KCET-2018 (Chemistry)

1. 1.0 g of Mg is burnt with 0.28 g of O_2 in a closed vessel. Which reactant is left in excess and how much?
   a. Mg, 5.8 g
   b. Mg, 0.58 g
   c. O_2 , 0.24 g
   d. O_2 , 2.4 g

2. The orbital nearest to the nucleus is
   a. 4f
   b. 5d
   c. 4s
   d. 7p

3. Which of the following is the correct order of radius?
   a. $H^- > H > H^+$
   b. $Na^+ > F^- > O^{2-}$
   c. $F^- > O^{2-} > Na^+$
   d. $Al^{3+} > Mg^{2+} > N^{3-}$

4. The intramolecular hydrogen bond is present in
   a. Phenol
   b. o-Nitrophenol
   c. p-Nitrophenol
   d. p-Cresol

5. The state of hybrid orbitals of carbon in CO_2, CH_4 and CO_3^{2-} respectively is
   a. sp^3 , sp^2 and sp
   b. sp^3 , sp and sp^2
   c. sp, sp^3 and sp^2
   d. sp^2 , sp^3 and sp

6. For an ideal gas, compressibility factor is
   a. 0
   b. 1
   c. –1
   d. +2

7. The relationship between K_p and K_c is $K_p = K_c(RT)^{\Delta n}$. What would be the value of Δn for the reaction, $NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$?
   a. 1
   b. 0.5
   c. 1.5
   d. 2

8. Acidity of BF_3 can be explained on which of the following concepts?
   a. Arrhenius concept
   b. Bronsted-Lowry concept
   c. Lewis concept
   d. Bronsted-Lowry as well as Lewis concept

9. For the redox reaction

$xMnO_4^- + yH_2C_2O_4 + zH^+ \rightarrow mMn^{2+} + n\,CO_2 + pH_2O$

The values of x, y, m and n are

a. 10, 2, 5, 2
b. 2, 5, 2, 10
c. 6, 4, 2, 5
d. 3, 5, 2, 10

10. H_2O_2 is

a. An oxidizing agent
b. A reducing agent
c. Both oxidizing and reducing agent
d. Neither oxidizing nor reducing agent

11. Dead burnt plaster is.

a. $CaSO_4$
b. $CaSO_4 \cdot \frac{1}{2} H_2O$
c. $CaSO_4 \cdot H_2O$
d. $CaSO_4 \cdot 2H_2O$

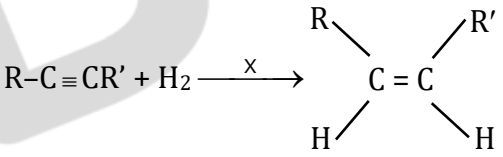
12. Identify the following compound which exhibits geometrical isomerism:

a. But-2-ene
b. But-1-ene
c. Butane
d. Isobutane

13. During the fusion of organic compound with sodium metal, nitrogen present in the organic compound is converted into

a. $NaNO_2$
b. $NaNH_2$
c. NaCN
d. NaNC

14. The reagent 'X' used for the following reaction is



a. Ni
b. Pd/C
c. $LiAlH_4$
d. Na/Liquid NH_3

15. Which of the following ions will cause hardness in water?

a. Ca^{2+}
b. Na^+
c. Cl^-
d. K^+

16. Which of the following oxides shows electrical properties like metals?

a. SiO_2
b. MgO
c. $SO_2(s)$
d. CrO_2

17. Which of the following aqueous solutions should have the highest boiling point?
    a. 1.0 M NaOH
    b. 1.0 M Na_2SO_4
    c. 1.0 M NH_4NO_3
    d. 1.0 M KNO_3

18. The charge required for the reduction of 1 mole of MnO_4^- to MnO_2 is
    a. 1 F
    b. 3 F
    c. 5F
    d. 7 F

19. For the reaction,
    $2SO_2 + O_2 \rightleftharpoons 2SO_3$,
    The rate of disappearance of O_2 is 2×10^{-4}mol L^{-1} s^{-1}. The rate of appearance of SO_3 is
    a. 2×10^{-4}mol L^{-1} s^{-1}
    b. 4×10^{-4}mol L^{-1} s^{-1}
    c. 1×10^{-1}mol L^{-1} s^{-1}
    d. 6×10^{-4}mol L^{-1} s^{-1}

20. Which of the following electrolytes will have maximum coagulating value for AgI/Ag^+ sol?
    a. Na_2S
    b. Na_3PO_4
    c. Na_2SO_4
    d. NaCl

21. Electrolytic refining is used to purify which of the following metals?
    a. Cu and Zn
    b. Ge and Si
    c. Zr and Ti
    d. Zn and Hg

22. Dry ice is
    a. Solid CO
    b. Solid SO_2
    c. Solid CO_2
    d. Solid O_2

23. Which of the following is an amphoteric oxide?
    a. V_2O_5, Cr_2O_3
    b. Mn_2O_7, Cr_2O_3
    c. CrO , V_2O_5
    d. V_2O_5 , V_2O_4

24. The IUPAC name of $[Co(NH_3)_4Cl(NO_2)]$ Cl is
    a. tetraamminechloridonitrito-N-cobalt(III) chloride
    b. tetraamminechloridonitrocobalt(II) chloride
    c. tetraamminechloridonitrocobalt(I) chloride
    d. tetraamminechloridodinitrocobalt(III) chloride

25. Which of the following statements is true in case of alkyl halides?
    a. They are polar in nature
    b. They can form hydrogen bonds
    c. They are highly soluble in water
    d. They undergo addition reactions

26. Phenol can be distinguished from ethanol by the reagent
    a. Bromine water
    b. Sodium metal
    c. Iron metal
    d. Chlorine water

27. Which of the following compounds undergoes haloform reaction?
    a. CH_3COCH_3
    b. HCHO
    c. CH_3CH_2Br
    d. $CH_3 - O - CH_3$

28. Which of the following will be the most stable diazonium salt $(RN_2^+X^-)$?
    a. $CH_3N_2^+X^-$
    b. $C_6H_5N_2^+X^-$
    c. $CH_3CH_2N_2^+X^-$
    d. $C_6H_5CH_2N_2^+X^-$

29. Which of the following bases is not present in DNA?
    a. Adenine
    b. Guanine
    c. Cytosine
    d. Uracil

30. Which one of the following is a polyamide polymer?
    a. Terylene
    b. Nylon-6, 6
    c. Buna-S
    d. Bakelite

31. In F.C.C. the cell is shared equally by how many unit cells?
    a. 10
    b. 8
    c. 6
    d. 2

32. At a particular temperature, the ratio of molar conductance to specific conductance of 0.01 M NaCl solution is
    a. $10^5\ cm^3mol^{-1}$
    b. $10^3\ cm^3mol^{-1}$
    c. $10\ cm^3mol^{-1}$
    d. $10^5\ cm^2mol^{-1}$

33. Isotonic solutions are solutions having the same
    a. Surface tension
    b. Vapour pressure
    c. Osmotic pressure
    d. Viscosity

