CUET Chemistry Solved Paper-2022
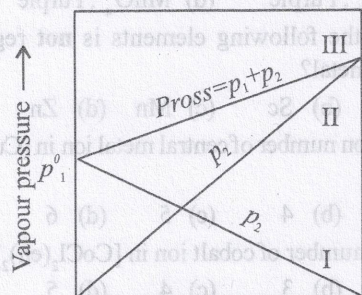
1. Which of the following shows both Frenkel as well as Schottky defects?
   (a) AgBr
   (b) NaCl
   (c) KCl
   (d) AgCl

2. Which of the following is correct for a hexagonal crystal system?
   (a) $a = b \neq c, \alpha = \beta = \gamma = 90°$
   (b) $a \neq b \neq c, \alpha = \beta = \gamma = 90°$
   (c) $a = b \neq c, \alpha = \beta = 90°, \gamma = 120°$
   (d) $a \neq b \neq c, \alpha = \gamma = 90°, \beta \neq 90°$

3. Efficiency of packing in body centred cubic structures is found to be
   (a) 33%
   (b) 74%
   (c) 52.4%
   (d) 68%

4. Observe the given graph and identify the correct statement for the solution.

   (a) Component 2 is more volatile than component 1
   (b) Component 1 is more volatile than component 2
   (c) Boiling point of component 1 is lower than that of component 2
   (d) Volatility of a component depends upon its mole fraction

5. 18 g of a non-volatile solution A is dissolved in 1 kg of water, the boiling point of water is raised to 373.51 K. Given K_b for water is 0.52 K kg mol^{-1}, boiling point for water is 373.15 K at 1.013 bar pressure.
   The molecular weight of the solid A is
   (a) 58.0 g mol^{-1}
   (b) 26.0 g mol^{-1}
   (c) 55.0 g mol^{-1}
   (d) 110.0 g mol^{-1}

6. Based on solute solvent interactions, arrange the following in the order of increasing solubility in n-octane.
   A. Cyclohexane
   B. KCl
   C. CH_3OH
   D. CH_3NH_2
   E. CH_3CN

   Choose the correct answer from the options given below.
   (a) $A < B < C < D < E$
   (b) $B < C < E < D < A$
   (c) $C < B < A < E < D$
   (d) $B < C < D < E < A$

7. In a pseudo first order reaction, the rate constant
   (a) Is independent of the concentration of reactants
   (b) Depends on concentration of reactants present in small quantity
   (c) Depends on temperature
   (d) Depends on concentration of reactants present in excess

8. When the temperature of a reaction is increased by 20°C, the rate of reaction increases by
   (a) 3 times
   (b) 4 times
   (c) 2 times
   (d) 1.5 times

9. Observe the given graph. What will be the unit for the rate constant?
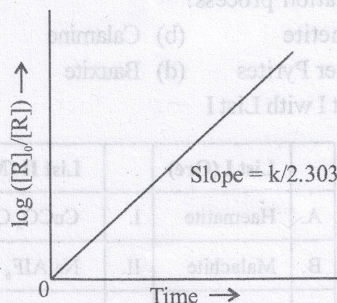
   (a) mol L^{-1} s^{-1}
   (b) mol^{-1} L s^{-1}
   (c) s^{-1}
   (d) mol^{-2} L^2 s^{-1}

10. For a chemical reaction :
    A+B→Products

Experiment	$\dfrac{[A]}{mol\ L^{-1}}$	$\dfrac{[A]}{mol\ L^{-1}}$	Initial rate $\dfrac{}{mol\ L^{-1}s^{-1}}$
1.	0.1	0.1	2.0×10^{-3}
2.	0.2	0.2	4.0×10^{-3}
3.	0.1	0.2	2.0×10^{-3}

Which is the overall order of chemical reaction?
   (a) 3
   (b) 1
   (c) 2
   (d) 0

11. Match List-I with List-II.

List-I (Example of colloidal system)		List-I (Types of colloid)	
A.	Smoke	I.	Foam
B.	Cheese	II.	Aerosol
C.	Soap lather	III.	Emulsion
D.	Milk	IV.	Gel

Choose the correct answer from the options given below:
(a) A-II, B-IV, C-I, D-III
(b) A-I, B-II, C-III, D-IV
(c) A-I, B-III, C-II, D-IV
(b) A-IV, B-III, C-II, D-I

12. The colloids that cannot be easily coagulated are
(a) Lyophobic colloids
(b) Lyophilic colloids
(c) Irreversible sols
(d) Associated colloids

