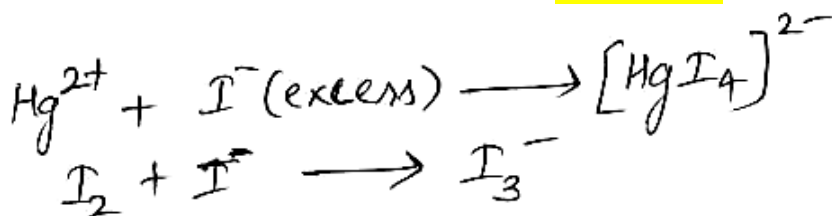
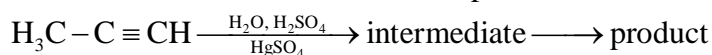


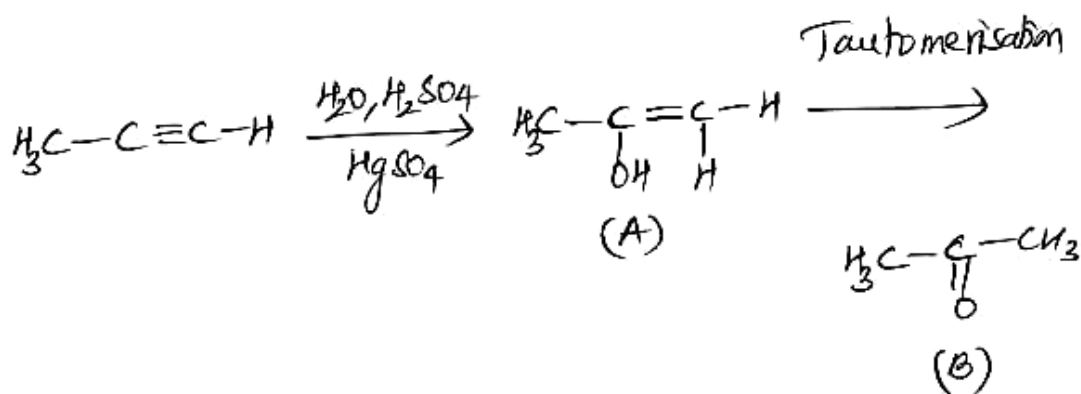
1. HgCl_2 and I_2 both when dissolved in water containing I^- ions the pair of species formed is :
- (1) $\text{HgI}_2, \text{I}_3^-$ (2) HgI_2, I^- (3) $\text{HgI}_4^{2-}, \text{I}_3^-$ (4) $\text{Hg}_2\text{I}_2, \text{I}^-$



2. Predict the correct intermediate and product in the following reaction:



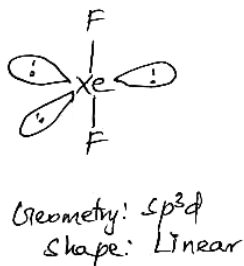
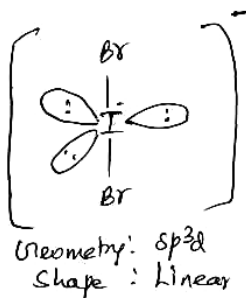
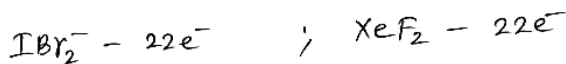
- (A) (B)
- (1) A: $\text{H}_3\text{C}-\underset{\text{SO}_4}{\text{C}}=\text{CH}_2$ B: $\text{H}_3\text{C}-\underset{\text{O}}{\text{C}}-\text{CH}_3$
- (2) A: $\text{H}_3\text{C}-\underset{\text{OH}}{\text{C}}=\text{CH}_2$ B: $\text{H}_3\text{C}-\underset{\text{SO}_4}{\text{C}}=\text{CH}_2$
- (3) A: $\text{H}_3\text{C}-\underset{\text{O}}{\text{C}}-\text{CH}_3$ B: $\text{H}_3\text{C}-\text{C}\equiv\text{CH}$
- (4) A: $\text{H}_3\text{C}-\underset{\text{OH}}{\text{C}}=\text{CH}_2$ B: $\text{H}_3\text{C}-\underset{\text{O}}{\text{C}}-\text{CH}_3$



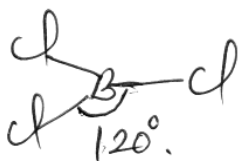
3. The correct statement regarding electrophile is :
- (1) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile
 - (2) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile
 - (3) Electrophile are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile
 - (4) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile

Electrophiles can be either neutral (or) positively charged species and can form a bond by accepting a pair of electrons from a nucleophile.

