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KCET-2017-2nd May
Questions – Chemistry

1. If 3.01×10^{20} molecules are removed from 98 mg of H_2SO_4, then number of moles of H_2SO_4 left are

   (A) 0.1×10^{-3} mol

   (B) 0.5×10^{-3} mol

   (C) 1.66×10^{-3} mol

   (D) 9.95×10^{-2} mol

2. The correct set of quantum number for the unpaired electrons of chlorine atom is

   (A) $2,0,0,+\frac{1}{2}$

   (B) $2,1,-1,+\frac{1}{2}$

   (C) $3,1,1,\pm\frac{1}{2}$

(D) $3, 0, 0, \pm\frac{1}{2}$

3. The electronegativities of C, N, Si and P are in the order of

(A) $P < Si < C < N$

(B) $Si < P < N < C$

(C) $Si < P < C < N$

(D) $P < Si < N < C$

4. Which of the following structure of a molecule is expected to have three bond pairs and one lone pair of electrons ?

(A) Tetrahedral

(B) Trigonal Planar

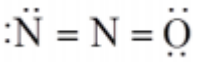
(C) Pyramidal

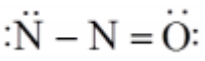
(D) Octahedral

5. Which of the following is the correct electron dot structure of N_2O molecule?

(A) $:N = N = \ddot{O}:$

(B) $:N \equiv \overset{+}{N} - \ddot{\underset{\cdot\cdot}{O}}:^{-}$

(C) 

(D) 

6. The pressure of real gases is less than that of ideal gas because of

(A) Intermolecular attraction

(B) Finite size of particles

(C) Increase in the number of collisions

(D) Increase in the kinetic energy of the molecules

7. A reaction has both ΔH and $\Delta S - ve$. The rate of reaction

(A) increases with increase in temperature

(B) increases with decrease in temperature

(C) remains unaffected by change in temperature

(D) cannot be predicted for change in temperature

8. The equilibrium constant for the reaction

$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ is 4×10^{-4} at 2000 K. In presence of a catalyst the equilibrium is attained ten times faster. Therefore the equilibrium constant in presence of catalyst of 2000 K is

(A) 40×10^{-4}

(B) 4×10^{-2}

(C) 4×10^{-3}

(D) 4×10^{-4}

9. The reaction quotient 'Q_c' is useful in predicting the direction of the reaction. Which of the following is incorrect ?

(A) If $Q_c > K_c$, the reverse reaction is favoured

(B) If $Q_c < K_c$, the forward reaction is favoured

(C) If $Q_c = K_c$, no reaction occur

(D) If $Q_c > K_c$, the forward reaction is favoured

10. $3ClO^-_{(aq)} \rightarrow ClO^- + 2Cl^-$ is an example of

(A) Oxidation reaction

(B) Reduction reaction

(C) Disproportionation reaction

(D) Decomposition reaction

11. In the manufacture of hydrogen from water gas $(CO + H_2)$, which of the following is correct statement ?

(A) CO is oxidized to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali.

(B) CO and H_2 are separated based on difference in their densities.

(C) Hydrogen is isolated by diffusion.

(D) H_2 is removed by occlusion with pd.

12. Plaster of Paris is represented as

(A) $CaSO_4 \cdot \frac{1}{2} H_2O$

(B) $CaSO_4 \cdot H_2O$

(C) $CaSO_4 \cdot 2H_2O$

(D) $CaSO_4$

13. Addition of mineral acid to an aqueous solution of Borax, the following compound is formed

(A) Boron hydride

(B) Orthoboric acid

(C) Meta boric acid

(D) Pyroboric acid

14. Identify the correct statement in the following:

(A) n-butane and isobutane are functional isomers

(B) Dimethyl ether and ethanol are chain isomers

(C) Propan-1-ol and propan-2-ol are position isomers

(D) Ethanoic acid and methyl methanoate are position isomers

15. In which of the following, homolytic bond fission takes place ?

(A) Alkaline hydrolysis of ethyl chloride

(B) Addition of HBr to double bond

(C) Free radical chlorination of methane

(D) Nitration of Benzene

16. For the preparation of Alkanes, aqueous solution of sodium or potassium salt of carboxylic acid is subjected to

(A) Hydrolysis

(B) Oxidation

(C) Hydrogenation

(D) Electrolysis

17. Which one of the following is not a common component of photo-chemical smog?

(A) Ozone

(B) Acrolein

(C) Peroxy acetyl nitrate

(D) Chloro flouro carbons

18. Which of the following crystal has unit cell such that $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90^{\circ}$?

(A) $K_2Cr_2O_7$

(B) $NaNO_3$

(C) KNO_3

(D) K_2SO_4

19. The correct statement regarding defect in solids is

(A) Frenkel defect is usually favoured by a very small difference in the sizes of cations and anions.