34. The temperature coefficient of a reaction is 2. When the temperature is increased from 30° C to 90°C, the rate of reaction is increased by
    a. 150 times
    b. 410 times
    c. 72 times
    d. 64 times

35. Gold sol is not a
    a. Lyophobic sol
    b. Negatively charged sol
    c. Macromolecular sol
    d. Multimolecular colloid

36. The common impurity present in bauxite is
    a. CuO
    b. ZnO
    c. Fe_2O_3
    d. Cr_2O_3

37. Very pure N_2 can be obtained by
    a. Thermal decomposition of ammonium dichromate
    b. Treating aqueous solution of NH_4Cl and $NaNO_2$
    c. Liquefaction and fractional distillation of liquid airMidbrain
    d. Thermal decomposition of sodium azide

38. Which of the following oxidation states is common for all lanthanides?
    a. + 2
    b. + 3
    c. + 4
    d. + 5

39. The electronic configuration of transition element "X" is +3, oxidation state is $[Ar]3d^5$. What is its atomic number?
    a. 25
    b. 26
    c. 27
    d. 24

40. n-Propyl chloride reacts with sodium metal in dry ether to give
    a. CH_3-CH_2-CH_2–CH_2–CH_2–CH_3
    b. CH_3-CH_2-CH_3
    c. CH_3-CH_2-CH_2–CH_3
    d. CH_3-CH_2-CH_2–CH_2–CH_2–CH_2–CH_3

41. When the vapours of tertiary butyl alcohol are passed through heated copper at 573 K, the product formed is
    a. But-2-ene
    b. 2-Butanone
    c. 2-Methyl propene
    d. Butanal

42. What is the increasing order of acidic strength among the following?

    (i) p-methoxy phenol

    (ii) p-methyl phenol

    (iii) p-nitro phenol

    a. ii < iii <i
    b. iii < ii <i
    c. i< ii < iii
    d. i< iii < ii

43. Which of the following is more basic than aniline?
    a. Diphenylamine
    b. Triphenylamine
    c. p-nitroaniline
    d. Benzylamine

44. The two forms of D-Glucopyranose are called
    a. Diastereomers
    b. Anomers
    c. Epimers
    d. Enantiomers

45. Among the following, the branched chain polymer is
    a. Polyvinyl chloride
    b. Bakelite
    c. Low density polythene
    d. High density polythene

46. Edge length of a cube is 300 pm. Its body diagonal would be
    a. 600 pm
    b. 423 pm
    c. 519.6 pm
    d. 450.5 pm

47. Which of the following is not a conductor of electricity?
    a. Solid NaCl
    b. Cu
    c. Fused NaCl
    d. Brine solution

48. For a cell reaction involving two electron changes, E^0_{cell} = 0.3 V at 25° C. The equilibrium constant of the reaction is
    a. 10^{-10}
    b. 3×10^{-2}
    c. 10
    d. 10^{10}

49. The value of rate constant of a pseudo first order reaction
    a. Depends only on temperature
    b. Depends on the concentration of reactants present in small amounts
    c. Depends on the concentration of reactants present in excess
    d. Is independent of the concentration

50. $(CH_3)_3SiCl$ is used during polymerization of organosilicons because
    a. The chain length of organosilicon polymers can be controlled by adding $(CH_3)SiCl$
    b. $(CH_3)_3SiCl$ does not block the end terminal of silicone polymer
    c. $(CH_3)_3SiCl$ does not block the end terminal of silicone polymer
    d. $(CH_3)_3SiCl$ acts as a catalyst during polymerisation

51. When PbO_2 reacts with concentrated HNO_3, the gas evolved is
    a. NO_2
    b. O_2
    c. N_2
    d. N_2O

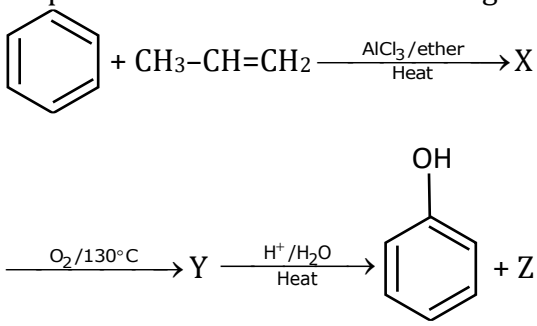
52. $KMnO_4$ acts as an oxidizing agent in alkaline medium. When alkaline $KMnO_4$ is treated with KI, iodide ion is oxidized to
    a. I_2
    b. IO^-
    c. IO_3^-
    d. IO_4^-

53. $[Fe(NO_2)_3\ Cl_3]$ and $[Fe(O–NO)_3\ Cl_3]$ shows
    a. Linkage isomerism
    b. Geometrical isomerism
    c. Optical isomerism
    d. Hydrate isomerism

54. Tertiary alkyl halide is practically inert to substitution by S_{N^2} mechanism because of

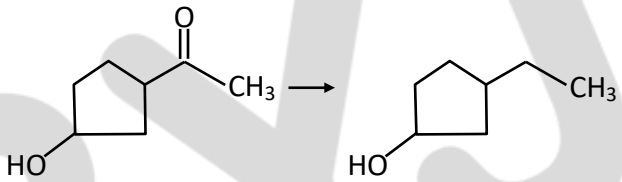
a. Insolubility
b. Instability
c. Inductive effect
d. Steric hindrance

55. The products X and Z in the following reaction sequence are



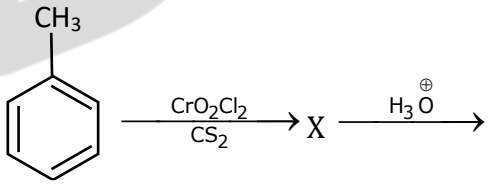
a. Isopropyl benzene and acetone
b. Cumene peroxide and acetone
c. Isopropyl benzene and isopropyl alcohol
d. Phenol and acetone

56. The appropriate reagent for the following transformation is



a. Zn–Hg/HCl
b. $H_2N–NH_2$, KOH/ethylene glycol
c. Ni/H_2
d. $NaBH_4$

57. In the following reaction



The compound Z is

a. Benzoic acid
b. Benzaldehyde
c. Acetophenone
d. Benzene

58. The reaction of Benzene diazonium choloride with aniline yields yellow dye. The name of the yellow dye is

a. p-Hydroxyazobenzene
b. p-Aminoazobenzene
c. p-Nitroazobenzene
d. o-Nitroazobenzene

59. The glycosidic linkage involved in linking the glucose units in amylose part of starch is
    a. $C_1 - C_4$ β-linkage
    b. $C_1 - C_6$ α-linkage
    c. $C_1 - C_6$ β-linkage
    d. $C_1 - C_4$ α-linkage

60. Ziegler-Natta catalyst is used to prepare
    a. Low-density polythene
    b. Teflon
    c. High density polythene
    d. Nylon-6

KCET-2018 (Chemistry)

ANSWER KEYS

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

Solution

1. (b)

Given : Amount of Mg = 1.0g

Amount of O_2 =0.25g

Balanced chemical reaction

$2Mg + O_2 \longrightarrow 2MgO$

$$\text{Moles of Mg} = \frac{\text{given mass}}{\text{atomic mass}} = \frac{1g}{24g/mol}$$

$$\begin{cases} \text{atomic weight of mg} = 24 \\ \text{atomic weight g O} = 16 \end{cases}$$

= 0.0416 moles

$$\text{Moles of } O_2 = \frac{0.28g}{32\ g/mol} = 0.00875 \text{ moles}$$

In this chemical reaction, O_2 acts as limiting reagent.