4. Which of the following pairs of compounds is isoelectronic and isostructural?
- (1) BeCl_2 , XeF_2
 - (2) TeI_2 , XeF_2
 - (3) IBr_2^- , XeF_2
 - (4) IF_3 , XeF_2



5. The species having bond angles of 120° is :
- (1) PH_3
 - (2) ClF_3
 - (3) NCl_3
 - (4) BCl_3



6. Which of the following is a sink for CO?

- (1) Haemoglobin
- (2) Micro organisms present in the soil
- (3) Oceans
- (4) Plants

Haemoglobin acts as sink for 'CO'.
'CO' reacts with haemoglobin to form Carboxyhaemoglobin.

7. Which one of the following pairs of species have the same bond order?

(1) CO, NO

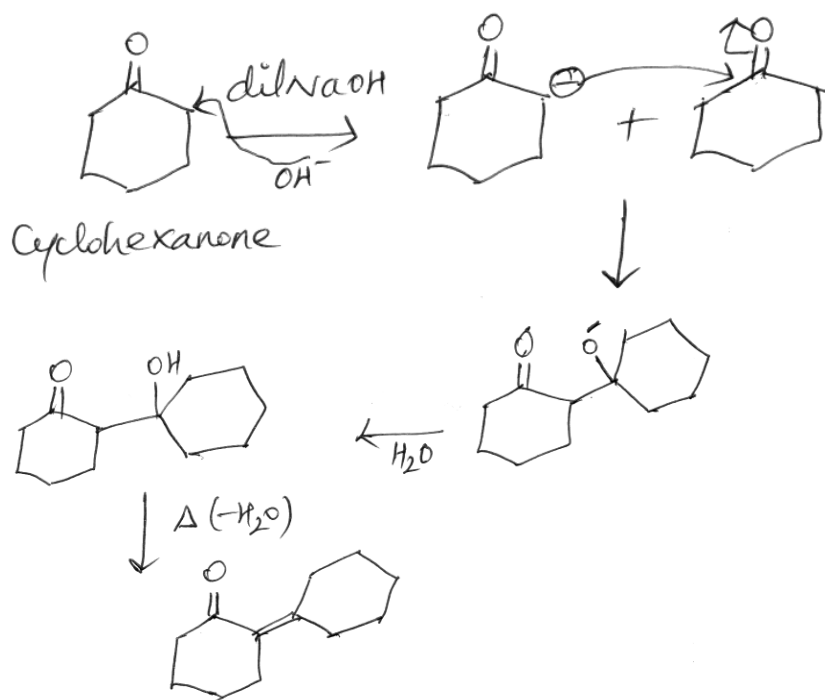
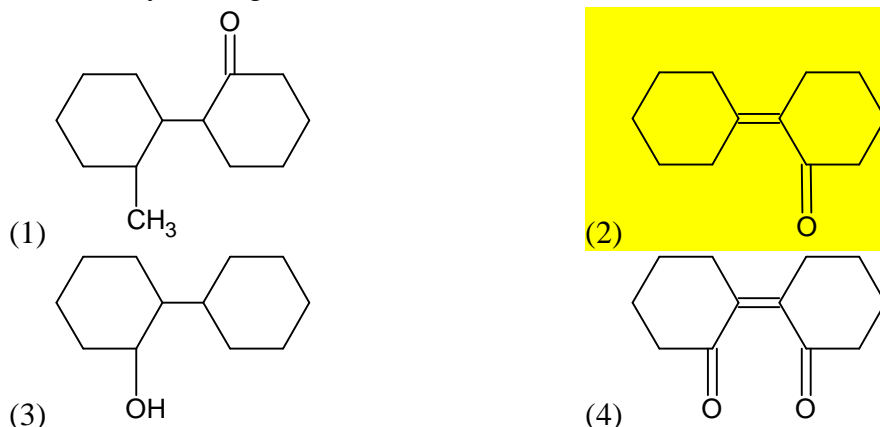
(2) O₂, NO⁺

(3) CN⁻, CO

(4) N₂, O₂⁻

Both CN⁻ and CO are isoelectronic species having 14 e⁻s having similar bond order of 3, according to MOT (Molecular orbital theory)

8. Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?