(B) Frenkel defect is a dislocation defect.

(C) Trapping of proton in the lattice leads to the formation of F-centers.

(D) Schottky defect has no effect on the physical properties of solids.

20. In a face centred cubic arrangement of A and B atoms in which 'A' atoms are at the corners of the unit cell and 'B' atoms are at the face centers. One of the 'A' atom is missing from one corner in unit cell. The simplest formula of compound is

(A) A_7B_{24}

(B) A_7B_8

(C) AB_3

(D) A_7B_3

21. Which of the following aqueous solution has highest freezing point ?

(A) 0.1 molal $Al_2(SO_4)_3$

(B) 0.1 molal $BaCl_2$

(C) 0.1 molal $AlCl_3$

(D) 0.1 molal NH_4Cl

22. The Vant Hoff's factor 'i' accounts for

(A) extent of solubility of solute

(B) extent of dissociation of solute

(C) extent of dissolution of solute

(D) extent of mobility of solute

23. When the pure solvent diffuses out of the solution through the semi-permeable membrane then the process is called

(A) Osmosis

(B) Reverse osmosis

(C) Sorption

(D) Dialysis

24. The standard reduction potential at 298 K for the following half cell reaction

$Zn^{2+}_{(aq)} + 2e \rightarrow Zn_{(s)}$ $E^o = -0.762$ V

$Cr^{3+}_{(aq)} + 3e \rightarrow Cr_{(s)}$ $E^o = 0.740$ V

$2H^{+}_{(aq)} + 2e \rightarrow H_{2(g)}$ $E^o = 0.0$ V

$F_{2(g)} + 2e \rightarrow 2F^{-}_{(aq)}$ $E^o = 2.87$ V

Which of the following is strongest reducing agent ?

(A) $Zn_{(s)}$

(B) $Cr_{(s)}$

(C) $H_{2(g)}$

(D) $F_{2(g)}$

25. By passing electric current, $NaClO_3$ is converted into $NaClO_4$ according to the following equation

$NaClO_3 + H_2O \rightarrow NaClO_4 + H_2$

How many moles of $NaClO_4$ will be formed when three Faradays of charge is passed through $NaClO_3$?

(A) 0.75

(B) 1.0

(C) 1.5

(D) 3.0

26. In the electrolysis of aqueous sodium chloride solution, which of the half cell reaction will occur at anode ?

(A) $Na^{+}_{(aq)} + e^{-} \rightarrow Na_{(s)}$
$E^{o} = -2.71$ volts

(B) $2H_2O_{(l)} \rightarrow O_2 + 4H^{+} + 4e^{-}$
$E^{o}_{cell} = 1.23$ volts

(C) $H^{+}_{(aq)} + e^{-} \rightarrow \frac{1}{2}H_2$
$E^{o}_{cell} = 0.00$ volts

(D) $Cl^{-}_{(aq)} \rightarrow \frac{1}{2}Cl_2 + e^{-}$
$E^{o}_{cell} = 1.36$ volts

27. Which of the following statement is in accordance with the Arrhenius equation?

(A) Rate of a reaction increases with increase in temperature

(B) Rate of a reaction increases with decrease in activation energy

(C) Rate constant decreases exponentially with increase in temperature

(D) Rate of reaction does not change with increase in activation energy

28. Which of the following statement is incorrect?

(A) The rate law for any reaction cannot be determined experimentally

(B) Complex reactions have fractional order.

(C) Biomolecular reactions involve simultaneous collision between two species

(D) Molecularity is only applicable for elementary reaction.

29. For a reaction $\frac{1}{2}A \rightarrow 2B$ rate of disappearance of A is related to rate of appearance of B by the expression

