KCET-2017 (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. $2, 0, 0, + \dfrac{1}{2}$
   b. $2, 1, -1, + \dfrac{1}{2}$
   c. $3, 1, 1, \pm \dfrac{1}{2}$
   d. $3, 0, 0, \pm \dfrac{1}{2}$

3. The electro negativities 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. $:N = N = \overset{..}{\underset{..}{O}}:$
   b. $:N = \overset{+}{N} - \overset{..}{\underset{..}{O}}:^{-}$
   c. $:\overset{..}{\underset{..}{N}} = N = \overset{..}{\underset{..}{O}}$
   d. $:\overset{..}{\underset{..}{N}} - N = \overset{..}{\underset{..}{O}}:$

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 ΔS –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

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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 $Q_c > K_c$, forward reaction is favoured

10. $3ClO^-_{(aq)} \longrightarrow ClO^- + 2Cl^-$ 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. $CaSO_4 \cdot \dfrac{1}{2} H_2O$
    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-l-ol and propan-2-ol are position isomers
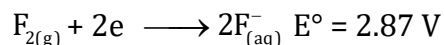   d. Ethanoic acid and methyl methanoate are position isomers
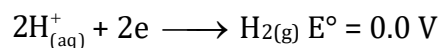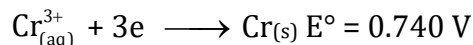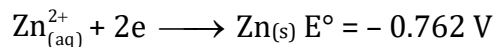
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15. In which of the following, haemolytic bond fission takes place?
    a. Alkaline hydrolysis of ethyl chloride
    b. Addition of HBr to double bond
    c. Free radical chlorination of methane
    d. Nitration of Benzene

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. Chloroflouro carbons

18. Which of the following crystal has unit cell such that $a \neq b \neq c$ and $\alpha \neq \beta \neq 90°$?
    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

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

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

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

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

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

$$NaClO_3 + H_2O \longrightarrow NaClO_4 + H_2$$

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. $Na^+_{(aq)} + e^- \longrightarrow Na_{(s)} \ E^0 = -2.71$ volts

b. $2H_2O_{(l)} \longrightarrow O_2 + 4H^+ + 4e^- \ E^0_{cell} = 1.23$ volts

c. $H^+_{(aq)} + e^- \longrightarrow \dfrac{1}{2}H_2 \ E^0_{cell} = 0.00$ volts

d. $Cl^-_{(aq)} \longrightarrow \dfrac{1}{2}Cl_2 + e^- \ E^0_{cell} = 1.36$ 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.

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

    a. $\dfrac{-d[A]}{dt} = 4\dfrac{d[B]}{dt}$

    b. $\dfrac{-d[A]}{dt} = \dfrac{1}{4}\dfrac{d[B]}{dt}$

    c. $\dfrac{-d[A]}{dt} = \dfrac{1}{2}\dfrac{d[B]}{dt}$

    d. $\dfrac{-d[A]}{dt} = \dfrac{d[B]}{dt}$

30. The process which is responsible for the formation of delta at a place where rivers meet 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
    a. Al
    b. Ag
    c. Cu
    d. Na

34. Extraction of chlorine from brine solution is based on
    a. Oxidation
    b. Chlorination
    c. Reduction
    d. Acidification

35. Which of the following element forms $p_\pi - p_\pi$ bond with itself?
    a. N
    b. P
    c. Se
    d. Te

36. Which one of the following metallic oxide exhibit amphoteric nature?
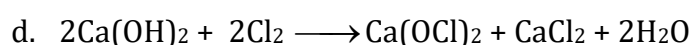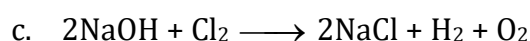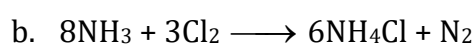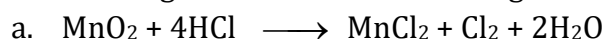   a. CaO
    b. Na_2O
    c. BaO
    d. Al_2O_3