9. Name the gas that can readily decolourise acidic KMnO₄ solution:

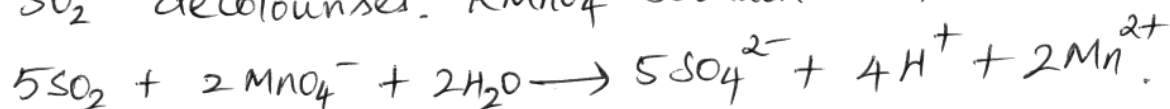
(1) CO₂

(2) SO₂

(3) NO₂

(4) P₂O₅

'SO₂' decolourises KMnO₄ solution as follows:



10. Which one is the wrong statement?

(1) de-Broglie's wavelength is given by $\lambda = \frac{h}{mv}$, where m = mass of the particle, v = group velocity of the particle

(2) The uncertainty principle is $\Delta E \times \Delta t \geq \frac{h}{4}$

(3) Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement.

(4) The energy of 2s orbital less than the energy of 2p orbital in case of Hydrogen like atoms.

In Hydrogen atom, 'n' value decides the energy of the orbital and not 'l' value. Hence 2s and 2p orbitals will have same energy in hydrogen atom

11. Correct increasing order for the wavelength of absorption in the visible region for the complexes of Co^{3+} is :

(1) $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

(2) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$

(3) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$

(4) $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

Strong field ligands has higher splitting energy with a lower wavelength. Hence wavelength increasing order is as follows:
 $[\text{Co}(\text{en})_3]^{3+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{H}_2\text{O})_6]^{3+}$

12. The correct order of the stoichiomers of AgCl formed when AgNO_3 in excess is treated with the complexes: $\text{CoCl}_3 \cdot 6\text{NH}_3$, $\text{CoCl}_3 \cdot 5\text{NH}_3$, $\text{CoCl}_3 \cdot 4\text{NH}_3$ respectively is :

(1) 1AgCl, 3AgCl, 2AgCl

(2) 3AgCl, 1AgCl, 2AgCl

(3) 3AgCl, 2AgCl, 1AgCl

(4) 2AgCl, 3AgCl, 2AgCl

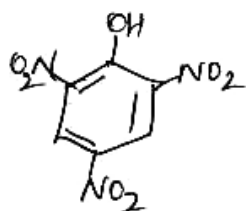
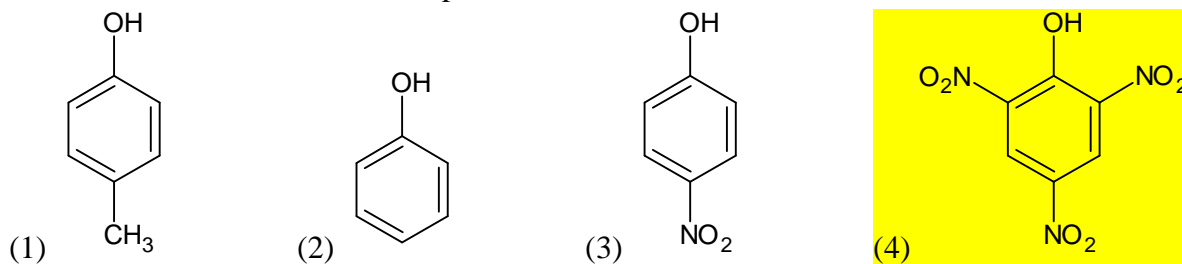
These are the correct formula of the complexes :-

$[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ gives 3Cl⁻ ions

$[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2 \cdot \text{NH}_3$ gives 2Cl⁻ ions and

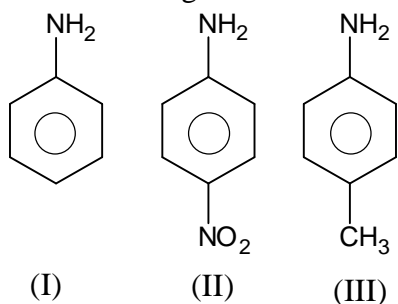
$[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} \cdot (\text{NH}_3)_2$ gives 1Cl⁻ ion.

13. Which one is the most acidic compound?



2,4,6-Trinitrophenol is most acidic due to three powerful $-NO_2$ groups which are $-R$ and $-I$.