(A) $\frac{-d[A]}{dt} = 4\frac{d[B]}{dt}$

(B) $\frac{-d[A]}{dt} = \frac{1}{4}\frac{d[B]}{dt}$

(C) $\frac{-d[A]}{dt} = \frac{1}{2}\frac{d[B]}{dt}$

(D) $\frac{-d[A]}{dt} = \frac{d[B]}{dt}$

30. The process which is responsible for the formation of delta at a place where rivers meets the sea is

(A) Coagulation

(B) Colloid formation

(C) Emulsification

(D) Peptization

31. Hydrogenation of vegetable oils in presence of finely divided Nickel as catalyst. The reaction is

(A) Heterogeneous catalysis

(B) Homogeneous catalysis

(C) Enzyme catalysed reaction

(D) Liquid catalysed reaction

32. Which of the following is not a favourable condition for physical adsorption?

(A) High temperature

(B) High pressure

(C) Higher critical temperature of adsorbate

(D) Low temperature

33. The metal extracted by leaching with a cyanide is

(A) Al

(B) Ag

(C) Cu

(D) Na

34. Extraction of chlorine from brine solution is based on

(1) Oxidation

(2) Chlorination

(3) Reduction

(4) Acidification

35. Which of the following element forms $p_\pi - p_\pi$ bond with itself ?

(1) N

(2) P

(3) Se

(4) Te

36. Which one of the following metallic oxide exhibit amphoteric nature ?

(A) CaO

(B) Na_2O

(C) BaO

(D) Al_2O_3

37. Select wrong chemical reaction among the following:

(A) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$

(B) $8NH_3 + 3Cl_2 \rightarrow 6NH_4Cl + N_2$

(C) $2NaOH + Cl_2 \rightarrow 2NaCl + H_2 + O_2$

(D) $2Ca(OH)_2 + 2Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + 2H_2O$

38. Which one of the following noble gas has an unusual property of diffusing through the materials such as rubber, glass or plastic ?

(1) Ne

(2) Ar

(3) Kr

(4) He

39. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition elements which shows highest magnetic moment ?

(A) $3d^7$

(B) $3d^5$

(C) $3d^8$

(D) $3d^2$

40. Which of the following statement is wrong regarding Lanthanoids?

(A) Ln(III) compounds are generally colourless.

(B) Ln(III) compounds are predominantly ionic in character.

(C) The ionic size of Ln(III) ions decreases with increasing atomic number.

(D) Ln(III) hydroxides are mainly basic in nature.

41. Square planar complex of the type M_{AXBL} (where A, B, X and L are unidentate ligands) shows following set of isomers

(A) Two cis and one trans

(B) Two trans and one cis

(C) Two cis and two trans

(D) Three cis and one trans

42. According to crystal field theory, the M−L bond in a complex is

(A) purely ionic

(B) purely covalent

(C) purely co-ordinate

(D) partially covalent

43. The co-ordination number and the oxidation state of the element 'M' in the complex $\left[M(en)_2(C_2O_4) \right] NO_2$ {where (en) is ethane-1,2-diamine} are respectively.

(A) 6 and 3

(B) 6 and 2

(C) 4 and 2

(D) 4 and 3

44. Toluene reacts with halogen in presence of Iron (III) chloride giving ortho and para halo compounds. The reaction is

(A) Electrophilic elimination reaction

(B) Electrophilic substitution reaction

(C) Free radical addition reaction

(D) Nucleophilic substitution reaction

45. In the following sequence of reactions

$$CH_3Br \xrightarrow{KCN} A \xrightarrow{H_3O^+} B \xrightarrow{LiAlH_4} C$$

The end product C is

(A) Acetone

(B) Methane

(C) Acetaldehyde

(D) Ethyl Alcohol

46. Which of the following order is true regarding the acidic nature of phenol ?

(A) Phenol > O-cresol > O-nitrophenol

(B) O-cresol < phenol < O-nitrophenol

(C) phenol < O-cresol > O-nitrophenol

(D) phenol < O-cresol < O-nitrophenol

47. Which of the following reagent cannot be used to oxidize primary alcohols to aldehydes ?

(A) CrO_3 in anhydrous medium

(B) $KMnO_4$ in acidic medium

(C) Pyridinium chloro chromate

(D) Heating in presence of Cu at 573 K

48. Cannizzaro's reaction is an example of auto oxidation

(A) It is a typical reaction of aliphatic aldehyde.

(B) It is a reaction answered only by aromatic aldehydes.

(C) It is a reaction answered by all aldehydes.

(D) It is a reaction answered by only aldehydes containing $\alpha-$ hydrogen

49. Lower members of aliphatic carboxylic acid are soluble in water. This is due to

(A) Formation of hydrogen bonds with water.

(B) Van der-Waals interaction with water molecules.