1 mole O_2 react with 2 mole Mg

0.0875 Mole O_2 react with = 2 × 0.00875 moles of mg = 0.0175 mole Mg

Number of moles of Mg left after reaction with oxygen

= 0.0416–0.0175

= 0.0241 moles

Weight of Mg left in excess = moles ×atomic weight

= 0.0241×24

= 0.578 ≈ 0.58 g

2. (c)

Penetration power of the electron describes how much it is closer to the nucleus.

Penetration power of an electron follows:

1S > 2S > 2P > 3S > 3P > 4S > 3d > 4P >5S > 4d >5P > 6S

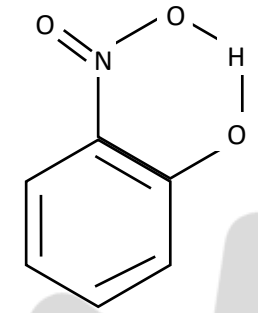
Sub shell penetration power follows:

S > P > D > F

So, 4S orbital is closer to the nucleus among the other 4f, 5d, 7p orbital.

3. (a)
Correct order of radius:
$H^- > H > H^+$
Size of an atom is directly proportional to atomic radius if size increases, atomic radius also increases.
Addition of an extra electron in an atom increases the size of the atom as compare to neutral atom and removal of an electron (cation) makes the atom size shorter than the parent atom

4. (b)
Intramolecular hydrogen bonding:
When H– atom of one molecule form bond with an atom of the electronegative element.
Intramolecular H-bonding presents in O– nitrophenol.

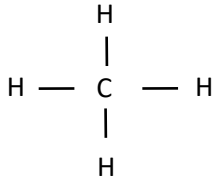


O– nitrophenol

Intramolecular hydrogen –bonding

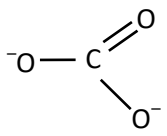
5. (c)
According to VSEPR theory, we can use the steric number to determine the hybridization of an atom.
S N = number of lone pairs + number of atom directly attached to the central atom.
For CO_2 : $\ddot{O} = C = \ddot{O}$:
S N = 0 + 2 = 2 = S P hybridization
That means one S and one P hybrid orbital participate in hybridization.

For CH_4:



S N = 0 + 4 = SP^3 hybridization
Here, one S and three P hybrid orbitals participate in hybridization.

For CO_3^{2-} :



S N = 0 + 3 = SP^2 hybridization
In CO_3^{2-} ions

That means one S and two P hybrid orbitals participate in hybridization.

6. (b)

Compressibility factors of an ideal gas to describe the deviation of a real gas behavior from ideal gas, compressibility factor represented by Z.

$$Z = \frac{PV}{nRT}$$

For ideal gas, value of Z is always unity = 1

7. (d)

For the reaction:

$NH_4Cl_g \square \quad NH_{3_{(g)}} + HCl_{(g)}$

Δn_g =Number of moles of gaseous product – Number of moles of reactant

$\Delta n_g = 2 - 0$

$\Delta n_g = 2$

8. (c)

Lewis concept: According to Lewis acid base theory bases are lone pair donor and acids are lone pair acceptor.

BF_3 molecule is electro deficient.

Electronic configuration of boron = $1S^2, 2S^2, 2P^1$

Exited state electronic configuration of boron = $1S^2, 2S^2, 2P_x^1, 2P_y^1, P_z$

After bond formation with the fluorine atom, boron having one vacant P-orbitals which makes the molecule electron deficient. BF_3 very energetically react with water and ammonia that has available lone pair.

9. (b)

For redox reaction

$xMnO_4^- + y\ H_2C_2O_4 + ZH^+ \longrightarrow m\ Mn^{+2}, +n\ CO_2 + P\ H_2O$

Skeletal equation

(1) $MnO_4^- + H_2C_2O_4 \rightarrow Mn^{+2} + CO_2$

C oxidized, $+3 \longrightarrow +4$ $\quad \therefore H_2C_2O_4$ is the reducing agent

Mn reduced, $+7 \longrightarrow +2$ $\quad \therefore MnO_4^-$ is the oxidizing agent

(2) Balancing the equation other than H and O.

Oxidized; $H_2C_2O_4 \longrightarrow 2CO_2$

Reduction: $MnO_4^- \longrightarrow Mn^{+2}$

(3) Balance oxygen by addition of H_2O

Oxidation: $H_2C_2O_4 \longrightarrow 2CO_2 + 2H^+$

Reduction: $MnO_4^- \longrightarrow Mn^{+2} + 4H_2O$

(4) Balance hydrogen by adding H^+

Oxidation: $H_2C_2O_4 \longrightarrow 2CO_2 + 2H^+$

Reduction: $8H^+ + MnO_4^- \longrightarrow Mn^{+2} + 4H_2O$

(5) Balance charge by addition of electrons.

Oxidation: $H_2C_2O_4 \longrightarrow 2CO_2 + 2H^+ + 2e^-$

Reduction: $5e^- + 8H^+ + MnO_4^- \longrightarrow Mn^{+2} + 4H_2O$

(6) $5\times$ [Oxidation: $H_2C_2O_4 \longrightarrow 2CO_2 + 2H^+ + 2e^-$]

$2\times$ [reduction: $5e^- + 8H^+ + MnO_4^- \longrightarrow 2Mn^{+2} + 4H_2O$

Add half reactions together, simplify (cancel species that are same on the both sides of the equation);

$5H_2C_2O_4 + 10e^- + 16H^+ + 2MnO_4^- \longrightarrow 10CO_2 + 10H^+ + 10e^- + 2Mn^{+2} + 8H_2O$

So, the final balanced redox reaction:

$$5H_2C_2O_{4(aq.)} + 2MnO_{4(aq.)}^- + 6H_{(aq.)}^+ \rightarrow 10CO_{2(g)} + 2Mn_{(aq.)}^{+2} + 8H_2O_{(l)}$$

10. (c)

H_2O_2 is act as both oxidizing and reducing agent oxygen of H_2O_2 (-1 oxidation state) is reduced to H_2O (–2 oxidation state) act as oxidizing agent. When oxygen of H_2O_2 (-1 oxidation state) is oxidized to (0) oxidation state act as reducing agent.

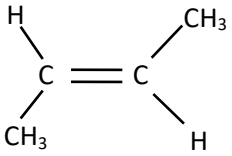
11. (a)

Plaster of Paris ($CaSO_4.1/2\ H_2O$) is heated above 393K, its half water molecule last to crystallization and anhydrous calcium sulphate is left which is called as dead burnt plaster ($CaSO_4$).

12. (a)

Geometrical isomerism (cis-trans isomerism): -

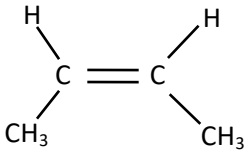
This isomerism occurs where restricted rotation is found in a molecule. Usually involve the carbon –carbon double bond containing compound.