37. Select wrong chemical reaction among the following :
    a. $MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$
    b. $8NH_3 + 3Cl_2 \longrightarrow 6NH_4Cl + N_2$
    c. $2NaOH + Cl_2 \longrightarrow 2NaCl + H_2 + O_2$
    d. $2Ca(OH)_2 + 2Cl_2 \longrightarrow Ca(OCl)_2 + CaCl_2 + 2H_2O$

38. Which one of the following noble gas has an unusual property of diffusing through the materials such as rubber, glass or plastic?
    a. Ne
    b. Ar
    c. Kr
    d. 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 $[M(en)_2 (C_2O_4)] NO_2$ {where (en) is ethan-1, 2 – diamine} are respectively
    a. 6 and 3
    b. 6and 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

    $CH_3Br \xrightarrow{KCN} A \xrightarrow{H_3O^+} B \xrightarrow{LiA/H_4} C$

    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
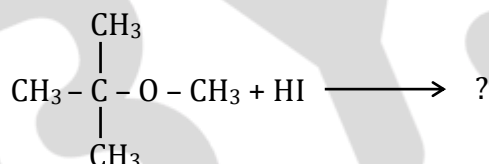   d. Phenol < O-cresol > O-nitrophenol

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 α-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 electrolyte
    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. $(CH_3)_2NH < NH_3 < CH_3NH_2$
    c. $NH_3 < CH_3NH_2 < (CH_3)_2NH$
    d. $CH_3NH_2 < (CH_3)_2 NH < NH_3$

51. The product formed during the following reaction are

$$CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - O - CH_3 + HI \longrightarrow \quad ?$$

    a. $CH_3OH + CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - I$

    b. $CH_3 I + CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - OH$

    c. $CH_3 OI + H_3C - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - H$

    d. $CH_4 + H_3C - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - OI$

52. Reduction of ketones cannot be carried out with which of the following reagents?
    a. Sodium borohydride or Lithium Aluminum 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. Adrenaline

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 (pyridoxine) 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-β 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.

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ANSWER KEYS

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

* G – Indicates One GRACE MARK awarded for the question number.

Solution

1. (b)

   Number of moles of H_2SO_4 left = N/Na

   Now, finding N

   For 98 gm of H_2SO_4 the molecules are 6.02×10^{20}

   H_2SO_4 left = $6.02 \times 10^{20} - 3.01 \times 10^{20} = 3.01 \times 10^{20}$

   Number of moles of H_2SO_4 left = N/NA

   $\qquad\qquad\qquad = 3.01 \times 10^{20} / 6.02 \times 10^{23} = 0.5 \times 10^{-3}$ mol

2. (c)

   For finding out unpaired electron of chlorine atom we have to find electronic configuration

   $Cl = 1S^2\ 2S^2\ 2P^6\ 3S^2\ 3P^5$

   $n = 3,\ \ l = 1,\ \ m = 1,\ \ s = \pm\ \dfrac{1}{2}$

3. (c)

   As we move down the group, the electro negativity increase Si < P < C < N

4. (c)

   It is given that there are total three bond pairs and one lone pair

   $\therefore$ Total electron pair is 4 which shows sp^3 hybridization

   $\because$ It is given that one lone pair is also present than geometry will be pyramidal

5. (b,c)

   The structure of $\bullet\bullet N \equiv \overset{+}{N} - \overset{-}{\underset{\bullet\bullet}{\overset{\bullet\bullet}{O}}}\bullet$ [NO₂]

   Positive charge is on N atom due to its less electro negativity than oxygen. The structure in option C is also a stable configuration since octets of nitrogen and oxygen are fulfilled and no charge separation is there.

6. (a)

   The intermolecular attraction between the particles of real gas in much less hence the pressure of real gas is less than that of ideal gas. Their energy is less $\because$ they do not collide with each other at an impact. The pressure of real gases is less than that of ideal gas because of intermolecular attraction.

7. (b)

   We know, $\Delta G = \Delta H - T\Delta S$

   Given ΔH and ΔS are negative.

   Therefore expression will be

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

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

   By seeing the above equation for negative ΔG the value of ΔS must be less than ΔH.

   $\qquad \Delta H > T\Delta S$

So, the reaction will be exothermic. If the reaction is exothermic then, it's rate will increase with decrease in temperature.