(C) Water is non-electroyte

(D) Due to London forces

50. The correct order of increasing basic nature for the bases, NH_3, CH_3NH_2 and $(CH_3)_2 NH$ in aqueous solutions

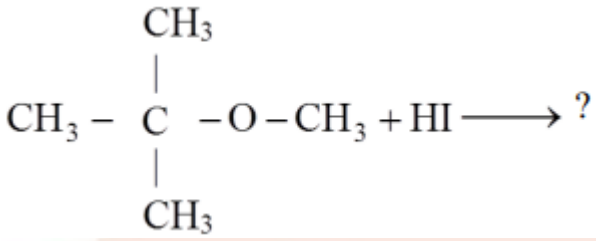
(A) $CH_3NH_2 < NH_3 < (CH_3)_2 NH$

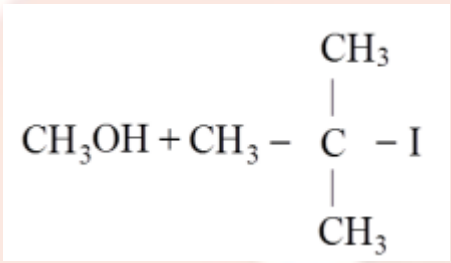
(B) $(CH_3)_2 NH < NH_3 < CH_3NH_2$

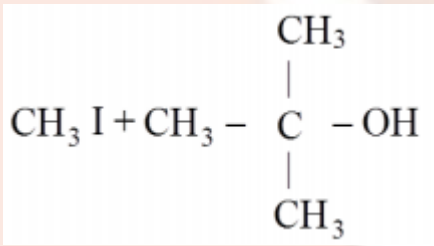
(C) $NH_3 < CH_3NH_2 < (CH_3)_2 NH$

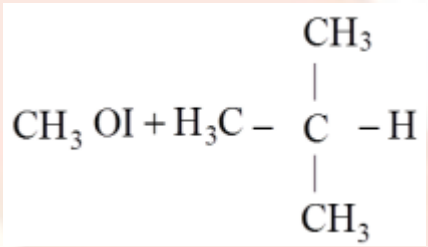
(D) $CH_3NH_2 < (CH_3)_2 NH < NH_3$

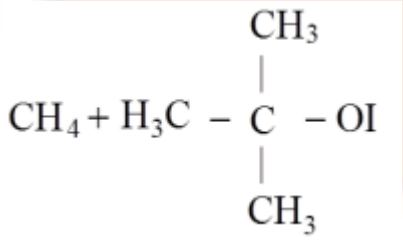
51. The product formed during the following reaction are



(A) 

(B) 

(C) 

(D) 

52. Reduction of ketones cannot be carried out with which of the following reagents?

(A) Sodium borohydride or Lithium Aluminium hydride

(B) Zinc amalgam and concentrated HCl

(C) Hydrazine and KOH in ethylene glycol

(D) Hydrogen in presence of palladium in Barium sulphate and quinoline

53. Gabriel phthalimide synthesis is used in the preparation of primary amine from phthalimide, which of the following reagent is not used during the process?

(A) KOH

(B) NaOH

(C) HCl

(D) Alkyl Halides

54. The Glycosidic linkage present in sucrose is between

(A) $C-1$ of α- glucose and $C-2$ of β- fructose.

(B) $C-1$ of α- glucose and $C-4$ of α- glucose.

(C) $C-1$ of β- galactose and $C-4$ of α- glucose.

(D) $C-1$ of α- glucose and $C-4$ of β- fructose.

55. Hormones are secreted by ductless glands of human body. Iodine containing hormone is

(A) Insulin

(B) Thyroxine

(C) Testosterone

(D) Adrenoline

56. Pick the wrong statement from the following :

(A) Sources of Vitamin B_1 are yeast, milk, green vegetables and cereals

(B) Deficiency of Vitamin B_6 (pyridoxime) results in convulsions

(C) Consumption of citrus fruits and green leafy vegetables in food prevents scurvy

(D) Deficiency of vitamin D causes xerophthalmia

57. The monomer used in Novolac, a polymer used in paints

(A) Phenol and Formaldehyde

(B) Melamine and Formaldehyde

(C) Butadiene and Styrene

(D) Butadiene and Acrylo Nitrile

58. Which of the following is not a biodegradable polymer?

(A) Polyhydroxy butyrate $-CO-\beta$ hydroxy valerate

(B) pHBV

(C) Nylon 2-Nylon-6

(D) Glyptol

59. Bactericidal antibiotics among the following is

(A) Ofloxacin

(B) Erythromycin

(C) Tetracycline

(D) Chloramphenicol

60. Pick the correct statement among the following :

(A) Cetyl trimethyl ammonium bromide is a popular cationic detergent used in air conditioner

(B) Non-ionic detergents is formed when polyethylene glycol reacts with adipic acid

(C) Sodium dodecyl benzene sulphonate used in tooth paste is a cationic detergent.

(D) Sodium lauryl sulphate forms an insoluble scum with hard water.

KCET-2017-2nd May
Answer keys

1	B	16	D	31	A	46	B
2	C	17	D	32	A	47	B
3	C	18	A	33	B	48	B
4	C	19	B	34	A	49	A
5	B	20	A	35	A	50	C
6	A	21	D	36	D	51	A
7	B	22	B	37	C	52	D
8	D	23	B	38	D	53	C
9	C and D	24	A	39	B	54	D
10	B	25	C	40	A	55	B
11	A	26	D	41	A	56	D
12	A	27	A and B	42	A	57	A
13	B	28	A	43	A	58	D
14	C	29	B	44	B	59	A
15	C	30	A	45	D	60	A