Trans-But-2-ene

(I)

Geometrical isomers.



cis-but-2-ene

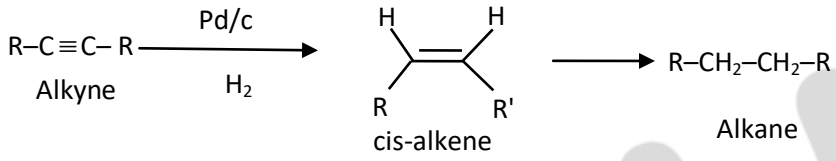
(II)

In one case, the CH_3 groups are on opposite sides of the double bond and in the other case they are on the same side.

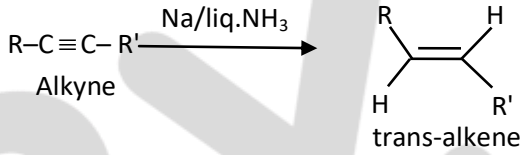
13. (c)
When organic compound reacts with sodium (Na) metal, its nitrogen converted in sodium cyanide.
Chemical reaction:

$$\underset{\text{Carbon}}{C} + \underset{\text{Nitrogen}}{N} + \underset{\text{Sodium}}{Na} \rightarrow \underset{\text{Sodium cyanide}}{NaCN}$$

14. (b)
Hydrogenation of an alkyne with Pd/C gives cis alkane.



⇒ Reduction of alkynes using sodium metal and liquid ammonia NH_3 gives trans alkane



⇒ Lithium aluminiumhydride ($LiAlH_4$) does not reduce alkynes, reduce only if an alcohol group is nearby.

15. (a)

Hardness in water:

Calcium and magnesium carbonates or bicarbonates dissolved in the water are the two most common mineral that make water "hard".

Water which does not give lather with soap is hard water.

16. (d)

Transition metal oxides show electrical properties like metals. CrO_2 (chromium oxides) is a good conductor of electricity. It is ferromagnetic at room temperature. The Curie temperature is 118° C and the material readily is demagnetized with little energy input. The electrical conductivity of this black compound is quite high.

17. (b)

Colligative properties of solutions are properties that depend upon the concentration of solute molecules or ions but not the identity of the solute.

Concentrations of all the solutions are same given one. So, colligative property (elevation in boiling point) depends only on number of ions or molecules. Boiling point increases as number of ions increases in the aqueous solutions.

1M NaOH give number of ions =2

1M Na_2SO_4 give number of ions =3

1M NH_4SO_4 give number of ions =2

1M KNO_3 give number of ions =2

So, 1M Na_2SO_4 have maximum boiling point among the all.

18. (b)

For: $\overset{+7}{MnO_4^-} \xrightarrow[\text{reduced}]{[H]} \overset{+4}{MnO_2}$

Change is oxidation state =7 – 4 = + 3

The amount of electric charge carried by one mole of electrons (6.02×10^{23} electrons) is called the Faraday (F) and is equal to 96,500 coulombs.

1 mole e^-required1F electric charge

3 mole e^- required 3F electric charge

To reduce MnO_4^- into MnO_2 we require 3 mole of electron charge.

19. (b)

For the reaction

$$2SO_2 + O_2 \rightleftharpoons 2SO_3$$

Rate of reaction

$$-\frac{1}{2}\frac{d[SO_2]}{dt} = \frac{-d[O_2]}{dt} = \frac{1}{2}\frac{d[SO_3]}{dt}$$

Rate of disappearance of $O_2 = 2\times10^{-4}$mol L^{-1} S^{-1}

Then,

$$\frac{-d[O_2]}{dt} = \frac{1}{2}\frac{d[SO_3]}{dt}$$

$$2\times10^{-4} = \frac{1}{2}\frac{d[SO_3]}{dt}$$

$$\frac{d[SO_3]}{dt} = 4\times10^{-4}\ \text{mol}\ L^{-1}\ \text{sec}^{-1}$$

Rate of appearance of $SO_3 = 4\times10^{-4}$mol L^{-1} sec^{-1}

20. (d)

Different electrolytes have different coagulation values. Smaller the coagulation value of the electrolyte larger is its coagulating or precipitating power.

$$\text{Coagulating power} \propto \frac{1}{\text{Coagulation value or flocculation value}}$$

According to Hardy-schulze law, greater the charge on anion greater the coagulating power

Electrolyte	Anion	Charge
Na_2S	S^{2-}	2
Na_3PO_4	PO_4^{3-}	3
Na_2SO_4	SO_4^{2-}	2
NaCl	Cl^-	1

So, NaCl has lowest anionic charge and maximum coagulating power.

21. (a)

Electrolytic refining:

It is a process of refining a metal (mainly copper and Zinc) by the process of electrolysis.

During electrolysis impure metal is used as anode with a thin strip of pure metal at the cathode. In this setup, an electrolyte (metal salt aqueous solution) depending on the metal is after used.

The pure metal is obtained at the cathode when the electric current of a sufficient voltage is applied by dissolving metal to the anode. It is about 99.95% pure which makes it good product.

22. (c)

Dry ice: Dry ice is common name for solid carbon dioxide (CO_2). It gets this name because it does not melt into a liquid when heated; Instead, it changes directly into a gas (a process known as sublimation).

23. (a)

Amphoteric oxides can react with both acids and bases to form salt and water as the main products.

Element that form amphoteric oxides have some metals and some of the non-metals characteristics.

Amphoterism based on oxide's oxidation state.

Both Cr_2O_3 and V_2O_5 are amphoteric in nature because of their high oxidation state.

V_2O_5 reacts with alkalies as well as acids to give VO_4^{3-} and VO_4^{+} respectively.

Cr_2O_3 (chromium (III) oxide) insoluble in water but dissolves in acid to produce hydrated chromium ions,$[Cr(H_2O)_6]^{+3}$ which react with base to give slat of $[Cr(OH)_6]^{3-}$

It dissolved in concentrated alkali to yield cromite ions $[CrO_2]^-$.

24. (a)

First write the name of cationic part and then anionic part. After that ligands name in alphabetical order and then name of metal atom.

For ambidentate ligand here we use –N– before the name of metal ion, because of the nitrogen of – NO_2 ligand is directly attached to the cobalt metal.

After the name of metal ion with its oxidation state in roman number and then anionic ligand name

$[CO(NH_3)_4Cl(NO_2)]Cl$

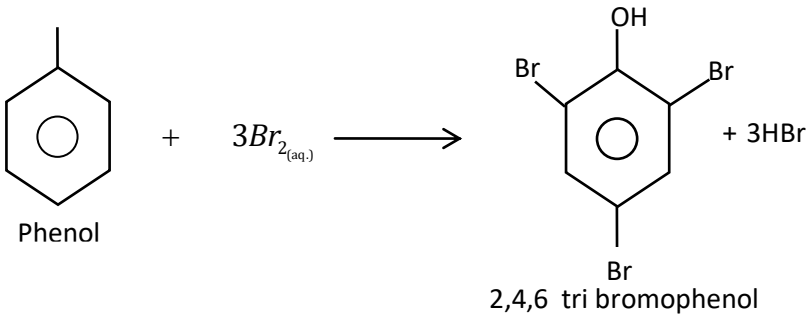
$x + (0)\ 4 + (-1) + (-1) = +1$

$x = +3$

IUPAC name of this complete is tetraamminechloridonitrito –N–cobalt (III) chloride.