8. (d)

Equilibrium constant does not depend on catalyst.

So, value of constant is same that is 4×10^{-4}

9. (d)

If the reaction is in reverse direction then reaction quotient is greater than equilibrium constant $Q_c > K_c$

If the reaction is in equilibrium then reaction quotient is equal to equilibrium constant $Q_c > K_c$

∴ If $Q_c > K_c$. Reaction is forward.

10. (b)

$$3ClO_{(aq)}^- \longrightarrow ClO^- + 2Cl^-$$
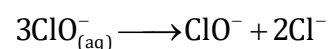
The oxidation state of chlorine changes from +1 to – 1

∴ This reaction is an example of reduction reaction.

11. (a)

A CO (g) + H_2O (g) $\xrightarrow{\text{670K}}$ CO_2 (g) + H_2 (g)
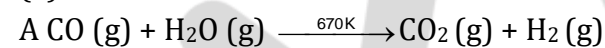
The reaction shown above is reaction of manufacturing of hydrogen from water gas. Here, CO is oxidized to CO_2 with steam in the presence of catalyst. Then absorption of CO_2 in alkali takes place.

So answer is CO is oxidized to CO_2.

12 (a)

The formula for plaster of paris is $CaSO_4 . \frac{1}{2} H_2O$

13 (b)

The reaction involved for addition of mineral acid to aqueous solution of borax is

$Na_2B_4O_7 + H_2SO_4 + 5H_2O \rightarrow Na_2SO_4 + 4H_3BO_3$

      (Borane)   (Acid)   (orthoboric acid)
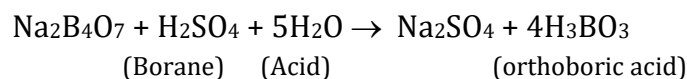
So, orthoboric acid is formed as a product.

14 (c)

Position isomers are those in which both compounds have different position of a substituent but have same parent chain and functional group.

$$CH_3-CH_2-CH_2-OH \ \& \ CH_3-\underset{\underset{\displaystyle OH}{|}}{CH}-CH_3$$
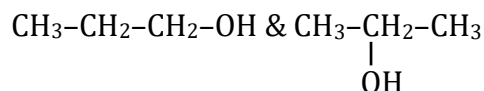
∴ Propan-l-ol and propan-2-ol are position isomers.

15 (c)

Homolytic bond fission takes place when the bonded molecules are of same or almost equal electro negativity or where bonding pair of electrons move independently.

So, in free radical chlorination of methane homolytic fission takes place.
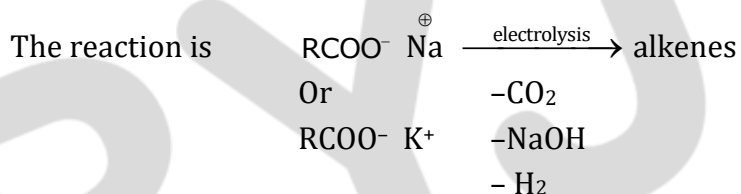
The mechanism is shown bellow.

$$Cl_2 \xrightarrow{\text{light}} 2Cl^\bullet$$

$$Cl + CH_4 \longrightarrow HCl + CH_3^\bullet$$

$$Cl_2 + CH_3 \longrightarrow CH_3Cl + Cl^\bullet$$
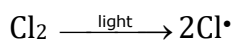
At termination the reactions are

$$2Cl^\bullet \longrightarrow Cl_2$$

$$Cl^\bullet + CH_3^\bullet \longrightarrow CH_3 - Cl$$

$$2\, CH_3^\bullet \longrightarrow CH_3 - CH_3$$
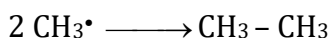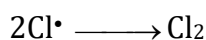
So answer is "free radical chlorination of Methane".

16 (d)

In electrolysis of salts new bond is created

The reaction is $RCOO^- \overset{\oplus}{Na} \xrightarrow{\text{electrolysis}}$ alkenes

Or $-CO_2$

$RCOO^-\ K^+$ $-NaOH$

                              $-H_2$

So, aqueous solutions of sodium and potassium salts of carboxylic acid undergo electrolysis for preparation of alkenes.