13. Which of the following ores can be concentrated using froth floatation process?
(a) Magnetite   (b) Calamine
(c) Copper Pyrites (d) Bauxite

14. Match List I with List I

	List I (Ore)		List II (Molecular form)
A.	Haematite	I.	$CuCO_3.Cu(OH)_2$
B.	Malachite	II.	Na_3AIF_6
C.	Calamine	III.	Fe_2O_3
D.	Cryolite	IV.	$ZnCO_3$

Choose the correct answer from the options given below :
(A) A(III), B(I), C(IV), D(II)
(B) A(I), B(III), C(I), D(IV)
(C) A(IV), B(II), C(I), D(III)
(D) A(II), B(IV), C(III), D(I)

15. The correct order of boiling points for hydrogen halides is
A. HCl   B. HBr
C. HF   D. HI
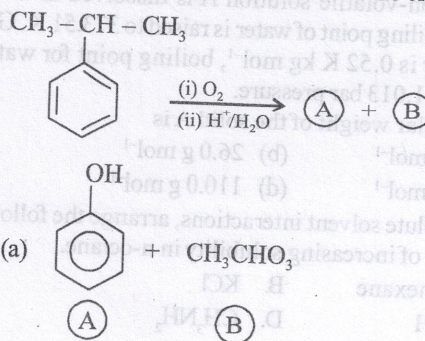Choose the correct answer from the options given below:
(a) HF < HI < HBr < HCl
(b) HF < HCl < HBr < HI
(c) HF > HCl > HBr > HI
(d) HF > HI > HBr > HCl
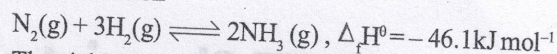
16. In the reaction
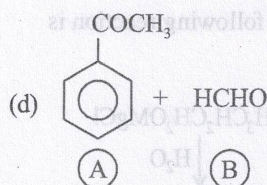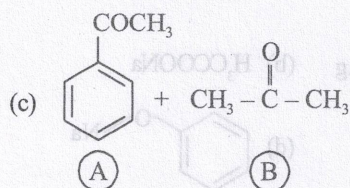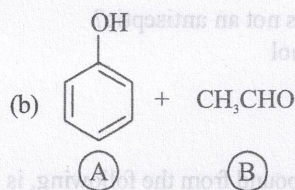$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, $\Delta_f H^0 = -46.1 kJ mol^{-1}$
The yield of ammonia is expected to be maximum at
(a) High temperature and low pressure
(b) High temperature and high pressure
(c) Low temperature and high pressure
(d) Low temperature and low pressure

17. The structure of SF_4 is
(a) Square planar
(b) Tetrahedral
(c) Trigonal bipyramidal
(d) Octahedral

18. Which of the following interhalogen compound does not exist?
(a) BrF   (b) BrF_3
(c) BrF_2 (d) BrF_5

19. The electronic configuration of Cu in +1 oxidation state is
(a) $[Ar]3d^{10}$ (b) $[Ar]3d^94s^1$
(c) $[Ar]3d^{10}4s^1$ (d) $[Ar]3d^94s^2$

20. Chemical formula and colour of manganate ion is___
(a) MnO_4^{2-}, Green   (b) MnO_4^-, Green
(c) MnO_4^-, Purple   (d) MnO_4^{2-}, Purple

21. Which of the following elements is not regarded as a transition metal?
(a) Cu   (b) Sc   (c) Mn   (d) Zn

22. Coordination number of central metal ion in $[Cu(H_2O)_4en]^{2+}$ is
(a) 3   (b) 4   (c) 5   (d) 6

23. Oxidation number of cobalt ion in $[CoCl_2(en)_2]^+$ will be
(a) 2   (b) 3   (c) 4   (d) 5

24. Number of ions produced on hydrolysis of $Cr(NH_3)_4Cl_3$ reacting with $AgNO_3$ to give 1 mole of AgCl, will be
(a) 2   (b) 3   (c) 4   (d) 5

25. Hybridisation state of central metal ion in $[Fe(NH_3)_4(en)]^{2+}$ will be
(a) sp^3 (b) dsp^2
(c) d^2sp^3 (d) sp^3d^2

26. What are the products obtained in the chemical reaction?

$CH_3-CH-CH_3$ ... $\xrightarrow[(ii) H^+/H_2O]{(i) O_2}$ Ⓐ + Ⓑ

(a) ... + CH_3CHO_3
Ⓐ   Ⓑ

(b)