25. (a)
Polarity results from the uneven partial charge distribution between various atoms in a compound. More the electro negativity difference between two atoms more will be the polarity of that compound.
In alkyl halide, the carbon–hydrogen bond is polar because all the halogen is more electronegative than carbon. Due to high electronegativity of halogens they pull electrons of carbon towards them so, on carbon a small positive charge (δ+) and on halogen partial negative charge (δ–) developed.
As the Alkyl halides have polar bond they are not soluble in water not form H-bond also.

26. (a)
Bromine water test (Saturation test) :-
The bromine water test used to identify the alkene or alkane functional groups.
phenols undergo substitution reaction in the presence of bromine water to give a brominated product. During the process, bromine water is decolorized and gives white precipitate.



Ethanol (C_2H_5OH) is a saturated compound; it does not react with a bromine water solution.

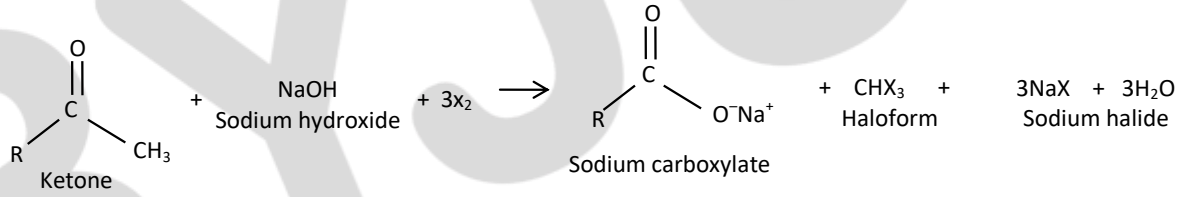
27. (a)

Haloform reaction:

Haloform reaction is a chemical reaction where haloform (R–X) are produced by the complete halogenations of acetone ($CH_3–CO–CH_3$). Acetophenone ($PHCOCH_3$), or acetaldehyde ($HCOCH_3$) in the presence of a base.

The aldehyde or ketone must have a methyl group (α–hydrogen) next to the carbonyl.

Haloform reaction:



28. (b)

$$R - \overset{+}{N} \equiv N$$

Diazonium salts are usually prepared by the reaction (diazotization) of primary amines with nitrous acid; their most striking property is their stability.

The aliphatic diazonium salts exist only as transient intermediates quickly decomposes into a nitrogen molecular and a carbonium ion ; Aromatic diazonium salts are stable enough to be isolated but react readily either by loss of nitrogen or by formation of azo compounds

$$ArNH_2 \xrightarrow[H_3O^+]{NaNO_2} Ar\overset{+}{N}\equiv N$$

Aromatic amine — Aryldiazonium salt

$C_6H_5N_2^+X^-$ is more stable in comparison to $C_6H_5N_2^+X^-$ because of resonance stabilized due to direct bond with nitrogen.

29. (d)
DNA is made up of nucleotides. A nucleotide has two compounds: a backbone, made from the sugar deoxyribose, phosphate groups, and nitrogenous bases, known as cytosine, thymine, adenine, and guanine.
Adenine and Uracil are the main basic building block of RNA.

30. (b)

Polyamide polymers are the poly condensation product of a diacid chloride and a diamine.

Nylon-6, 6 is a member of polyamide group.

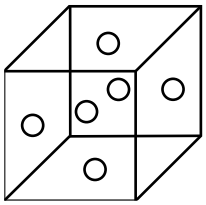
The structural unit of polyamide is joined together by an amide

$\left[\begin{matrix}NH-C-\\ \quad\quad\| \\ \quad\quad O\end{matrix}\right]$ groups.

$$n\,HOOC(CH_2)_4COOH + n\,H_2N(CH_2)_6NH_2 \rightarrow \left[-NH-(CH_2)_6-NH-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}-\right]$$

Adipic acid — hexamethylenediamine — Nylon–6,6

31. (c)
In FCC arrangement, there are eight atoms at corners of the unit cell, and one atom centered and six in each of the faces. The atoms in the face are shared with the adjacent unit cell. So, in FCC unit cell is shared equally six unit cell.



Atoms present on the six faces of the face centered unit cell.

32. (a)
Given
Concentration = 0.01 m

$\wedge_m = k/c$ k = specific conductance

$\wedge_m$ = molar conductance

$\wedge_m = \frac{K \times 100}{m}$ C = concentration (mol/L)

$$\frac{\text{molar condutance}}{\text{specific conductance}} = \frac{\wedge_m}{k} = \frac{1000}{m} = \frac{1000}{0.01}$$

Ratio of

$$\frac{\wedge_m}{k} = 10^{+5}\ \text{cm}^3\ \text{mol}^{-1}$$

33. (c)
Isotonic solution
Two solutions having the same osmotic pressure across a semipermeable membrane is referred to as an isotonic solution
It has the same osmolarity (solute concentration) as another solution.

34. (d)
Given that
Temperature coefficient =2

T_1 = 30°C

T_2 = 90° C

Rate of the reaction (R) = $\left(\text{Temperature coefficient}\right)^{\frac{\Delta T}{10}}$

$= (2)^{\frac{90-30}{10}}$

$= (2)^6$

R = 64

So, the rate of reaction is increased by 64 times.

35. (c)
Gold sol is example of multi molecular colloid. In multi molecular colloid many particles (atoms or small molecules) of the dispersed phase aggregate together to form species having the size of a colloidal particle (1–1000 nm).

36. (c)

Major impurities in bauxite are iron oxides [hematite (Fe_2O_3) & goethite] , silicon dioxide, the clay mineral kaolinite as well as small amount of anatase (TiO_2)

37. (d)

Thermal decomposition of ammonium dichromate:

$$\underset{\text{ammonium dichromate}}{(NH_4)_2Cr_2O_7} \xrightarrow{\Delta} \underset{\text{Nitrogen gas}}{N_2} + 4H_2O + \underset{\text{Chromium(III) oxides}}{Cr_2O_3}$$

Treatment of aqueous solution of NH_4Cl and $NaNO_2$

$$NH_4Cl + NaNO_2 \rightarrow NaCl + N_2\uparrow + 2H_2O$$

Thermal decomposition of sodium azide:

$$2NaN_3 \xrightarrow{\Delta} 3N_2\uparrow + 2Na_{(s)}$$

From the above decomposition of sodium azide gives maximum and very pure N_2 gas.

38. (b)

The lanthanides consist of the elements in the f-block of period six, in the periodic table. Lanthanide's most common and stable oxidation state is +3. It is obtain by removing three outer most electrons from 6S orbital and one electron from 4f orbital. Removal of one more electron from 4f sub-shell is difficult because of high energy difference.