17 (d)

Ozone, nitrogen, PAN, oxygen and some organic compounds are the pollutants in photochemical smog. Photochemical smog does not include chloro flouro carbons.

18 (a)

Given that $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90$

Then the unit cell must be triclinic

∵ $K_2Cr_2O_7$ has triclinic unit cell then.

$\alpha \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90$

19 (b)

Since, in Frenkel defect, the smallest ion gets dislocated to its interstitial site hence, Frenkel defect is termed as dislocation defect as well.

20 (a)

Given that it is face centered cubic cell and A atoms are at the corners of unit cell

∵ One of A atom is missing from one corner in unit cell then, there are 7A atoms with total contribution.

$$7 \times \frac{1}{8} = \frac{7}{8}$$

B atoms are at face centers.

∵ There are 6 face centers. Each contributes $\frac{1}{2}$. So, total contribution will be $6 \times \frac{1}{2} = 3$

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

The simplest formula of compound is A_7B_{24}

21 (d)

NH_4Cl dissociation in aqueous solution is as follows:

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

Lesser the number of particles available higher will be the freezing point.

Here i = 2 which is least among all so it has highest freezing point.

22 (b)

Vant-Hoff's factor 'i' accounts for extent of dissociation of solute

23. (b)

Reverse osmosis is the process in which pure solvent diffuses out of the solution through the semi-permeable membrane.

24. (a)

The reducing agent will be stronger when its reduction potential is more negative.

∴ zinc is strongest reducing agent as its value of reducing potential is highly negative (0.762 v)

25. (c)

The reaction is

$$NaClO_3 + H_2O \rightarrow NaClO_4 + H_2$$
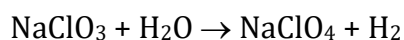
Here, the oxidation number changes from +5 to +7 so, two electrons are involved in the reaction.

Thus, 2 Faraday of charge will form one mole of $NaClO_4$.

∴ 3 Faraday of charge will form $\frac{1}{2} \times 3 = 1.5$ mole of $NaClO_4$.

26. (d)

Half cell reduction reaction at cathode is

$$H_2O \text{ (l)} + e^- \longrightarrow \frac{1}{2} H_2 + OH^-$$
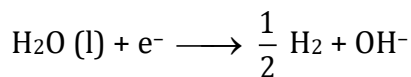
The standard reduction potential of above reaction is 0 volts.
The half cell oxidation reaction at anode is shown below.

$$Cl^- \text{ (aq)} \rightarrow \frac{1}{2} Cl_2 + e^-$$
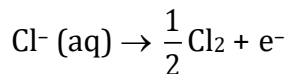
The standard reduction potential of above reaction is 1.36 volts

27. (a,b)

$\because$ The expression for Arrhenius equation is $k = Ae^{-\in a/RT}$

By seeing above equation we can conclude that the rate of reaction depends upon activation energy and temperature. It is clear that the rate of reaction will increase as the activation energy decreases and temperature increases.
The rate of reaction depends upon activation energy and temperature, increases with increase in temperature & decrease in activation energy.

28. (a)

The rate law for chemical reaction is equation that links the initial reaction rate with concentration of reactants. For many reactions the initial rate is given by $V_0 = k[A]^x [B]^y$ hence, rate law for any reaction can be determined experimentally.

29. (b)

The given equation is $\frac{1}{2} A \rightarrow 2B$

The rate of reaction is
Rate of disappearance of products = Rate of formation of products.

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

$\therefore$ Rate of disappearance of A is

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

30. (a)

When river meets the sea the colloidal particles are coagulated by electrolyte available in sea, due to which the colloidal particles settle down during meet time. So, coagulation occurs.

31. (a)

For finding solution we have to write the equation of hydrogenation of vegetable oils

$$\text{oil(l)} + H_2\text{(g)} \xrightarrow[\Delta]{Ni(s)} \text{vegetable ghee (s)}.$$
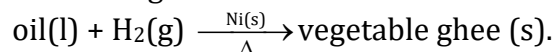
Here, we can see that the phases of reactant and catalyst are different so, the reaction is heterogeneous catalysis.

