

CUET Chemistry Solved Paper-2023

Held on 22 May 2023, (Shift-III)

- Which of the following electrolytes will have maximum coagulating value for AgI/Ag^+ sol?
 - Na_2S
 - Na_3PO_4
 - Na_2SO_4
 - NaCl
- A drop of solution (Volume 0.05 mL) contains 3.0×10^{-6} mole of H^+ ions. If the rate constant of disappearance of H^+ is $1.0 \times 10^{-7} \text{ mol litre}^{-1} \text{ sec}^{-1}$, how long will take H^+ ions to disappear?
 - $6 \times 10^{-8} \text{ s}$
 - $6 \times 10^{-9} \text{ s}$
 - $6 \times 10^{-7} \text{ s}$
 - $6 \times 10^{-10} \text{ s}$
- Identify 'X' along with oxidation state of halogen in the given reaction:

$$3\text{Cl}_2 + 6\text{NaOH} \rightarrow 5\text{NaCl} + \text{X} + 3\text{H}_2\text{O}$$
 (hot and conc.)
 - $\text{NaClO}_2, +3$
 - $\text{NaClO}_3, +5$
 - $\text{NaClO}_2, +7$
 - $\text{NaClO}_3, +1$
- The minimum concentration of an electrolyte in millimoles per litre which is required to cause the precipitation of a sol in two hours is called as:
 - Coagulating value
 - Gold number
 - Congo-rubin number
 - Flocculation
- Match List - I with List - II.

List - I	List - II
(A) Fuel Cell	I. Rechargeable
(B) Mercury Cell	II. Reaction at anode,
	$\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$
(C) Leclanche Cell	III. Cell reaction
	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
(D) Ni-Cd Cell	IV. Gives steady potential

 Choose the correct answer from the options given below:
 - (A)-(I), (B)-(IV), (C)-(III), (D)-(II)
 - (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
 - (A)-(III), (B)-(IV), (C)-(II), (D)-(I)
 - (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
- Which of the following is **not** correct about the order of a reaction?
 - The order of a reaction is the sum of the powers of molar concentration of the reactants in the rate law expression.
 - The order of reaction is always equal to the sum of the stoichiometric coefficient of reactants in the balance chemical equation of a reaction.
 - The order of a reaction can be fractional number.
 - Order of a reaction is experimentally determined quantity.
- Positive carbylamine test is shown by:
 - N-Methylaniline
 - N,N-Dimethylaniline
 - Triethylamine
 - p-Methylbenzylamine
- Which of the following defects are shown by KCl Crystal?
 - Schottky defect
 - Frenkel defect
 - Metal excess defect
 - Metal deficiency defect
 Choose the **correct** answer from the options given below:
 - (A) and (B) only
 - (A) and (C) only
 - (B) and (C) only
 - (B) and (D) only
- Match List - I with List - II.

List - I	List - II
(K_H values / K bar)	(Gas)
(A) 145	(I) CO_2
(B) 89	(II) He
(C) 76.5	(III) N_2 (at 293 K)
(D) 1.67	(IV) N_2 (at 303 K)

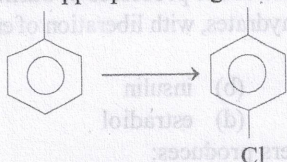
 Choose the correct answer from the options given below:
 - (A)-(II), (B)-(IV), (C)-(III), (D)-(I)
 - (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
 - (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
 - (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
- The half-life of a first order reaction is 25 minutes. Its rate constant is:
 - $2.27 \times 10^{-2} \text{ min}^{-1}$
 - $3.2 \times 10^{-3} \text{ min}^{-1}$
 - $9.2 \times 10^{-2} \text{ min}^{-1}$
 - $2.8 \times 10^{-2} \text{ min}^{-1}$
- The standard reduction potential for $\text{Sn}^{4+}/\text{Sn}^{2+}$ is +0.15 V and for Cr^{3+}/Cr is -0.74 V. These two half-cells, coupled in their standard states, are connected to make a cell. The galvanic cell can be correctly represented by:
 - $\text{Sn}^{2+}(\text{aq})|\text{Sn}^{4+}(\text{aq})||\text{Cr}(\text{s})|\text{Cr}^{3+}(\text{aq})$
 - $\text{Sn}^{4+}(\text{aq})|\text{Sn}^{2+}(\text{aq})||\text{Cr}^{3+}(\text{aq})|\text{Cr}(\text{s})$
 - $\text{Cr}(\text{s})|\text{Cr}^{3+}(\text{aq})||\text{Sn}^{4+}(\text{aq})|\text{Sn}^{2+}(\text{aq})$
 - $\text{Cr}(\text{s})|\text{Cr}^{3+}(\text{aq})|\text{Sn}^{2+}(\text{aq})||\text{Sn}^{4+}(\text{aq})$
- In the cyanide extraction process of silver the oxidising and reducing agents used are:
 - O_2 and CO respectively
 - O_2 and Zn dust respectively
 - H_2O and Zn dust respectively
 - H_2O and NaCN respectively
- Amongst the following, identify the condensation polymer/s:
 - Bakelite
 - Teflon
 - Melamine formaldehyde resin
 - Nylon -2 nylon-6
 - Buna-S