   + CH_3CHO

   (A)   (B)

(c)

   + $CH_3 - \overset{\overset{O}{\|}}{C} - CH_3$

   (A)   (B)

(d)

   +   HCHO

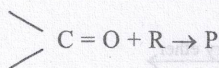   (A)   (B)

27. The IUPAC name of glycerol is
(a) 2-Methyl phenol
(b) Propane-1, 2, 3-triol
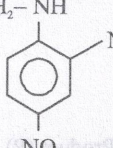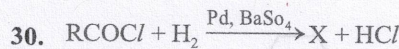(c) 2-Methylpropan-2-ol
(d) 2-Methylcyclopentanol

28. Which set of reagents will be most suitable to bring about the following change?
2, 4, 6-Trinitrochlorobenzene to picric acid
(a) NaOH, 623 K, 300 atm
(b) Hot conc sulphuric acid
(c) Warm water
(d) Acidified water

29. Match List I with List II

$$\overset{\diagdown}{\underset{\diagup}{C}}=O + R \rightarrow P$$

Reagent (R)	Name of the product formed on addition to carbonyl compounds (P)
A. $NH_2NH\,CO\,NH_2$	I. Imine
B. NH_2-OH	II. Hydroazone
C. $NH\overset{\cdot\cdot}{N}H_2$	III. 2, 4-Dinitrophenyl-hydrazone
D. NH_2-NH	IV. Semicarbazone

Choose the correct answer from the options given below:
(a) A-I, B-III, C-IV, D-II
(b) A-IV, B-I, C-II, D-III
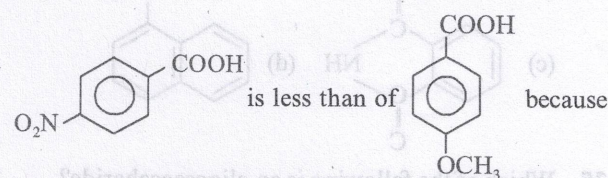(c) A-II, B-III, C-IV, D-I
(d) A-II, B-III, C-I, D-IV

**30.** $RCOCl + H_2 \xrightarrow{Pd,\ BaSo_4} X + HCl$
X can be
A. CH_3COCH_3

B.

C.

D. $CH_3CH_2COCH_3$

E.
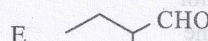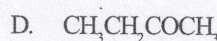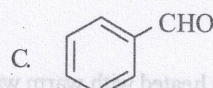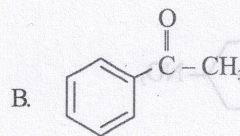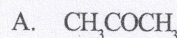
Choose the correct answer from the options given below:
(a) A, B and C only   (b) B, C and D only
(c) C and E only   (d) B and D only

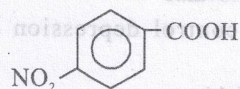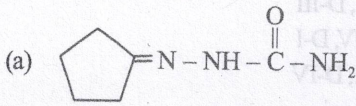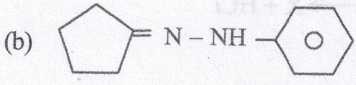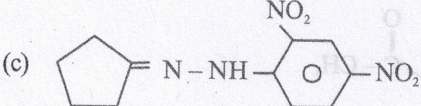**31.** pK_a value of

 is less than of because
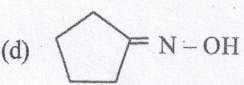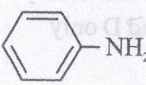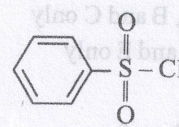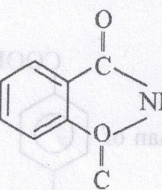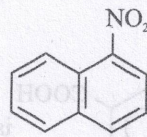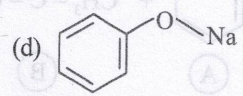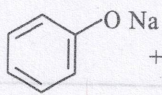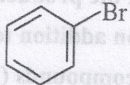
(a) NO_2 is an electron donating group which increases electron-density on ring.
(b) NO_2 is an electron-withdrawing group which decreases electron-density on ring.
(c) is less acidic than
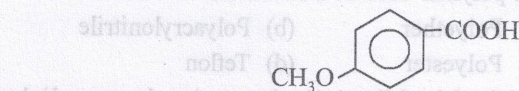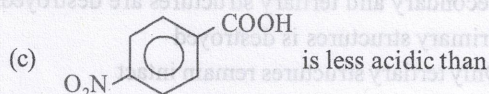
(d) Hyperconjugation is more in