32. (a)

Since physical adsorption is an exothermic process so it is favored at low temperature. Further Le chatelier's principle states that with the increase in temperature, the extend of adsorption decreases.

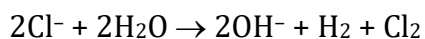So, high temperature is not favorable for physical adsorption.

33. (b)
The reactions involved in process of leaching of cyanides are

$Ag_2S + 4NaCN \rightleftharpoons 2Na[Ag(CN)_2] + Na_2S$

$2Na[Ag(CN)_2] + Zn \rightarrow Na_2[2n(CN)_4] + 2Ag\downarrow$
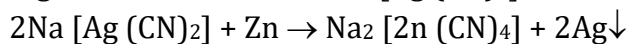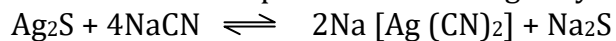
So, silver is obtained by leaching with cyanide

34. (a)
The reaction involved in extraction of chlorine from brine is

$2Cl^- + 2H_2O \rightarrow 2OH^- + H_2 + Cl_2$

So here oxidation of Cl^- ion to chlorine gas occurs.

35. (a)
Since, size of nitrogen atom is very small
So it is able to form $P\pi^- P\pi$ bond with itself and can accommodate other atoms of itself.
So, answer is nitrogen 'N'.

36. (d)
Amphoteric oxides are those that can act as acid as well as base. When we move down the 's' group the acidic character of element decreases and basic character increases.
So, Al_2O_3 is amphoteric in nature.
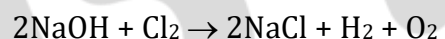
37. (c)
In reaction
$2NaOH + Cl_2 \rightarrow 2NaCl + H_2 + O_2$
The products formed are wrong the correct products will be

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

38. (d)
Helium is used for filling balloons and air ships since it is light in weight. It has property of diffusing through the materials such as rubber, glasses or plastic.

39. (b)
Magnetic character depends on number of unpaired electrons. $3d^5$ has five unpaired electrons. Therefore its magnetic moment is highest.

40. (a)
Lanthanoids are generally colourful since, vacant orbital's transition of electrons take place.

41. (a)
MAXBL complex is shown below.
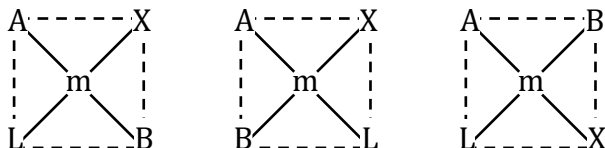
So, it can show two cis and one trans isomerism.

42. (a)

M – L M is metal and L is ligand. According to crystal field theory M-L bond is purely ionic in nature, because there is electrostatic interaction among metal ions and ligands.
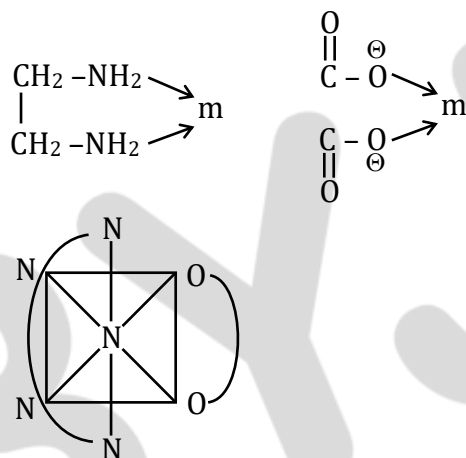
43. (a)

$[M(en)(C_2O_4)]\ NO_2$
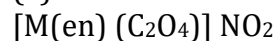
The general oxidation state for en $\rightarrow$ 2 for