Choose the correct answer from the options given below:

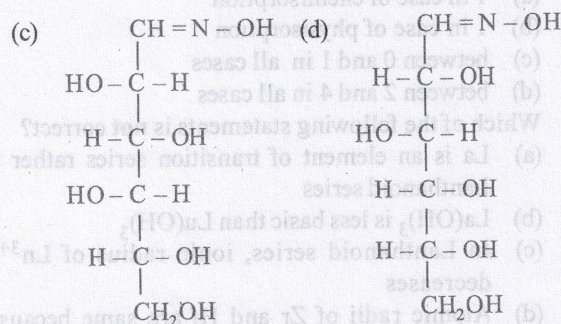
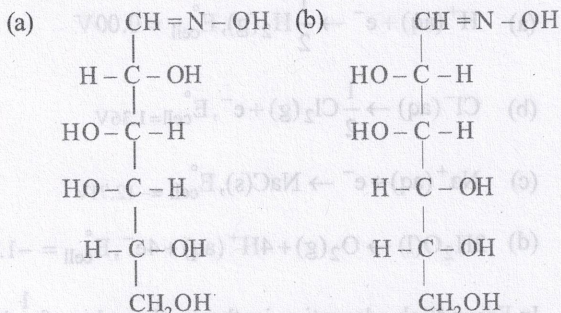
- (a) (B) and (E) only (b) (A), (C) and (D) only
(c) (C) and (D) only (d) (A), (B) and (E) only
14. Glucose does **not** react with:
(a) Conc. HNO_3 (b) Acetic Anhydride
(c) Hydroxylamine (d) Sodium bisulphite
15. An alkyl halide with molecular formula $\text{C}_5\text{H}_{11}\text{Br}$ on dehydrohalogenation give two isomeric alkenes X and Y with formula C_5H_{10} . On reductive ozonolysis X and Y gave four compounds CH_3CHO , $\text{CH}_3-\text{C}(=\text{O})-\text{CH}_3$, $(\text{CH}_3)_2\text{CHCHO}$, HCHO . The alkyl halide is:
(a) 3-Bromopentane
(b) 2-Bromo-3-methylbutane
(c) 2-Bromo-2-methylbutane
(d) 1-Bromo-2,2-dimethylpropane
16. In case of phosphorus, PCl_3 and PCl_5 are possible while nitrogen only forms NCl_3 and not NCl_5 . This due to:
(a) Nitrogen is a gas while phosphorus is a solid at room temperature.
(b) Nitrogen does not have vacant d-orbitals in its atom while phosphorus has vacant d-orbitals.
(c) The electronegativity of nitrogen is higher than that of phosphorus.
(d) The atom of nitrogen is smaller in size than phosphorus.
17. Ammonia is manufactured by:
 $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) \quad \Delta H^\circ_f = -46.1 \text{ kJ/mol}^{-1}$
The various steps involved are:
(A) Condensation of mixture of gases
(B) Passing the gaseous mixture over catalyst
(C) Compression of the mixture of gases
(D) Recirculation of the gaseous mixture
Choose the **correct** answer from the options given below:
(a) (C), (B), (A), (D) (b) (B), (C), (D), (A)
(c) (A), (D), (C), (B) (d) (B), (A), (D), (C)
18. Acetaldehyde and benzaldehyde can be best distinguished by:
(a) 2, 4 DNP test
(b) Tollens' test
(c) Sodium bicarbonate test
(d) Fehling's test
19. The oxoacid of sulphur which has a lone pair of electron on sulphur atom is:
(a) H_2SO_4 (b) H_2SO_3
(c) $\text{H}_2\text{S}_2\text{O}_8$ (d) $\text{H}_2\text{S}_2\text{O}_7$
20. The correct IUPAC name of $\text{CH}_3-\text{CH}(\text{C}_2\text{H}_5)-\text{CH}_2-\text{Br}$ is:
(a) 1-Bromo-2-methylbutane
(b) 1-Bromo-2-ethylpropane
(c) 1-Bromo-2-ethyl-2-methyl ethane
(d) 2-Methyl-1-bromobutane