32. The structure representing semicarbazone of cyclopentanone correctly is:

(a) $=N-NH-\overset{\overset{O}{\|}}{C}-NH_2$

(b) $=N-NH-\bigcirc$

(c) $=N-NH-$ (dinitrophenyl with NO_2, NO_2)

(d) $=N-OH$

33. Benzenediazonium chloride when heated with warm water, would produce
(a) benzene   (b) phenol
(c) chlorobenzene   (d) aniline

34. The reagent used in the Hinsberg test of primary, secondary and tertiary amines, is

(a) $\bigcirc-NH_2$ (b) $\bigcirc-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-Cl$

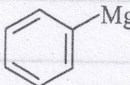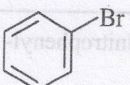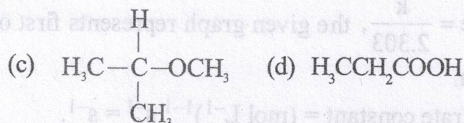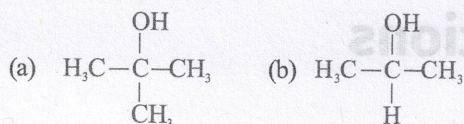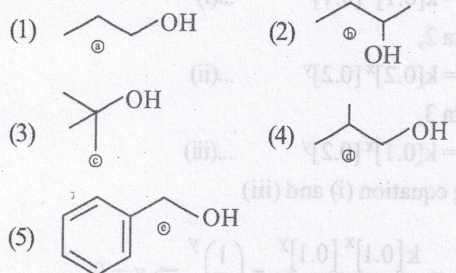(c) (benzene ring with $\overset{O}{C}$, NH, O, C bridged)   (d) (naphthalene with NO_2)

35. Which of the following is an oligosaccaharide?
(a) Starch   (b) Glucose
(c) Ribose   (d) Maltose

36. During denaturation of proteins
(a) Secondary and tertiary structures remain intact
(b) Secondary and tertiary structures are destroyed
(c) Primary structures is destroyed
(d) Only tertiary structures remain intact

37. The polymer used as a substitute for wool is
(a) Polyether   (b) Polyacrylonitrile
(c) Polyester   (d) Teflon

38. Which of the following polymers involve cross linkages?
(a) Bakelite   (b) PVC
(c) Nylon 6   (d) Novalac

39. The tranquilizer used to control depression and hypertension is
(a) Equanil   (b) Seldane
(c) Maprobamate   (d) Asprin

40. Which of the following is not an antiseptic?
(a) 1% solution of phenol
(b) Tincture of Iodine
(c) Dettol
(d) Iodoform

41. The organometallic compound from the following, is

(a) $H_3C-\overset{\overset{O}{\|}}{C}-O\,Ag$ (b) $H_3CCOONa$

(c) H_3CMgBr (d) $\bigcirc-O-Na$

42. The products formed in the following reaction is

$$CH_3CH_2MgCl + H-\overset{\overset{O}{\|}}{C}-H \rightarrow CH_3CH_2CH_2OMgCl$$

$$\downarrow H_2O$$

$$CH_3CH_2CH_2OH + Mg(OH)Cl$$

$$H_3CCH_2MgCl + \overset{\overset{O}{\|}}{C}\underset{H\quad H}{} \xrightarrow{H_2O}$$

(a) $H-\overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}}-CH_2CH_3,\ MgCl(OH)$

(b) $H_3CCH_2OH,\ HCOOH$

(c) $H_3CCH_3,\ MgCl(OH)$

(d) $H_3CCH_2CH_3,\ MgCl(OH)$

43. The correct equation from the following representing the preparation of phenyl magnesium bromide is

(a) $\bigcirc-ONa + MgBr_2 \xrightarrow{dry\ ether}$

(b) $\bigcirc-Br + Mg \xrightarrow{dry\ ether}$

(c) $\bigcirc-Mg + Br_2 \xrightarrow{alcohol}$

(d) $\bigcirc-Br + MgCl_2 \xrightarrow{acetic\ acid}$

44. The product (P) formed in the following reaction is

$$\overset{\overset{O}{\|}}{\underset{H_3C\quad H}{C}} + H_3CMgBr \xrightarrow[(ii)\ H_3O^+]{(i)\ dry\ ether}$$

Product (P) + MgBr (OH)

(a) $H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$
(b) $H_3C-\underset{\underset{H}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$

(c) $H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{H}{|}}{C}}-OCH_3$
(d) H_3CCH_2COOH

45. The number of alcohols which can be produced from Grignard reagent and formaldehyde from the following is

(1) ⊚ $\diagdown\diagup\diagdown$ OH

(2) ⊚ $\diagup\diagdown\diagup$ OH

(3) ⊚ $\diagup\overset{OH}{\diagdown}$

(4) ⊚ $\diagdown\diagup\diagdown$ OH

(5) ⊚ $\diagdown$ OH (benzene ring)

Choose the correct answer from the options given below.