C_2O_4 = 0 So, oxidation state of M will be

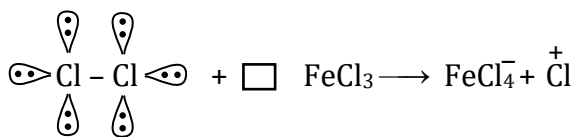$x + 0 + 2\ x\ (-2) = 0 - 1\ x = 3$

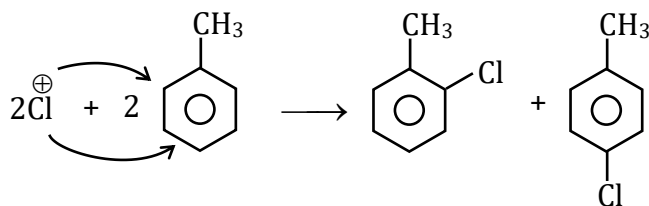Now finding coordination number

So, total coordination number is 6

44. (b)
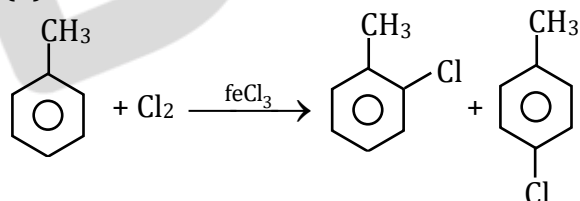
Mechanism
Step-(1)

Step-(2)

From step (1) we concluded that Cl^+ is formed

∵ Cl_2 has lone pair and $FeCl_3$ has vacant d-orbital so, lone pairs are transferred to its vacant orbital and Cl^+ is created.

∵ Cl^+ is electrophile substitutes with H^+ so reaction is electrophilic substitution reaction.

45. (d)

$$CH_3Br \xrightarrow{KCN} CH_3CN \ (A) \xrightarrow{H_3\overset{\oplus}{O}} CH_3COOH \ (B)$$

$$CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH$$
$$(C)$$

$CH_3{-}Br + \overset{\oplus}{K}\overset{\ominus}{CN} \longrightarrow CH_3CN$

$CH_3CN + \overset{\oplus}{H_3O} \longrightarrow CH_3COOH$

$CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH$ [Reduction]
                  Ethyl Alcohol
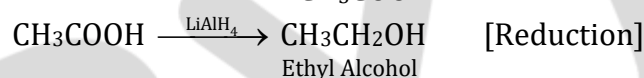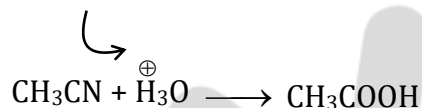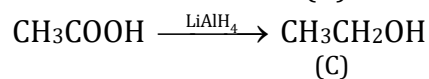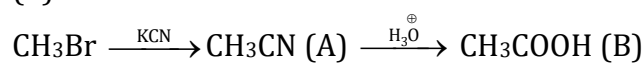
46. (b)
When the conjugate base is more stable then the compound is more acidic. The EWG makes conjugate base more stable.
So, correct order is
      O-cresol< phenol< O-nitrophenol
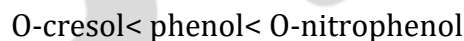
47. (b)
 $KMnO_4$ is strong oxidizing agent so they convert alcohols to carboxylic acid.