39. (b)

The electronic configuration of X after removal of three electrons is X^{+3}: [Ar] $3d^5$.

So, before removal of electrons. This compound contain X = 18 + 5 + 3 = $26e^-$.

Atomic number of X is 26.

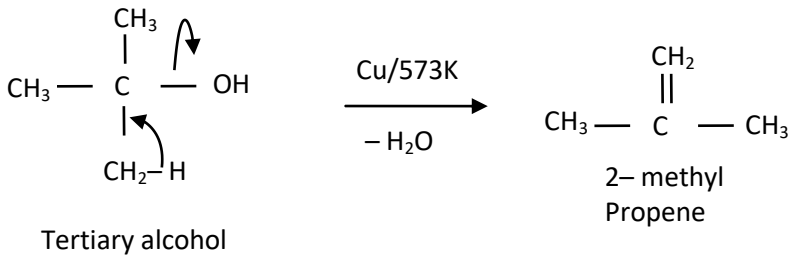
40. (a)

$$\underset{\text{n-propyl chloride}}{n=(H_3C-H_2C-H_2C-H_2C-Cl)} \xrightarrow[\text{dry ether}]{Na} \underset{\text{n-hexane}}{CH_3-CH_2-CH_2-CH_3}$$

n–propyl chloride reacts with sodium metal in presence of dry ether to give n-hexane, this reaction is known as wurtz reaction.

41. (c)

When the tertiary butyl alcohol vapors pass through heated copper, 2– methyl propene is formed with removal of one water molecule.

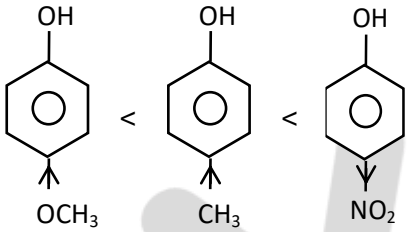


Tertiary alcohol

2– methyl Propene

According to saytzeff rule more substituted alkene will be more stable.

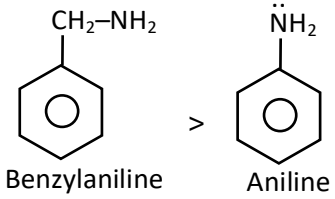
42. (c)



P–nitro phenol is more acidic due to –I effect of –nitro group which make the benzene ring e^- deficient, so the H^+ ion removed easily. On the other hand p-methoxyphenol is less acidic due to high mesomeric effect of the $-OCH_3$ groups in comparison to the weak hyper conjugation effect of the $-CH_3$ group.

43. (d)

Benzyl aniline is more basic than aniline

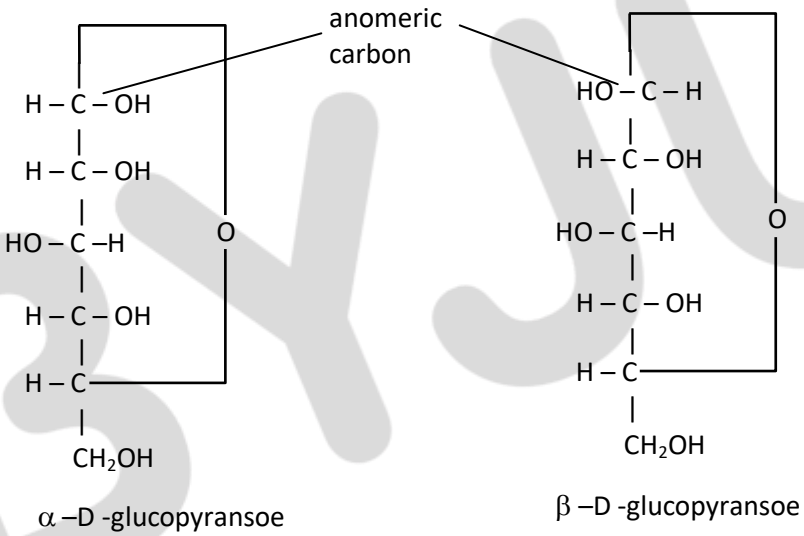


Basic character of a compound depends on availability of lone pair of electrons.

In aniline, lone pair of nitrogen atom delocalized to take part in resonance and not available to donate but in case of benzyl aniline nitrogen attached to the methyl group not to the benzene ring and do not take part in resonance so, available to donate.

44. (b)

D –glucopyranose : Anomers



45. (c)

Branched chain polymers are those polymers in which the monomers are joined to form long chain with side chains or branches of different lengths.

These branched chain polymers are irregularly packed and therefore, they have low density, low boiling point and low melting point.

So, the branched chain polymer is low density polymer.

46. (c)

Given

Edge length of a cube (a) =300 pm.

Body= $\sqrt{3}.a$.

Diagonal = $\sqrt{3}\times 300$

$=1.732\times 300$

$= 519.6$ pm

Body diagonal would be 519.6 pm.

47. (a)

To conduct electricity compound must have free electrons or ions. In solid state NaCl compound has fixed composition of ions. So these ions do not move from its place to conduct electricity. But in molten state (moist) ions are free to move to conduct electricity. So, in molten state they are good conductor of electricity.

48. (d)

Nernt's equation

For a cell reaction:

$$E^{\circ}_{Cell} = \frac{2.303RT}{nF}\log k$$

$$E^{\circ}_{Cell} = \frac{2.303\times 8.314\times 298}{2\times 96500}\log k$$

$$E^{\circ}_{Cell} = \frac{0.059}{2}\log k$$

F (faraday) =96500

R = gas constant (8.314 J mol^{-1} k^{-1})

T = Temperature (k)

n = charge

given

$E^{\circ}_{Cell} = 0.3\,V$

0.3 = 0.0295 log k or

0.3 = 0.03 log k

k = antilog 10

$k = 10^{10}$

Equilibrium constant of the reaction is 10^{10}

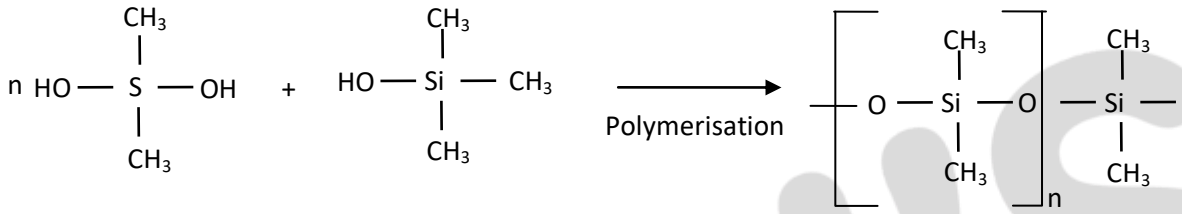
49. (c)

A pseudo final order reaction can be defined as a second order reaction that is made to behave like a first order reaction.

This reaction occurs when one reacting material is present in great excess.

In pseudo first order reaction rate is depends on the concentration of reaction present in excess.

50. (a)



During polymerization of organosilicons $(CH_3)_3$ SiCl block the end terminal to control the chain length of organo silicon polymers

51. (b)

PbO_2+ Conc. $HNO_3 \longrightarrow Pb(NO_3)_2 + H_2O + O_2$

When lead oxide reacts with concentrated nitric acids, removal of O_2 occurs due to the reduction of PbO_2.