(a) 5 (b) 2
(c) 4 (d) 3

46. The strongest oxidizing agent amongst the following Ag^+, Cu^{2+}, Fe^{2+}, Pb^{2+} is
(a) Ag^+ (b) Cu^{2+}
(c) Fe^{2+} (d) Pb^{2+}

47. Amongst the following the weakest reducing agent is
(a) Mg (b) Pb
(c) Fe (d) Cu

48. The emf of the cell $Ag(s)\,|\,Ag^+(1m)\,||\,Pb^{2+}(1m)\,|\,Pb(s)$, is
(a) 0.67 V (b) 1.06 V
(c) −0.93 V (d) 0.93 V

49. When Pb is added to an aqueous solution of a mixture of Cu^{2+} and Mg^{2+} ions, it is
(a) Cu^{2+} is reduced (b) Mg^{2+} is reduced
(c) Cu is reduced (d) Pb^{2+} is reduced

50. The combination of electrodes which will give maximum value of $E°$ cell at 298 K is

	Anode	Cathode
(a)	Ag	Mg
(b)	Cu	Fe
(c)	Mg	Ag
(d)	Pb	Mg

Hints & Explanations

1. **(a)** AgBr shows both, Frenkel as well as Schottky defects.

2. **(c)** For hexagonal crystal system,
$a = b \neq c$ and $\alpha = \beta = 90°, \gamma = 120°$

3. **(d)** For body centred cubic structures, $\sqrt{3}a = 4r$
Packing efficiency

$$= \frac{\text{Volume occupied by two spheres in unit cell} \times 100}{\text{Volume of unit cell}}$$

$$= \frac{2 \times \frac{4}{3}\pi r^3}{a^3} \times 100 = 68\%.$$

4. **(a)** p_1^o and p_2^o are the vapour pressures of pure component 1 and 2 respectively from the plot, $p_2^o > p_1^o$, that means component 2 is more volatile than component 1. So, boiling point of component 1 is greater than component 2.

5. **(b)** $\Delta T_b = K_b \times m$ (where m is molality)
$\Delta T_b = 373.51 - 373.15 = 0.36 \text{ K}$

$$\therefore \quad 0.36 = 0.52 \times \frac{18}{M_A \times 1} \Rightarrow M_A = 26 \text{ g mol}^{-1}$$

6. **(d)** According to like-dissolve-like theory, polar species are soluble with polar solvent and non-polar species are soluble with non-polar solvent. n-octane is non-polar in nature.
(A) Cyclohexane → non-polar
(B) KCl → highly polar
(C) CH_3OH → polar
(D) CH_3NH_2 → polar
(E) CH_3CN → less polar in nature.
So, correct order of solubility in n-octane is
$B < C < D < E < A$

7. **(d)** In a pseudo first order reaction, rate constant depends on concentration of excess reagent.

8. **(b)** For a chemical reaction with rise in temperature by 10°C, the rate constant is nearly doubled. So, for 20°C rise in temperature, the rate constant increases by four times.

9. **(c)** For first order reaction

$$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]} \Rightarrow \log \frac{[R]_0}{[R]} = \frac{k}{2.303} \times t$$

$\therefore$ Slope $= \dfrac{k}{2.303}$, the given graph represents first order reaction.

Unit of rate constant $= (\text{mol L}^{-1})^{1-1} \text{ s}^{-1} = \text{s}^{-1}$.