48. (G)
Bonus

49. (a)
∵ Condition for H-Bonding are the compound have high electronegative atom linked to hydrogen atom. Further, the adjacent atom on us has lone pair of electrons. These conditions are fulfilled by lower carboxylic acids so here formation of H-Bond takes place.
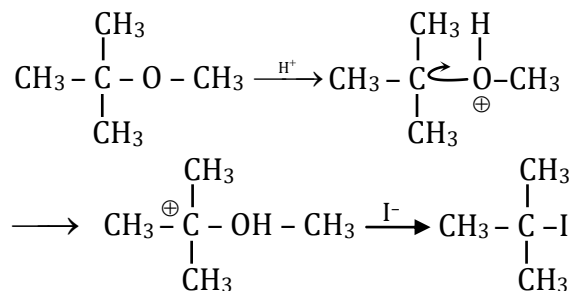
50. (c)
More the methyl groups, more the positive effect and more will be the availability of lone pair, hence compound will have more basic nature.
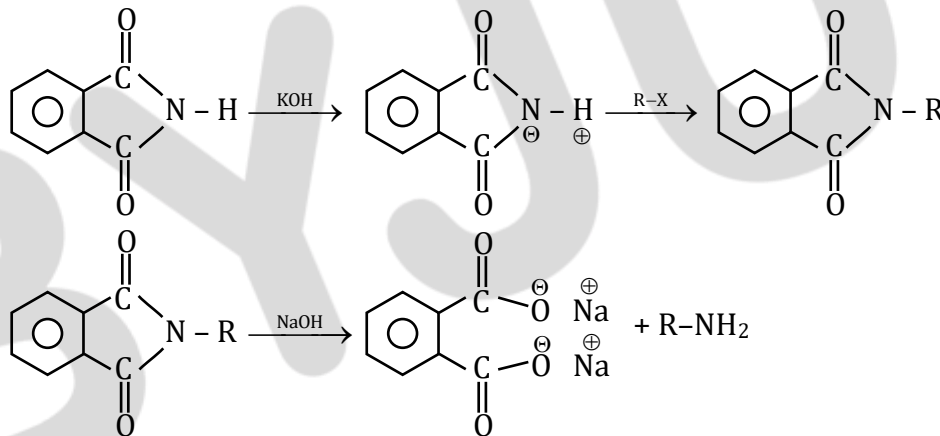
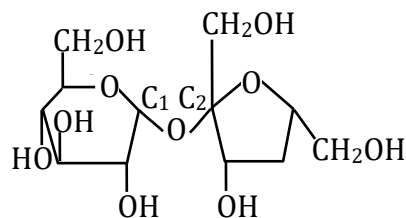$NH_3 < CH_3NH_2 < (CH_3)_2 NH$
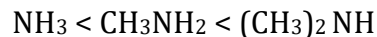
51. (a)
The reaction is

52. (d)
Reduction of ketones cannot be carried out with hydrogen in presence of palladium in Barium Sulphate since this reagent is lindlar's catalyst and is used for selective reduction of alkynes to trans alkenes.

53. (c)
Gabriel phthalimide synthesis: -

∴ HCl is not used

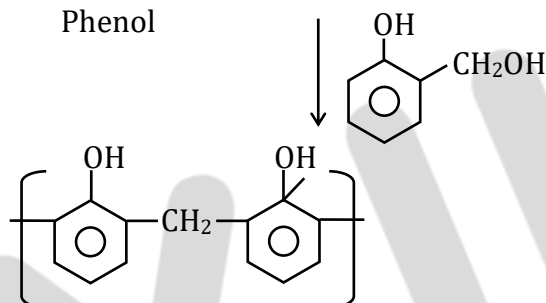54. (a)

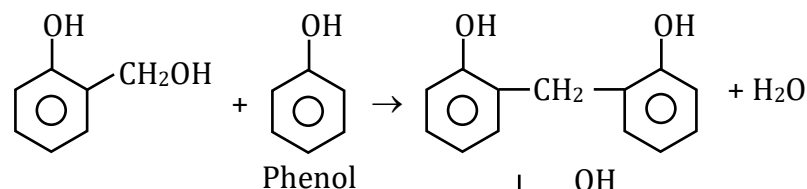C_1 of α-glucose and C_2 of B-fructose

55. (b)

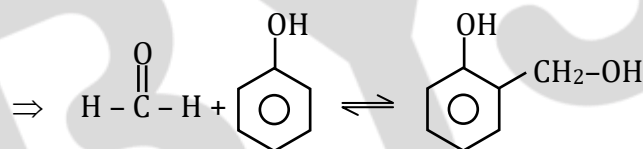Thyroxine is iodine containing hormone.

56. (d)

Due to the deficiency of vitamin D, rickets is caused. Deficiency of vitamin A, causes xerophthalmia. Vitamin A is also known as retinol.

57. (a)

Novolac

So, monomers are phenol and formaldehyde.

58. (d)
Glyptol is non-biodegradable polymer.

59. (a)
Bacterial antibiotics can kill bacteria and inhibits their growth. Ofloxacin is fluoro quinolone carboxylic acid. It's antibacterial.
So, answer is ofloxacin.

60. (G)
Bonus