21. The hormone which control the processes of burning of fats, proteins and carbohydrates, with liberation of energy in the body is:
(a) thyroxine (b) insulin
(c) adrenaline (d) estradiol
22. Basic hydrolysis of esters produces:
(a) Carboxylates (b) Carboxylic acids
(c) Aldehydes (d) Ketones
23. The cell reaction occurring at anode in the electrolysis of aqueous NaCl solution is:
(a) $\text{H}^+(\text{aq}) + \text{e}^- \rightarrow \frac{1}{2} \text{H}_2(\text{g}), E^\circ_{\text{cell}} = 0.00 \text{ V}$
(b) $\text{Cl}^-(\text{aq}) \rightarrow \frac{1}{2} \text{Cl}_2(\text{g}) + \text{e}^-, E^\circ_{\text{cell}} = 1.36 \text{ V}$
(c) $\text{Na}^+(\text{aq}) + \text{e}^- \rightarrow \text{Na}(\text{s}), E^\circ_{\text{cell}} = -12.71 \text{ V}$
(d) $2\text{H}_2\text{O}(\text{l}) \rightarrow \text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^-, E^\circ_{\text{cell}} = -1.23 \text{ V}$
24. In Freundlich adsorption isotherm, the value of $\frac{1}{n}$ is:
(a) 1 in case of chemisorption
(b) 1 in case of physisorption
(c) between 0 and 1 in all cases
(d) between 2 and 4 in all cases
25. Which of the following statements is **not** correct?
(a) La is an element of transition series rather than Lanthanoid series
(b) $\text{La}(\text{OH})_3$ is less basic than $\text{Lu}(\text{OH})_3$
(c) In Lanthanoid series, ionic radius of Ln^{3+} ion decreases
(d) Atomic radii of Zr and Hf are same because of Lanthanoid contraction
26. Which of the following statement is correct about catalyst?
(a) Catalyst is required in large quantities to catalyse reactions.
(b) Same reactants may give different product by using different catalysts.
(c) Catalytic activity of catalyst does not depend upon the strength of chemisorption.
(d) A catalyst does not remains the same before and after the reaction.
27. Which alloy is used for making bullets and lighter flints?
(a) Shell metal
(b) Misch metal
(c) Gun metal
(d) Monel metal
28. In amines, the nitrogen atom is A and B hybridised, making geometry of amines as C. Then A, B and C respectively are:
(a) trivalent, sp^2 , trigonal
(b) tetravalent, sp^3 , tetrahedral
(c) trivalent, sp^3 , pyramidal
(d) tetravalent, sp^2 , pyramidal

29. The appropriate reagent for the following conversion is:



- (a) SO_2Cl_2 (b) N-Chlorosuccinamide
(c) $\text{Cl}_2/\text{FeCl}_3$ (d) SOCl_2
30. D(+) Glucose reacts with hydroxylamine and forms oxime. The structure of oxime would be:



31. Arrange the following amines in the order of decreasing basic character in gaseous phase:

A. NH_3 B. $(\text{CH}_3)_3\text{N}$
C. $(\text{CH}_3)_2\text{NH}$ C. CH_3NH_2

Choose the **correct** answer from the options given below:

- (a) $(\text{CH}_3)_2\text{NH}$, CH_3NH_2 , $(\text{CH}_3)_3\text{N}$, NH_3
(b) $(\text{CH}_3)_3\text{N}$, $(\text{CH}_3)_2\text{NH}$, CH_3NH_2 , NH_3
(c) $(\text{CH}_3)_2\text{NH}$, $(\text{CH}_3)_3\text{N}$, CH_3NH_2 , NH_3
(d) $(\text{CH}_3)_3\text{N}$, CH_3NH_2 , $(\text{CH}_3)_2\text{NH}$, NH_3
32. $\text{C}_3\text{H}_6\text{O}$ does not form a silver mirror with Tollen's reagent but forms an oxime with hydroxylamine. It can give positive:
- (a) Iodoform test (b) Fehling's test
(c) Schiff's test (d) Carbylamine test
33. Aspartame is most successful artificial sweetener but is only limited to cold food and cold drinks because:
- (a) The control of sweetness of food is difficult
(b) Too many calories are released at high temperature
(c) Releases acetic acid when not in cold medium
(d) Unstable at cooking temperature

34. The quantity of charge required to obtain 2 mol of Mn^{2+} from MnO_4^- is:

(a) 2F (b) 10F (c) 5F (d) 1F

35. Match List-I with List-II.

List-I	List-II
(A) Electrolytic reduction	(I) Iron
(B) Bessemerization	(II) Zinc
(C) Smelting	(III) Aluminium
(D) Reduction from oxide	(IV) Copper

Choose the **correct** answer from the options given below:

- (a) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)
(b) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
(c) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
(d) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

36. A compound forms hexagonal closed packed structure. What is the number of tetrahedral voids in 0.8 mol of it?

(a) 1.5055×10^{23} (b) 2.4088×10^{23}
(c) 9.635×10^{23} (d) 3.011×10^{23}

37. Chemical formula of laughing gas is:

(a) NO (b) N_2O (c) N_2O_3 (d) N_2O_4

38. Which of the following reaction will **not** produce ketones?

(a) Hydration of alkynes
(b) Ozonolysis of substituted alkenes
(c) Treating nitrite with a Grignard reagent
(d) Stephen's reaction

39. The vapour pressure curve of the mixture of ethanol and acetone is higher than its constituents because:

(a) Weakening of interactions between molecules takes place
(b) Strengthening of interactions between molecules takes place
(c) New hydrogen bonds are formed
(d) Molecules are not able to escape from the solution

40. Which of the following is **not** an expression of Dalton's law of partial pressures?

(a) $P = P_1 + P_2$
(b) $P = P_1 \times x_1$
(c) $P = P_1^\circ + (P_2^\circ - P_1^\circ)x_2$
(d) $P_1 = P - P_2$

DIRECTIONS : (Qs. 41 - 45) : Answer the following questions on the basis of passage given below :

Transition metals form a large number of complexes or coordination compounds in which the metal atoms are bound to a number of anions or neutral molecules. The valence bond theory explain the formation, magnetic behaviour and geometrical shapes while the crystal field theory explains the effect of different crystal fields on the degeneracy of d-orbitals energies of the central metal atom/ ion. This provides for the quantitative estimation of orbitals separation energies, magnetic moments and spectral and stability parameters.

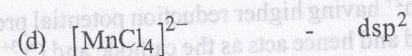
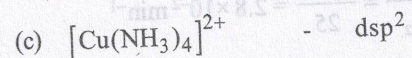
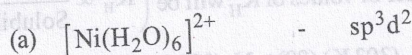
41. Two complexes of nickel have same geometry but different magnetic behaviour are:



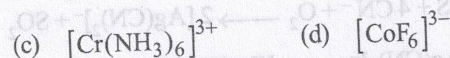
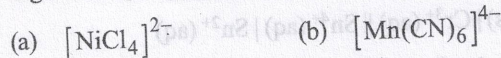
Choose the **correct** answer from the options given below:

- (a) (A) and (B) only (b) (B) and (D) only
(c) (B) and (C) only (d) (A) and (D) only

42. Which of the following complexes are not correctly matched with hybridisation of their central metal ion?



43. Amongst the following ions which should have the highest magnetic moment value?



44. The Compound $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ exhibits:

- (a) Geometrical isomerism
(b) Linkage isomerism
(c) Ionisation isomerism
(d) Coordination isomerism

45. Match List - I (Species / ions) with List-II (Colours)

List-I	List-II
(A) Mn^{2+}	(I) Yellow
(B) Fe^{3+}	(II) Green
(C) Ni^{2+}	(III) Blue
(D) Cu^{2+}	(IV) Pink

Choose the correct answer from the options given below:

- (a) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)
(b) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
(c) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

