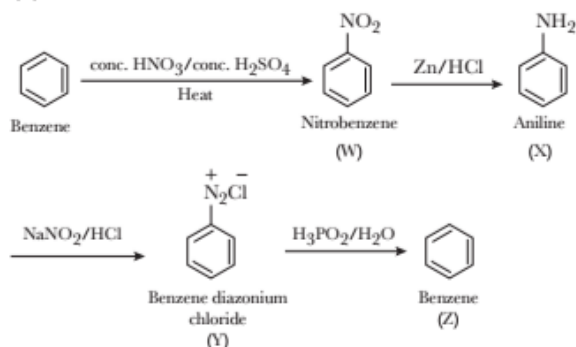
32. (a) Antibodies are Y-shaped proteins that binds to the body's foreign invaders and signal the immune system to get to work. Immunoglobulins are also known as antibodies, are glycoprotein molecules produced by plasma cells (white blood cells).

33. (b) The acidity increase with increasing number of electron-withdrawing substituents and decreases with larger alkyl groups. Therefore, the correct order is

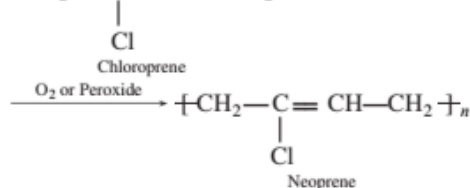


34. (d) *p*-amino azobenzene is a yellow dye. It is formed by the reaction of benzene diazonium salt and aniline.

35. (a)

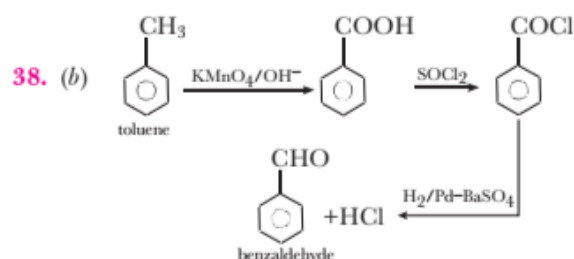


36. (d) $n\text{CH}_2=\text{C}(\text{Cl})-\text{CH}=\text{CH}_2$



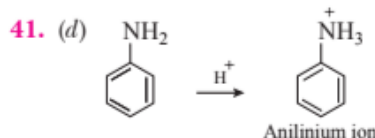
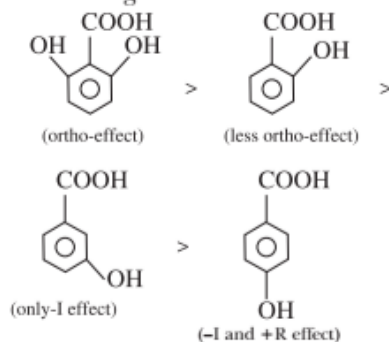
37. (d) Aspirin is used to reduce fever and relieve mild to moderate pain from conditions such as muscle aches, toothaches, common cold, and headaches. It may also be used to reduce pain and swelling in conditions such as arthritis. Aspirin is known as acetyl salicylic acid (ASA) and a nonsteroidal anti-inflammatory drug (NSAID).

Now-a-days, it is used to prevent heart-attacks because of its anti-blood clotting action.



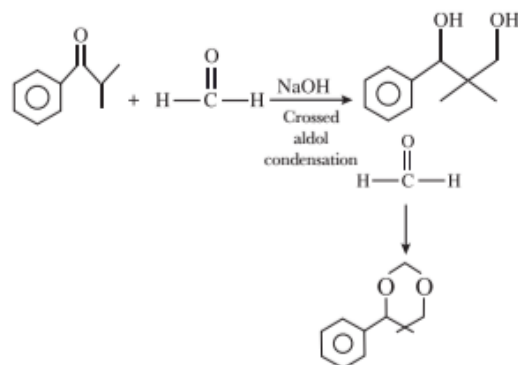
39. (d) In phenol, conjugation of unshared electron pair over oxygen with aromatic ring results in partial double bond character in carbon-oxygen bond. Moreover, oxygen is attached to a sp^2 hybridized carbon atom in phenol while in methanol it is attached to the sp^3 hybridized carbon atom.

40. (a) Due to ortho effect, the O-substituted benzoic acid is stronger. Thus the acid strength of



In acidic medium, aniline is protonated to form anilinium ion which is a *m*-directing group.

43. (a)



44. (c) Aromatic alcohols are compounds in which $-\text{OH}$ group is not directly attached with benzene ring directly.

47. (b) Detergent is used for both surface activity and cleansing action. Detergents are made of Alkylbenzene sulphonates, which helps in cleansing action in hard water.

48. (b) Statement P is false, but statement Q is true. The correct form of statement P is "Addition reaction of water to but-1-ene in acidic medium yields butan-2-ol."

49. (a) Because of their ability to intermolecular H-bonding, carboxylic acid exists as dimer. Hence it shows higher b.p than aldehydes, ketones and alcohols of comparable molecular mass.

50. (a) Vitamin E or tocopherol is a type of antioxidant. Deficiency of vitamin E may damage the reproductive organs like damages in the spermatogenesis, testicular dysfunction and shrinkage of seminiferous tubules.