10. **(b)** Let, rate $= k[A]^x [B]^y$
From data 1 in experiment,
$2 \times 10^{-3} = k[0.1]^x [0.1]^y$ ...(i)
From data 2,
$4 \times 10^{-3} = k[0.2]^x [0.2]^y$ ...(ii)
From data 3,
$2 \times 10^{-3} = k[0.1]^x [0.2]^y$ ...(iii)
Dividing equation (i) and (iii)

$$\frac{2 \times 10^{-3}}{2 \times 10^{-3}} = \frac{k[0.1]^x [0.1]^y}{k[0.1]^x [0.2]^y} = \left(\frac{1}{2}\right)^y \Rightarrow y = 0$$

Put the value of y in equation (i) and (ii),
$2 \times 10^{-3} = k[0.1]^x [0.1]^0$ ...(iv)
$4 \times 10^{-3} = k[0.2]^x [0.2]^0$ ...(v)
Dividing equation (iv) and (v)

$$\frac{1}{2} = \left(\frac{0.1}{0.2}\right)^x \Rightarrow x = 1$$
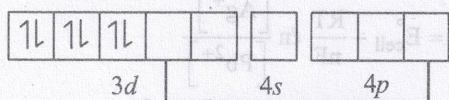
So, overall order $= x + y = 1 + 0 = 1$

11. **(a)** A - (II), B - (IV), C - (I), D - (III)

12. **(b)** Lyophilic colloids are quite stable and cannot be easily coagulated.

13. **(c)** Froth floatation process is generally used for sulphide ores. So, this method is used for copper pyrites (FeS_2)

14. **(a)** A - (III), B - (I), C - (IV), D - (II)

15. **(d)** HF has exceptionally high boiling point due to intermolecular H-Bonding.

16. **(c)** Formation of ammonia is an exothermic process so low temperature favours formation of ammonia forward direction. On increasing pressure, reaction moves in forward direction to increase the yield of ammonia.

17. **(c)** In SF_4, 'S' atom is sp^3d hybridised So, its geometry is trigonal bipyramidal.

18. **(c)** Out of all interhalogen compounds BrF_2 does not exist.

19. **(a)** Electronic configuration of Cu(z = 29) = $[Ar]3d^{10}4s^1$
Electronic configuration of Cu^+ ion = $[Ar]3d^{10}$

20. (a) Magnate ion: MnO_4^{2-}, Green

21. (d) Zn, Cd and Hg of group 12 have full d^{10} configuration in their ground state hence, they are not regarded as transition metals.

22. (d) H_2O is unidentate and ethylene diamine (en) is bidentate in nature. So, coordination number of Cu is 6

23. (b) $[CoCl_2(en)_2]^+$

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

$x = +3$, Oxidation state of cobalt is $+3$.

24. (a) $[Cr(NH_3)_4Cl_2]Cl + AgNO_3 \rightarrow [Cr(NH_3)_4Cl_2]NO_3 + AgCl$

So, on hydrolysis of $[Cr(NH_3)_4Cl_2]Cl$ two ions will be produced.

25. (c) In the given

Electronic configuration of Fe^{2+} ion = $[Ar]3d^6$.
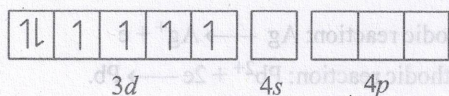
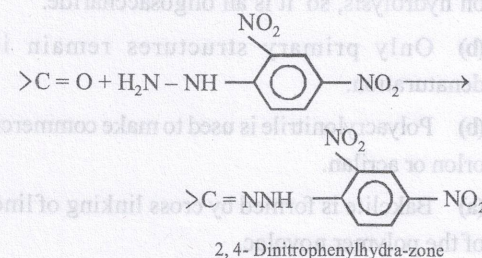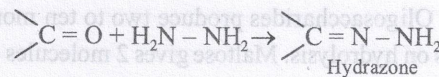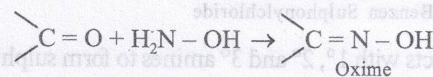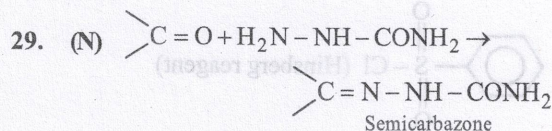As, Ethylene diamine is strong field ligand, so pairing takes place.

So, hybridisation of Fe is d^2sp^3.