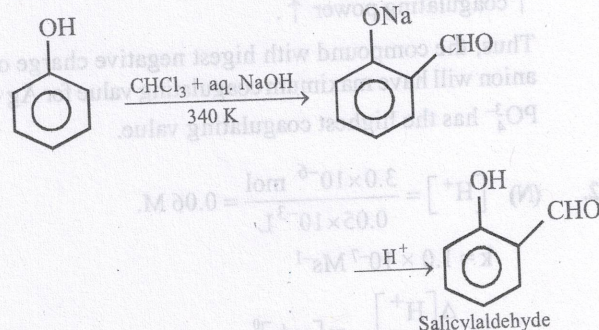
DIRECTIONS : (Qs. 46 - 50) : Answer the following questions on the basis of passage given below :

Alcohols and phenol are formed when a hydrogen atom in a hydrocarbon, aliphatic and aromatic respectively, is replaced by $-\text{OH}$ group. The substitution of a hydrogen atom in a hydrocarbon by an alkoxy or aryloxy group forms ethers. Alcohols and phenol consist of two part, an alkyl/aryl group and a hydroxyl group. The properties of alcohols and phenols are primarily due to the hydroxyl group. The nature of alkyl and aryl groups simply modify these properties. Alcohol react both as nucleophiles and electrophiles whereas in phenols, the reactions that take place on the aromatic ring are electrophilic substitution reactions.

46. Aspirin is an acetylation product of:

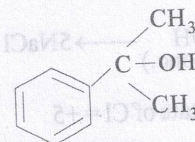
- (a) *o* - Dihydroxybenzoic acid
(b) *o* - Hydroxybenzoic acid
(c) *m* - Hydroxybenzoic acid
(d) *p* - Dihydroxybenzene

47. Name the given reaction:



- (a) Williamson's synthesis
(b) Kolbe's reaction
(c) Reimer-Tiemann reaction
(d) Sandmeyer's reaction

48. The IUPAC name of the following compound is:



- (a) 2-Methyl-2-phenyl ethanol
(b) 1-Methyl-1-phenyl ethanol
(c) 2-Phenylpropan-2-ol
(d) 1,1-Dimethyl-1-phenyl methanol

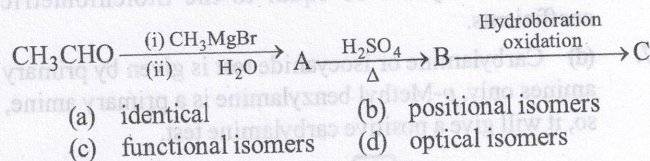
49. Few compounds are given below (A to D). Arrange them in the increasing order of their boiling points.

- (A) Pentan-1-ol (B) *n*-Butane
(C) Pentan-1-al (D) Ethoxyethane

Choose the **correct** answer from the option given below:

- (a) (D) < (B), (C) < (A)
(b) (B) < (C), (A) < (D)
(c) (B) < (D), (C) < (A)
(d) (D) < (B), (A) < (C)

50. In the following reaction, compounds A and C are:



Hints & Explanations

1. (b) According to Hardy-Schulze rule, charge $\uparrow$ coagulating power $\uparrow$.

Thus, the compound with highest negative charge on the anion will have maximum coagulating value for Ag⁺-sol. PO_4^{3-} has the highest coagulating value.

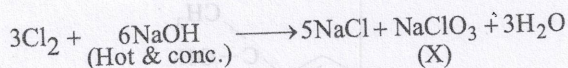
2. (N) $[\text{H}^+] = \frac{3.0 \times 10^{-6} \text{ mol}}{0.05 \times 10^{-3} \text{ L}} = 0.06 \text{ M}$.

$$k = 1.0 \times 10^{-7} \text{ Ms}^{-1}$$

$$\Rightarrow \frac{\Delta[\text{H}^+]}{\Delta t} = K[\text{H}^+]^0 = k \text{ (from units)}$$

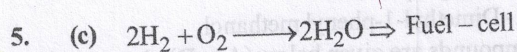
$$\Rightarrow \Delta t = \frac{\Delta[\text{H}^+]}{k} = \frac{0.06}{1.0 \times 10^{-7}} = 6.0 \times 10^5 \text{ seconds.}$$

3. (b)



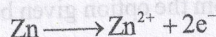
Oxidation state of Cl = +5

4. (a) Gold number measures the protective power in terms of gold while Congo-rubin number measures this in terms of the Congo-rubin dye.