52. (c)

In alkaline medium $KMnO_4$ act as oxidizing agent. When alkaline $KMnO_4$ is treated with KI, Iodide ion oxidized to iodate ion

$$2MnO_4^- + \underset{(\text{iodide ion})}{I^-} + H_2O \rightarrow 2MnO_4 + 2\bar{O}H + \underset{(\text{iodate ion})}{IO_3^-}$$

53. (a)

Linkage isomerism:

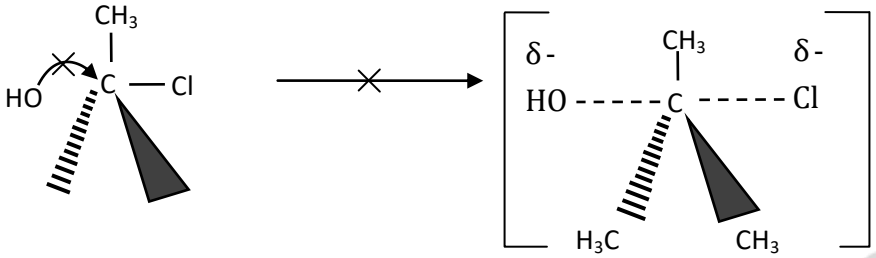
When two complexes differing only in the mode of attachment of an ambidentate ligand to the metal atom.

$[Fe(NO_2)_3Cl_3]$ and $[Fe(O–NPO)_3Cl_3$ are pair of linkage isomers, in which ligand is joined to iron atom through nitrogen or oxygen, with the formulas NO_2^- (nitro) and (ONO^-) (nitrito), respectively.

54. (d)

Tertiary alkyl halides do not react by an SN^2 mechanism because the substance blocks the approach of the nucleophile.

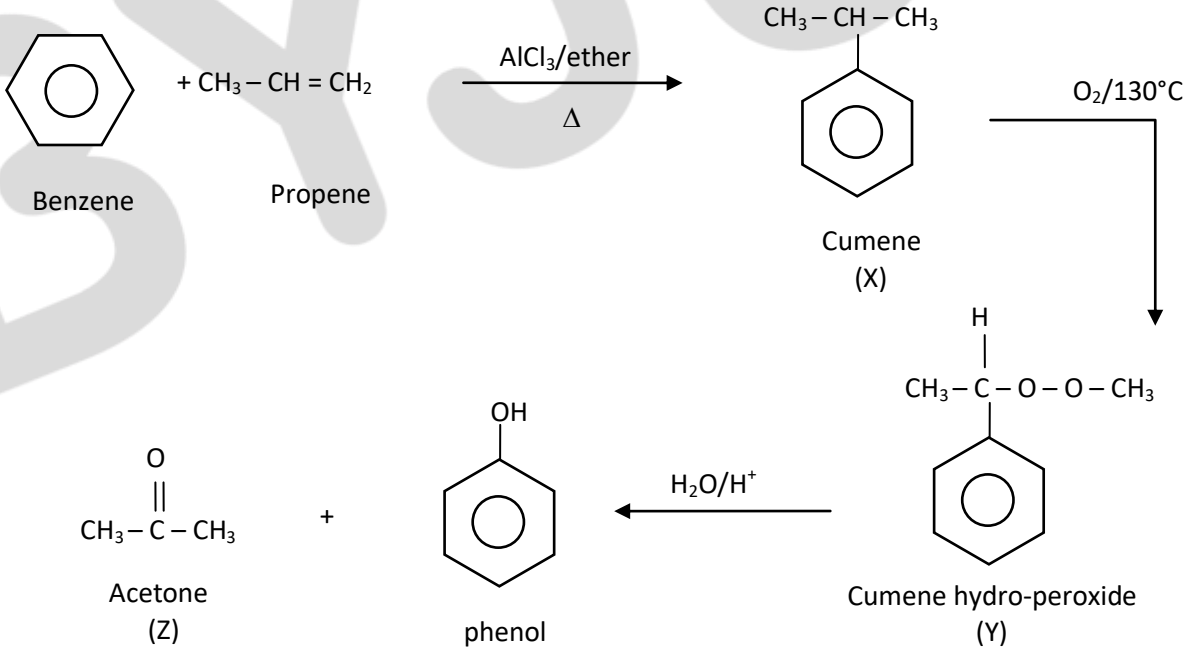
The trigonal bipyramidal transition state cannot form because it is too statically crowded.



A tertiary alkyl halide

Sterically hindered trigonal Bipyromidal transition State an SN^2 reaction does not occur

55. (a)



Benzene

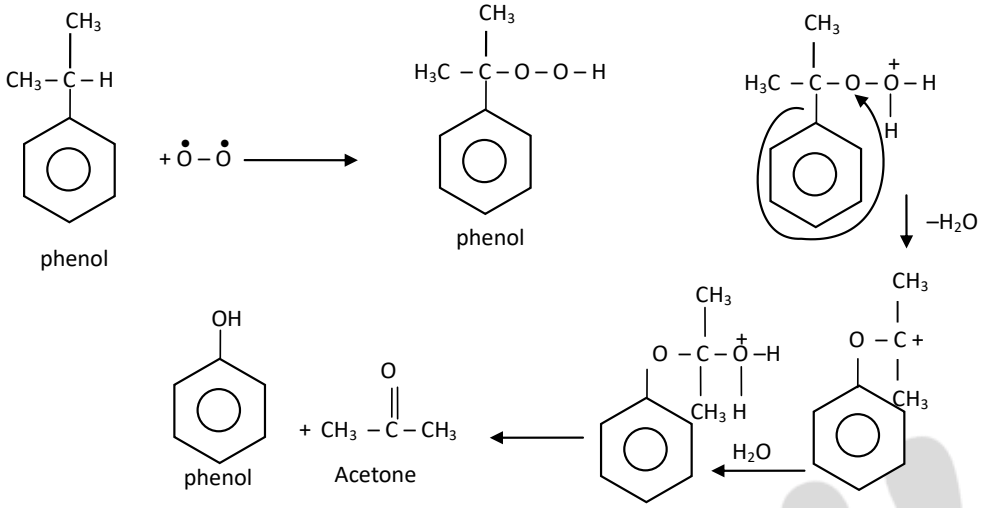
Propene

Cumene (X)

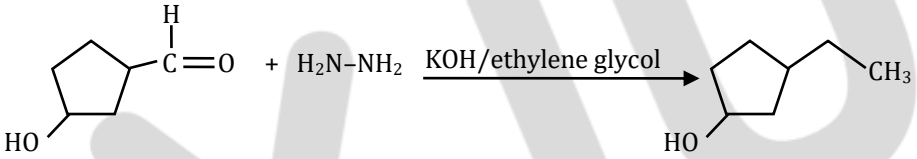
Cumene hydro-peroxide (Y)

Acetone (Z)