KCET-2017-2nd May
Solutions – Chemistry

1. For 98 mg of H_2SO_4 , the molecules will be equal to

6.02×10^{20}

H_2SO_4 left $= 6.02\times10^{20} - 3.01\times10^{20}$

$= 3.01\times10^{20}$

Number of moles of H_2SO_4 left $= \frac{N}{N_A}$

$= \frac{3.01\times10^{20}}{6.02\times10^{23}}$

$= 0.5\times10^{-3}$ mol

2. Electronic conguration of $Cl = 1s^2 2s^2 2p^6 3s^2 3p^5$.

The fifth electron in 3p subshell has following quantum numbers:

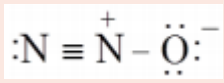
$n = 3, l = 1, m = 1, s = +\frac{1}{2}$

3. As we move across a period, the electronegativity increases and down a group, the electronegativity decreases

Therefore, the correct order of is:

$Si < P < C < N$

4. There are total three bond pairs and one lone pair. Therefore, total number of electron pairs is four which shows sp^3 hybridization. Due to the presence of one lone pair, the molecular geometry will be pyramidal.

5. The correct electron dot structure of N_2O molecule is  . The electronegativity of nitrogen (3.04) is less than oxygen atom (3.44). Therefore, it carries a positive charge.

6. The pressure of real gases is less than that of ideal gas. This is due to fact that intermolecular attraction between the particles of real gases is much less. They do no collide with each other at an impact. Therefore, the energy is very less.

7. The expression of ΔH and ΔS is shown below.

$\Delta G = \Delta H - T\Delta S$

It is given that the value of ΔH and ΔS is negative.

Therefore, the expression will become as:

$\Delta G = -\Delta H + T\Delta S$

$-\Delta G = \Delta H - T\Delta S$

The above expression shows that, for negative ΔG, the value of ΔS must be less than ΔH

$\Delta H > T\Delta S$

Therefore, the reaction proceeds favorably and is exothermic. Thus, it increases with the decrease in temperature.

8. The equilibrium constant does not change as the reaction achieves equilibrium 10 times faster. So, the value of constant is same, that is, 4×10^{-4}.

9. If the value of reaction quotient is greater than equilibrium constant $\left(Q_c > K_c\right)$, the reaction continues in the reverse direction.

If the value of reaction quotient is equal to equilibrium constant $\left(Q_c = K_c\right)$, the reaction achieves the state of equilibrium.

10. $3ClO^-_{(aq)} \rightarrow ClO^- + 2Cl^-$

In the above reaction, the oxidation state of chlorine changes from $(+1)$ to (-1).Therefore, the reaction is an example of reduction reaction.

11. Manufacture of hydrogen from water gas involves the following reactions:

$$CO(g) + H_2O(g) \xrightarrow{670\ K} CO_2(g) + H_2(g)$$

In the above reaction, CO is oxidized to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali.

12. The plaster of Paris is represented by the molecular formula of $CaSO_4 \cdot \frac{1}{2}H_2O$. The partially hydrated plaster of Paris is used in the art gypsum.

13. The addition reaction of mineral acid to an aqueous solution of Borax is shown below.

$$Na_2B_4O_7 + H_2SO_4 + 5H_2O \rightarrow Na_2SO_4 + 4H_3BO_3$$
$$(\text{Borax}) \quad (\text{Acid}) \qquad\qquad (\text{Orthoboric acid})$$

14. The position isomers are those isomers which have dissimilar location of functional groups but have similar carbon chain and identical functional groups. Propan-1-ol and propan-2-ol are position isomers.

15. The homolytic bond cleavage occurs where electrons in the bonding pair moves independently.

Free radical chlorination of methane shows homolytic bond cleavage as shown below.

$$Cl_2 \xrightarrow{\text{Light}} 2Cl^{\cdot}$$

$$Cl + CH_4 \rightarrow HCl + \dot{C}H_3$$

$$Cl_2 + CH_3 \rightarrow CH_3Cl + \dot{C}l$$

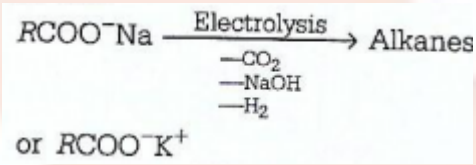
At termination, the reactions are,

$$2Cl^{\cdot} \rightarrow Cl_2$$

$$Cl^{\cdot} + \dot{C}H_3 \rightarrow CH_3Cl$$

$$2.CH_3 \rightarrow CH_3CH_3$$

16. The aqueous solution of sodium and potassium salts of carboxylic acid undergoes hydrolysis for the preparation of alkanes. The electrolysis of salts creates a new C-C bond. The reaction is shown below.



17. The photo-chemical smog includes harmful pollutants such as ozone, nitrogen, oxygen, peroxy acetyl nitrate (PAN),

acrolein and some organic compounds as well. It does not include chloro fluoro carbons.