Steady potential is given by mercury cells due to the cell reaction that does not involve ions.

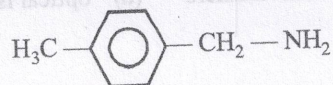
Leclanche cell anodic reaction involves



A Ni-Cd cell is rechargeable battery.

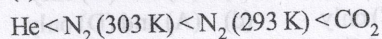
6. (b) Rate = $K[\text{Reactant}_1]^\alpha [\text{Reactant}_2]^\beta$
Order = $\alpha + \beta$ where α and β are experimentally-determined only and may not be equal to the Stoichiometric coefficients.

7. (d) Carbylamine or isocyanide test is given by primary amines only. *p*-Methyl benzylamine is a primary amine, so, it will give a positive carbylamine test.

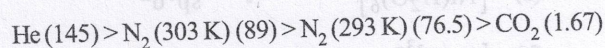


8. (b) KCl shows Schottky defect due K^+ and Cl^- being of comparable size.
KCl shows Frenkel defect due to anionic vacancies.

9. (a) Order of Strength of intermolecular forces-



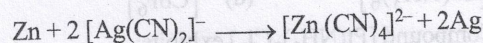
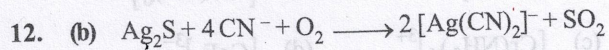
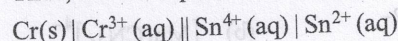
Thus, the order of values of K_H will be $\left(K_H \propto \frac{1}{\text{Solubility}} \right)$



10. (d) $k = \frac{0.693}{t_{1/2}} = \frac{0.693}{25} = 2.8 \times 10^{-2} \text{ min}^{-1}$

11. (c) $\text{Sn}^{4+} / \text{Sn}^{2+}$ having higher reduction potential prefers to get reduced and hence acts as the cathode and $\text{Cr}^{3+} / \text{Cr}$ acts as anode.

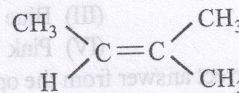
Thus, the cell representation will be-



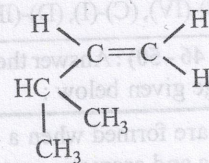
13. (b) Codensation polymers = Bakelite, Melamine-Formaldehyde resin, Nylon-2, Nylon-6
Addition polymers = Teflon, Buna-S.

14. (d) Glucose does not react with Schiff's reagent or NaHSO_3 due to its cyclic structure.

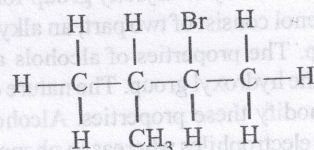
15. (b) CH_3CHO and CH_3COCH_3 can be obtained by the ozonolysis of



$(\text{CH}_3)_2\text{CHCHO}$ and HCHO can be obtained by the ozonolysis of



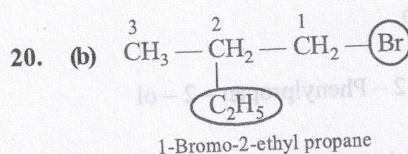
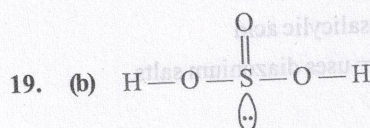
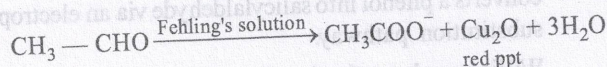
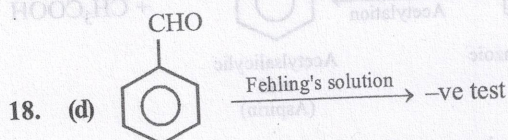
Thus, the alkyl halide will be-



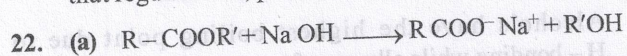
2-Bromo-3-methylbutane

16. (b) Due to the absence of vacant d-orbitals in N-atom, formation of NCl_5 is not possible as it cannot expand its octet.

17. (c) The gaseous mixture is first condensed and re-circulated and then compressed after which it is passed over the catalyst where they react to form NH_3 gas.