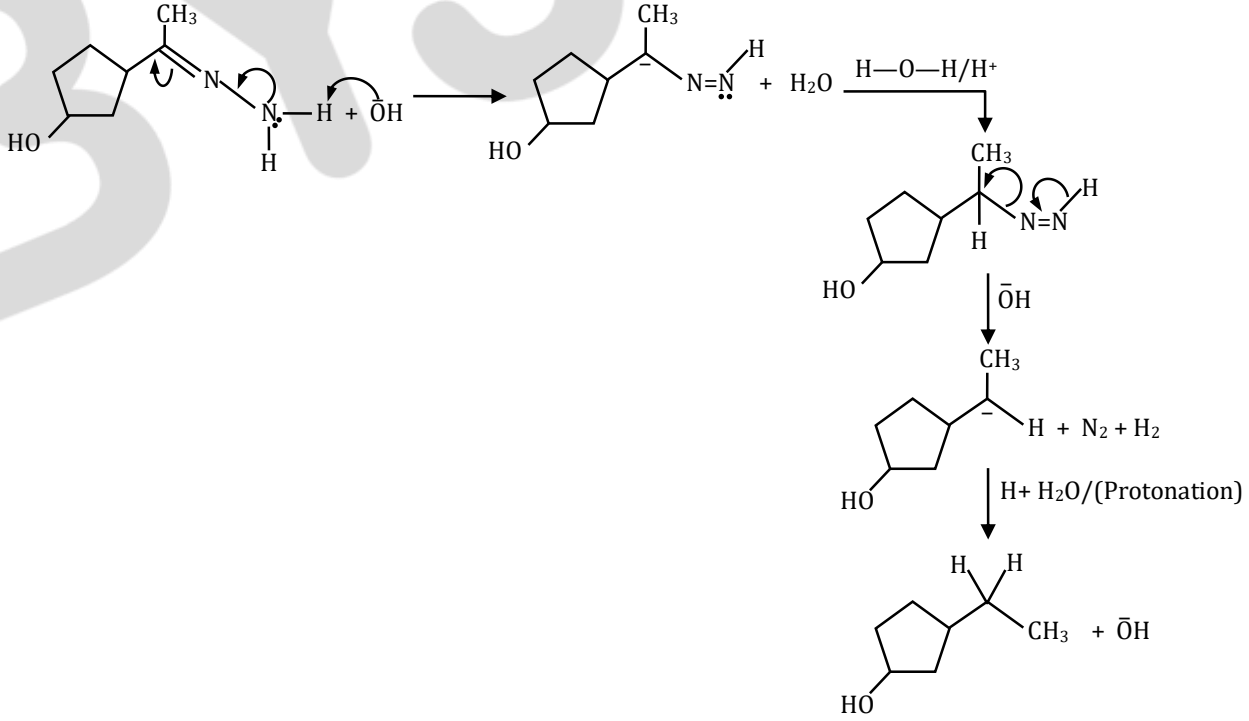
phenol



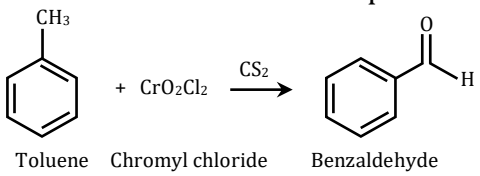
56. (b)
Ketones can be converted to a hydrazine derivative by reaction with hydrazine. These "Hydrazones" can be further converted to the corresponding alkane by reaction with base and heat.



Mechanism:

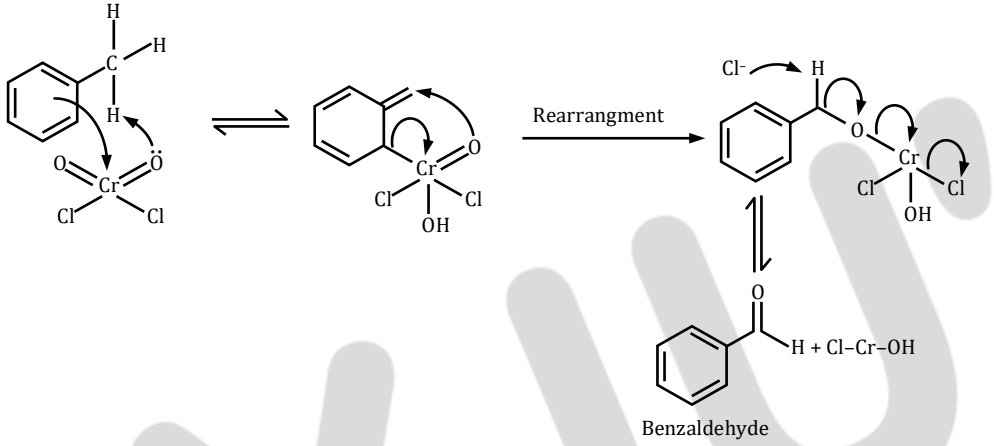


57. (b)
Toluene can be oxidized to Benzaldely using Etard reaction. The reaction begins with toluene with chromyl chloride, forming an Etard complex.
Reducing condition provided by saturated aqueous Sodium sulphide prevents further oxidation of the Etard Complex into a carboxylic acid.



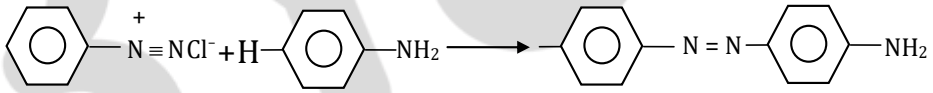
Toluene Chromyl chloride Benzaldehyde

Mechanism:



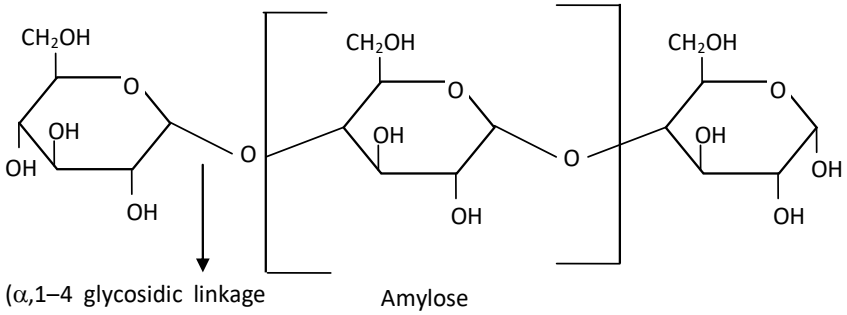
Benzaldehyde

58. (b)
Some liquid phenyl amine (aniline) is added to a cold solution of benzene diazonium chloride, and the mixture is shaken vigorously. A yellow solid is produced.



Benzene diazonium Chloride — Anline — P– Aminoazo benzene (aniline yellow azodye)

59. (d)
Amylase is a polysaccharide made of α–D-glucose bonded to each other by a (1, 4) glycoside bond



(α,1–4 glycosidic linkage — Amylose

Amylase is linear polymer of glucose, arrange in three dimensional helical structures.

60. (c)

Ziegler –Natta catalyst is used for the production of high density polyethylene. One of the common example is mixture of titanium tetrachloride ($TiCl_4$) and trimethyl aluminum ($Al(C_2H_5)_3$)