26. (N)

27. (b) Glycerol: $CH_2 - OH$
$\quad\quad\quad\quad\quad\quad |$
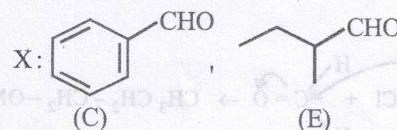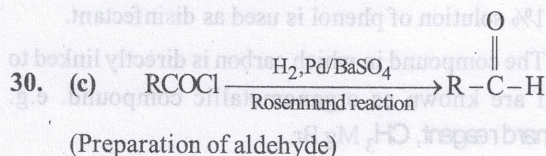$\quad\quad\quad\quad\quad CH - OH$
$\quad\quad\quad\quad\quad\quad |$
$\quad\quad\quad\quad\quad CH_2 - OH$
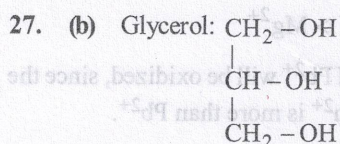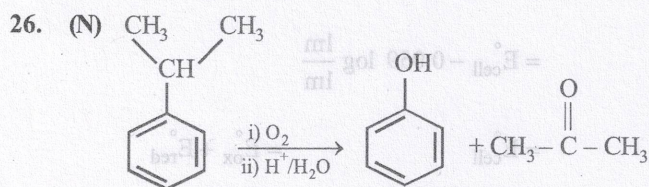
IUPAC Name: Propan - 1, 2, 3 - triol

28. (c)
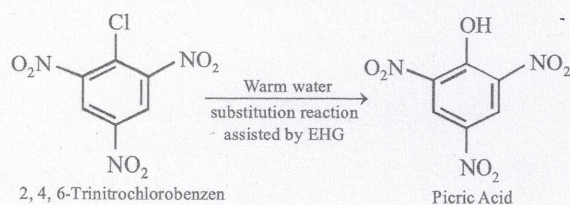
2, 4, 6-Trinitrochlorobenzen   Picric Acid

29. (N)

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

30. (c) $RCOCl \xrightarrow[\text{Rosenmund reaction}]{H_2, Pd/BaSO_4} R - \overset{\displaystyle O}{\overset{\displaystyle \|}{C}} - H$

(Preparation of aldehyde)

31. (b) NO_2 is an electron-withdrawing group which decreases electron density on ring.

is more acidic than
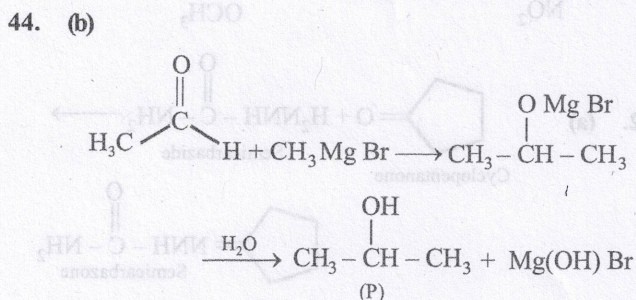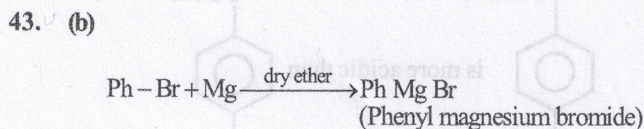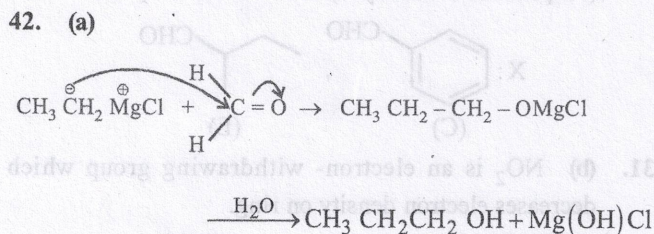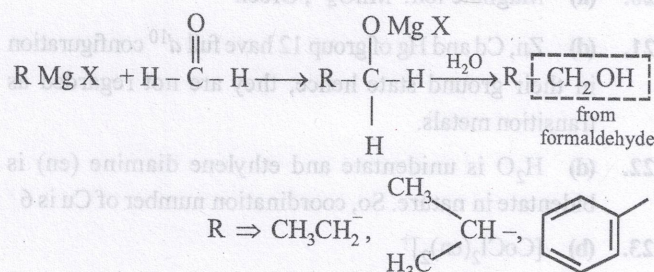
32. (a)

33. (b)