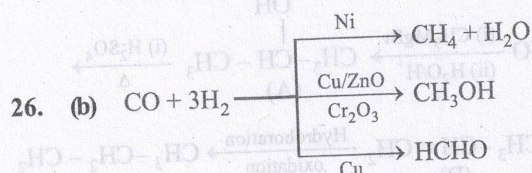
21. (a) Thyroxine is a hormone released by thyroid gland that regulates fat, protein and carbohydrate metabolism.



23. (d) The species that has the lowest reduction potential (or highest oxidation potential) will get oxidized more easily. The oxidation of H_2O has the lowest reduction or highest oxidation potential ($E_{\text{ox}}^\circ = +1.23 \text{ V}$).

24. (c) $\log \frac{x}{m} = \log K + \frac{1}{n} \log P$ where $\frac{1}{n} = 0.1 - 0.5$

25. (b) $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$ because of larger ionic radii of La^{3+} that results in $\text{La}(\text{OH})_3$ being more ionic.

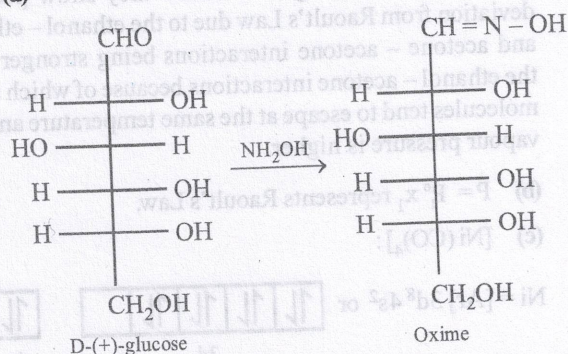


27. (b) Misch metal alloy is an alloy of lanthanoids and iron that is used in making bullets and lighter flints.

28. (c) Amines have nitrogen atom having a lone pair and three bond pairs making it trivalent and sp^3 -hybridized and resulting in pyramidal shape.

29. (c) The given conversion involves electrophilic chlorination of benzene ring in toluene that can be carried out using Cl_2 in a Lewis acid like FeCl_3 .

30. (d)



31. (b) The basicity order of amines in the gaseous phase follows the order :-

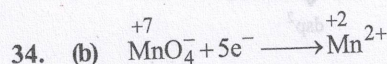
$$\text{NH}_3 < 1^\circ < 2^\circ < 3^\circ$$

This is due to the electron-donating effect of the alkyl groups that increase the charge density on N-atom and cause them to lose the lone pair of electrons.

32. (a) Ketones give negative Tollen's test and positive hydroxylamine reaction.

According to the formula $\text{C}_3\text{H}_6\text{O}$, such ketone can be $\text{CH}_3 - \text{CO} - \text{CH}_3$ which will give a positive iodoform test.

33. (d) Aspartame is unstable and decomposes at cooking temperature because of which it is used in cold foods.



For 1 mole of Mn^{2+} , we need 5 mole of electrons.

For 2 moles of Mn^{2+} , we would need 10 moles of electrons.

$$1 \text{ mole of } \text{e}^- = 1\text{F}$$

$$\Rightarrow 10 \text{ moles of } \text{e}^- = 10\text{F}$$

35. (c) Electrolytic reduction (for a reactive metal) = Al.

Bessemerization (old method for metals) = Cu

Smelting (uses pyrometallurgy) = Fe

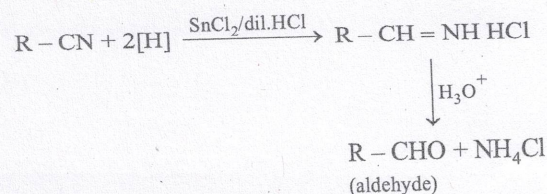
Reduction from oxide (easily reduced) = Zn

36. (c) For 0.8 moles = $0.8 \times 6.022 \times 10^{23}$
= 4.817×10^{23} molecules.

$$\Rightarrow \text{Number of tetrahedral voids} = 2 \times 4.817 \times 10^{23} = 9.635 \times 10^{23}$$

37. (b) Laughing gas = Nitrous oxide N_2O

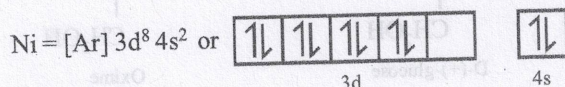
38. (d) Stephen's Reaction :-



39. (a) The curve is higher because they show positive deviation from Raoult's Law due to the ethanol-ethanol and acetone-acetone interactions being stronger than the ethanol-acetone interactions because of which more molecules tend to escape at the same temperature and the vapour pressure is higher.