18. The crystal of potassium dichromate $\left(K_2Cr_2O_7\right)$ consists a unit cell in which $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90^{\circ}$.

19. Frenkel defect is termed as dislocation defect as well. In Frenkel defect, the smallest ion gets dislocated to its interstitial site.

20. The simplest formula can be calculated as:

$$\text{Atoms of A}\left(\text{one atom is missing}\right) = 7 \times \frac{1}{8}$$

$$= \frac{7}{8}$$

$$\text{Atoms of B} = 6 \times \frac{1}{2}$$

$$= 3$$

Therefore, the formula becomes

$$A : B = \frac{7}{8} : 3 = A_7B_{24}$$

21. Least the number of particles available in the solution, highest will be its freezing point.

In aqueous solution, NH_4Cl dissociates as shown below.

$$NH_4Cl \rightarrow NH_4^+ + Cl^-$$

For the above reaction, the value of 'i' is equal to 2 which is the least number of particles. Therefore, it has highest freezing point.

22. The value of Van't Hoff factor indicates the association or dissociation of solute particles in aqueous solution.

23. The movement of solvent particles is prevented by applying the maximum pressure to a solution via a semipermeable membrane. This phenomenon is termed as reverse osmosis.

24. The strong reducing agents are those elements whose value of standard reduction potential is highly negative. The high

negative value of reduction potential indicates the high reducing ability of the element.

Therefore, zinc is strongest reducing agent as its value of reducing potential is highly negative $\left(-0.762\ \text{V}\right)$.

25. $NaClO_3 + H_2O \rightarrow NaClO_4 + H_2$

In the above reaction, the oxidation state of chlorine changes from $\left(+5\right)$ to $\left(+7\right)$.

The formation of 2 moles of electrons needs 2F of charge.

Therefore 3F of charge produce:

$$\text{Moles} = \frac{3}{2}$$
$$= 1.5 \text{ moles of } NaClO_4$$

26. The half-cell reduction reaction at cathode is shown below.

$$H_2O_{(l)} + e^- \rightarrow \frac{1}{2}H_2 + OH^-$$

The standard reduction potential for the above reaction is 0 volts

The half-cell oxidation reaction at anode is shown below.

$$Cl^-_{(aq)} \rightarrow \frac{1}{2}Cl_2 + e^-$$

The standard reduction potential for the above reaction is 1.36 volts

27. The rate of a reaction depends upon activation energy and temperature.

$$k = Ae^{\frac{-E_a}{RT}}$$

From the above expression, it is clear that the rate of reaction will increase as the activation energy decreases and temperature increases.

28. The rate law explains the relationship between the rate constant and the concentration of the reacting species present in the reaction. The rate law is used to determine the speed of a particular reaction. It can be determined experimentally.

29. The given reaction is shown below.

$$\frac{1}{2}A \rightarrow 2B$$

Since the rate of reaction is equal to:

$$\text{Rate of disappearance of products} = \text{Rate of formation of products}$$

Therefore, the rate expression for the above reaction is as follows:

$$\text{Rate} = -\frac{1}{2}\frac{d[A]}{dt} = 2\frac{d[B]}{dt}$$

Therefore, the rate of disappearance of A can be calculated as:

$$\frac{-d[A]}{dt} = \frac{1}{4}\frac{d[B]}{dt}$$

30. When river meets the sea, the suspended colloidal particles are coagulated by the electrolytes available in sea. As a result, these colloidal particles settle down during the time of meet.

31. The reaction of hydrogenation is shown below.

$$\text{Oil}(l) + H_2(g) \xrightarrow[\Delta]{Ni(s)} \text{Vegetable ghee}(s)$$

In the above reaction, the phases of reactants and catalyst are different. Therefore, the reaction is heterogeneous catalysis.

32. The process of physisorption increases when the temperature of a reaction falls. Therefore, physical adsorption occurs at low temperature instead of high temperature.

33. The process of leaching is used for the synthesis of a complex ion. On further reaction of soluble complex with zinc, silver is formed.

$$Ag_2S + 2NaCN \rightarrow Na\left[Ag(CN)_2\right]Zn$$

$$2Na\left[Ag(CN)_2\right] + Zn_{(s)} \rightarrow 2Ag\downarrow + Na_2\left[Zn(CN)_4\right]$$

34. The extraction reaction of chlorine from brine solution is as follows:

$$2H_2O(l) + 2Cl^-(aq) \rightarrow H_2(aq) + Cl_2(g) + 2OH^-(aq)$$

In the above reaction, the oxidation of chlorine changes from (-1) to (0). Therefore, the above reaction is based on the oxidation reaction of chloride ion.