34. (b)
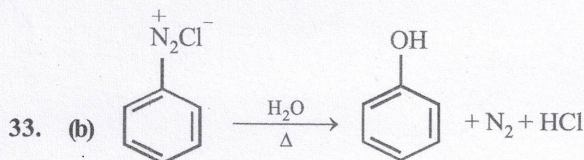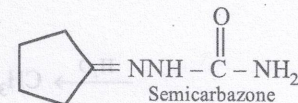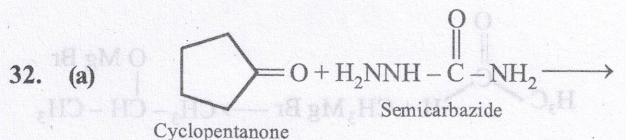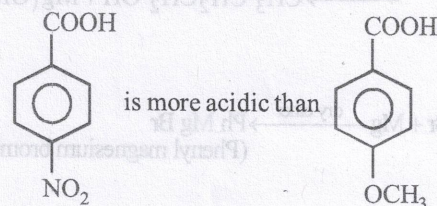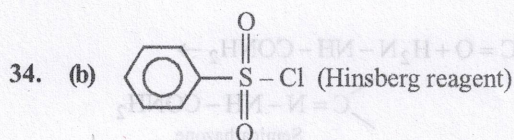
Benzen Sulphonylchloride

It reacts with 1°, 2° and 3° amines to form sulphonamides.

35. (d) Oligosaccharides produce two to ten monosaccharides on hydrolysis. Maltose gives 2 molecules of glucose on hydrolysis, so it is an oligosaccharide.

36. (b) Only primary structures remain intact on denaturation.

37. (b) Polyacrylonitrile is used to make commercial fibre as orlon or acrilan.

38. (a) Bakelite is formed by cross linking of linear chains of the polymer novolac.

39. (a) Equanil

40. (a) 1% solution of phenol is used as disinfectant.

41. (c) The compound in which carbon is directly linked to metal are known as organometallic compound. e.g. Grignard reagent, $CH_3\,Mg\,Br$.
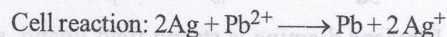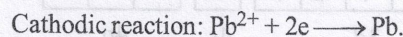
42. (a)

$$\xrightarrow{H_2O} CH_3\,CH_2CH_2\,OH + Mg(OH)Cl$$

43. (b)

$$Ph-Br+Mg\xrightarrow{dry\ ether}Ph\,Mg\,Br$$
(Phenyl magnesium bromide)

44. (b)

$$\xrightarrow{H_2O} CH_3-\underset{\underset{(P)}{OH}}{CH}-CH_3 + Mg(OH)\,Br$$

45. (d)

$$R\,Mg\,X + H-\overset{O}{\underset{}{C}}-H \longrightarrow R-\overset{O\,Mg\,X}{\underset{H}{C}}-H \xrightarrow{H_2O} R-\boxed{CH_2\,OH}$$
from formaldehyde

$$R \Rightarrow CH_3CH_2^-,$$

46. (a) Higher the value of reduction potential, higher will be the oxidizing power of the species.

$$E_{red}^{\circ}:Ag^+ > Cu^{2+} > Pb^{2+} > Fe^{2+} > Mg^{2+}$$

47. (d) Lesser the oxidation potential of the species, lesser will be the reducing power.

$$E_{ox}^{\circ}:Mg > Fe > Pb > Cu$$

48. (c) Anodic reaction: $Ag \longrightarrow Ag^+ + e$

Cathodic reaction: $Pb^{2+} + 2e \longrightarrow Pb$.

Cell reaction: $2Ag + Pb^{2+} \longrightarrow Pb + 2\,Ag^+$

(s) (1m)   (s) (1m)

$$\therefore\ E_{cell} = E_{cell}^{\circ} - \frac{RT}{nF}\,\ell n\,\frac{\left[Ag^+\right]^2}{\left[Pb^{2+}\right]}$$

$$= E_{cell}^{\circ} - \frac{2.303\,RT}{2F}\,2\log\frac{\left[Ag^+\right]}{\left[Pb^{2+}\right]}$$

$$= E_{cell}^{\circ} - 0.059\,\log\frac{1m}{1m}$$

$$= E_{cell}^{\circ} \qquad\qquad = E_{ox}^{\circ} + E_{red}^{\circ}$$

$$= (-0.80 - 0.13)v \qquad = -0.93v$$

49. (a) $E_{red}^{\circ}:Cu^{2+} > Pb^{2+} > Mg^{2+}$

Cu^{2+} will be reduced and Pb^{2+} will be oxidized, since the reduction potential of Cu^{2+} is more than Pb^{2+}.

50. (c) $E_{cell}^{\circ} = E_{Mg/Mg^{2+}}^{\circ} + E_{Ag^+/Ag}^{\circ}$

$$= 2.36 + 0.80 = 3.16\,V$$