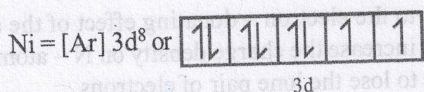
40. (b) $P = P_1^0 x_1$ represents Raoult's Law.

41. (c) $[\text{Ni}(\text{CO})_4]$:



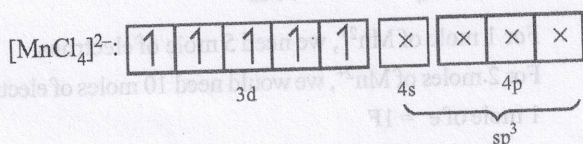
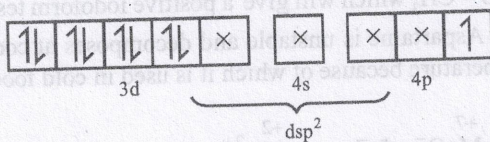
It has zero unpaired electrons (diamagnetic) and is tetrahedral.

$[\text{NiCl}_4]^{2-}$:

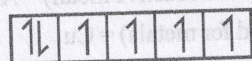


It has two unpaired electrons (Paramagnetic) and is tetrahedral.

42. (d) $[\text{Cu}(\text{NH}_3)_4]^{2+}$:

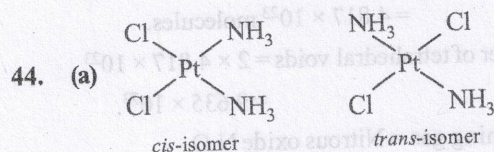


43. (d) $[\text{CoF}_6]^{3-}$:— Co is in +3 State. So $\text{Co}^{3+} = [\text{Ar}] 3d^6$ or



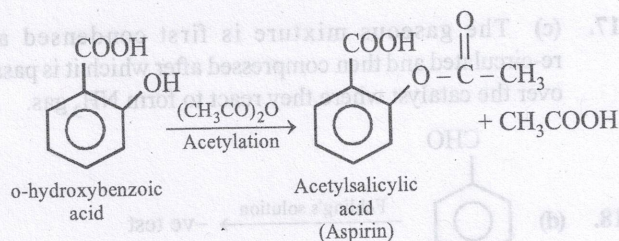
meaning it has four unpaired e^- .

$$\Rightarrow \mu = \sqrt{n(n+2)} = \sqrt{4(4+2)} = \sqrt{24} \text{ B.M. Which is highest.}$$



45. (b) Mn^{2+} = Pink, Fe^{3+} = Yellow, Ni^{2+} = Green, Cu^{2+} = blue.

46. (b)

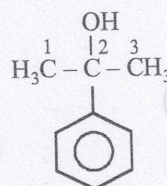


47. (c) The given reaction is Reimer-Tiemann reaction that converts a phenol into salicylaldehyde via an electrophilic substitution pathway.

Williamson's synthesis = for ethers

Kolbe's reaction = for salicylic acid

Sandmeyer's reaction = uses diazonium salts.



48. (c) 2-Phenylpropan-2-ol

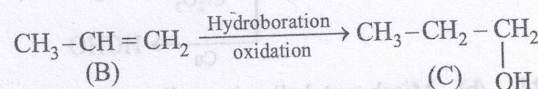
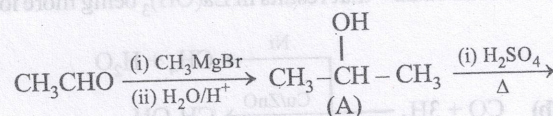
49. (c) Boiling point increases with an increase in the strength of the intermolecular forces between the molecules.

Alcohols have the highest boiling point due to H-bonding while alkanes of comparable mass have the lowest boiling point due to weakest van der Waals forces.

Among aldehydes & ethers, aldehydes have higher b.p due to stronger dipole-dipole forces. Thus, the order will be:

n-Butane < Ethoxy ethane < Pentan-1-al < Pentan-1-ol
(B) (D) (C) (A)

50. (b)



$\therefore$ (A) & (C) are position isomers.