35. Nitrogen is able to $p_\pi - p_\pi$ bond with itself. The size of p-orbital of nitrogen atom is very small, hence, it can accommodate other atoms of itself and able to form $p_\pi - p_\pi$ bonds as well. The elements which have larger size of p-orbitals are not able to form $p_\pi - p_\pi$ bonds.

36. Whenever a metal oxide acts both as an acid and a base, then the oxide is said to be of amphoteric nature.
In a periodic table, on moving down the group, the acidic character of element decreases and basic character increases. Therefore, Al_2O_3 is amphoteric in nature.

37. The wrong chemical reaction is shown below.
$2NaOH + Cl_2 \rightarrow 2NaCl + H_2 + O_2$

The correct chemical equation for the above reaction is as follows:

$$2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$$

38. Helium is a volatile noble gas. It shows the properties of inertness, high conductivity, low boiling point and low density. It has the tendency to diffuse through the solids such as rubber, glass, plastic etc. at a very fast rate.

39. The magnetic character of transition metals depends upon the number of unpaired elections.

$3d^5$ has five number of unpaired electrons. Therefore, its magnetic moment is highest.

40. The properties of Ln(III) compounds are given as follows:

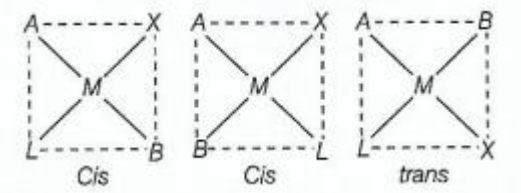
(1) They are generally colourful.

(2) They are ionic in nature due to the large size of Ln(III) ions.

(3) As the atomic number increases, the radii of Ln(III) ions decreases.

(4) The basic nature is exhibited by Ln(III) hydroxides.

41. Two cis and one trans isomers are exhibited by M_{ABL} square planar complex as shown below:



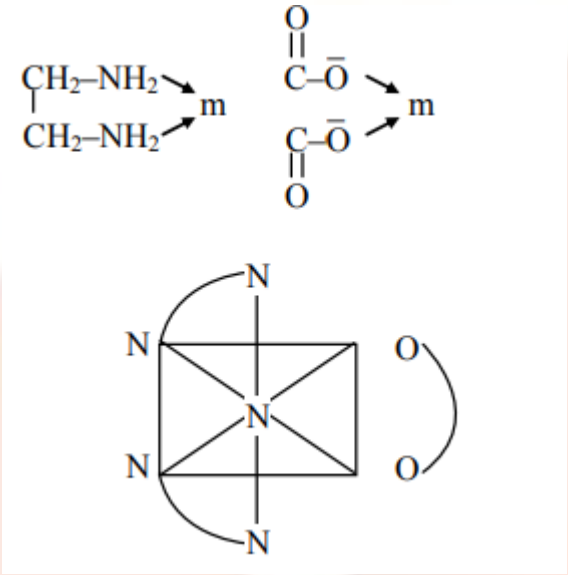
42. In M − L bond, M is the central metal ion and L is the ligands to which central metal is attached.
According to crystal field theory, the M − L bond in a complex is purely ionic in nature. This nature of bond arises from the electrostatic interaction among metal ions and ligands.

43. The oxidation state of M in complex ion $\left[M(en)_2(C_2O_4)\right]NO_2$ is calculated as:

$$x + 0 + 2 \times (-2) = 0 - 1$$

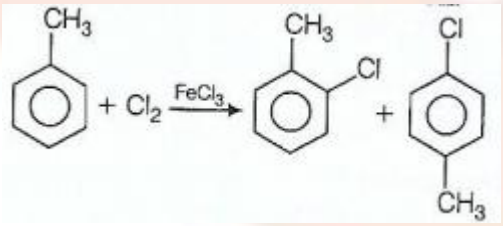
$$x = 3$$

In the complex ion, two *en* and one $C_2O_4^{2-}$ act as bidentate ligands.



The total coordination number is 6.

44. Toluene undergoes electrophilic substitution reaction when it reacts with halogen in presence of $FeCl_3$ and form ortho and para halo compounds. The reaction is shown below:



45. In first step, when CH_3Br reacts with KCN, Br is replaced by CN and forms CH_3CN.

In second step, CH_3CN undergoes hydrolysis reaction to form acetic acid.

In third step, acetic acid reduces to ethyl alcohol in the presence of catalyst.

$$CH_3Br \xrightarrow{KCN} CH_3CN(A) \xrightarrow{H_3O^+} CH_3COOH(B) \xrightarrow{LiAlH_4} CH_3CH_2OH(C)$$

46. The acidic nature of phenol depends upon electron withdrawing groups (EWG) such as NO_2 and electron donating groups (EDG) such as CH_3.

EDG groups decreases the acidic character and EWG groups increases the acidic character.

Therefore, the correct order is:

O-cresol < phenol < O-nitrophenol

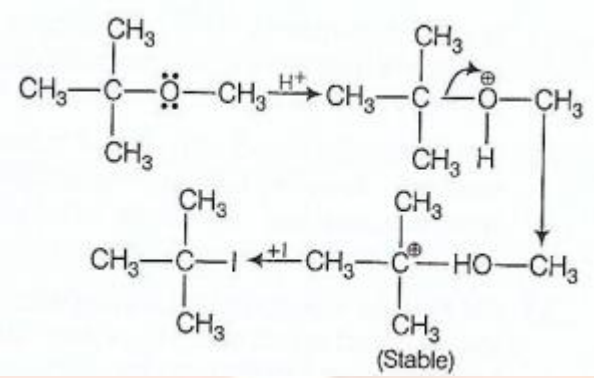
47. $KMnO_4$ in acidic medium is used in the direct oxidation of primary alcohols to carboxylic acids. They are not used for the oxidation of primary alcohols to aldehdyes.

48. Cannizzaro's reaction is an example of auto-oxidation which is answered only by aromatic aldehydes.

49. Lower members of aliphatic carboxylic acids are able to form hydrogen bonds with water. They are highly soluble in water due to H-bond.

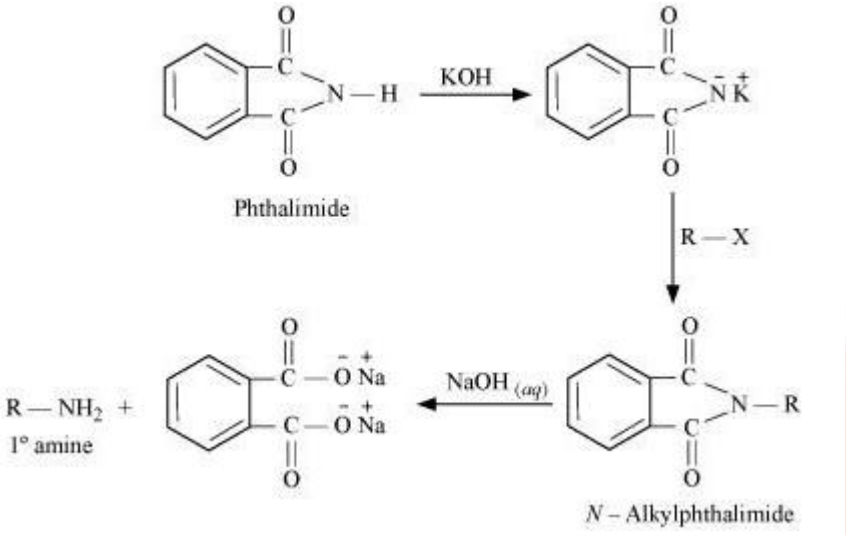
50. The properties such as steric hindrance, inductive effect and solvation play an important role in deciding the basic strength of alkyl amine in the aqueous phase.
Therefore, the correct order is:
$NH_3 < CH_3NH_2 < (CH_3)_2 NH$

51. The given reaction is an example of Williamson ether synthesis reaction which is used for the preparation of alkyl halide. The reaction is as follows:



52. The reduction of ketones cannot be carried out by H_2/Pd in the presence of barium sulphate and quinoline as these reagents are used to reduce acyl chloride to an aldehyde.

53. In Gabriel phthalimide synthesis, alkyl halides react with a base such as KOH or NaOH to form a primary amine. HCl is used in this synthesis of primary amine by this process.

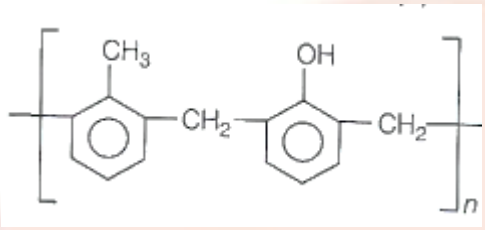


54. In the structure of sucrose, the glycosidic linkage is available between first carbon of α-glucose and fourth carbon of β-fructose. The structure is shown below.

55. Thyroxine is a human body horomone which contains iodine.

56. Deficiency of vitamin D is related with rickets. Xerophthalmia is caused by the scarcity of vitamin A in the human body which makes an eye fails to form tear.

57. Novolac is formed by the monomer of phenol and formaldehyde. It is phenol formaldehyde resin as shown below.



58. Glyptol is a non-biodegradable polymer. It does not degrade easily.

59. Ofloxacin is a bactericidal antibiotic as it prevents the growth of bacteria by killing them.

60. Due to its germicidal properties, Cetyl trimethyl ammonium bromide is used in air conditioner.
Thus, statement (A) is correct.