14. The correct increasing order of basic strength for the following compounds is :

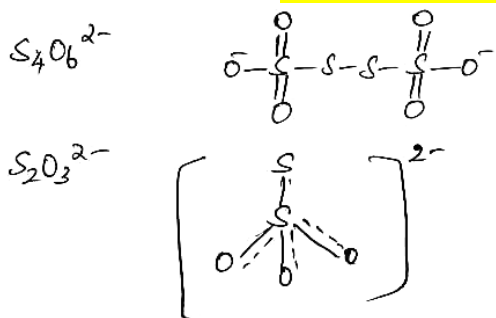


- (1) II < III < I (2) III < I < II (3) III < II < I (4) II < I < III

Basic nature of amines increases as $+H$ and $+I$ groups like $-CH_3$ group is present in the aniline ring. and basic nature of aniline decreases when $-R$ and $-I$ groups like $-NO_2$ is attached to the aniline ring.

15. In which pair of ions both species contains S-S bond?

- (1) $S_2O_7^{2-}$, $S_2O_3^{2-}$ (2) $S_4O_5^{2-}$, $S_2O_3^{2-}$ (3) $S_2O_7^{2-}$, $S_2O_3^{2-}$ (4) $S_4O_4^{2-}$, $S_2O_7^{2-}$



16. Mixture of chloroxylenol and terpineol acts as
 (1) analgetic (2) antiseptic (3) antipyretic (4) antibiotic

Dettol is a mixture of chloroxylenol and α -terpineol which acts as antiseptic

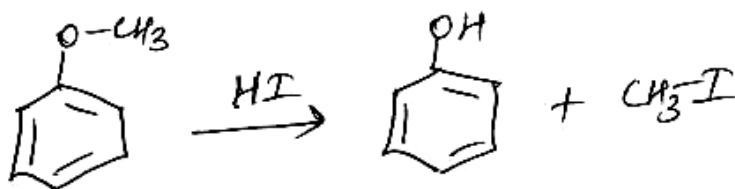
17. Which one is the correct order of acidity?
 (1) $\text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH} = \text{CH}_2 > \text{CH}_3 - \text{C} = \text{CH} > \text{CH} = \text{CH}$
 (2) $\text{CH} = \text{CH} > \text{CH}_3 - \text{C} = \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_3$
 (3) $\text{CH} = \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{C} = \text{CH} > \text{CH}_3 - \text{CH}_3$
 (4) $\text{CH}_3 - \text{CH}_3 > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{C} = \text{CH} > \text{CH} - \text{CH}$

The correct acidic nature order follows:

$$\text{HC} \equiv \text{CH} > \text{CH}_3 - \text{C} \equiv \text{C} - \text{H} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_2$$

$\downarrow \quad \downarrow$ 50% 50% \downarrow 50% \downarrow 33.33%
 \downarrow 25%

18. The heating of phenyl-methyl ethers with HI produces.
 (1) ethylchlorides (2) isoobenzene (3) phenol (4) benzene



19. A gas is allowed to expand in a well insulated container against a constant external pressure of 2.5 atm from an initial volume of 2.50 L to a final volume of 4.50 L. The change in internal energy ΔU of the gas in joule will be :
 (1) 1136.25 J (2) -500 J (3) -505 J (4) +505 J

$$\Delta Q = 0 ; \quad \Delta U = W$$

$$\Delta U = -P_{\text{ext}} \Delta V$$

$$= -2.5 \times (4.5 - 2.5)$$

$$= -2.5 \times 2 \text{ L atm}$$

$$= -5 \times 101 \text{ J}$$

$$= -505 \text{ J}$$

20. The most suitable method of separated of 1 : 1 mixture of ortho and para-nitrophenol is :
 (1) Sublimation (2) Chromatography (3) Crystallisation (4) Steam distillation

Due to intramolecular H-bonding in ortho-nitrophenol and intermolecular H-bonding in p-nitrophenol, they are separated by steam distillation technique

21. With respect to the conformers of ethane, which of the following statements is true?

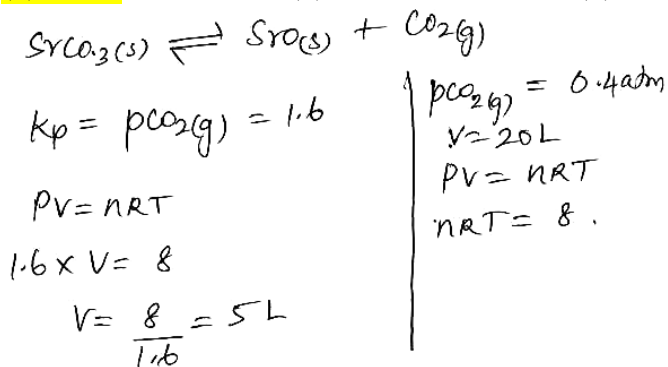
- (1) Bond angle remains same but bond length changes
 (2) Bond angle changes but bond length remains same
 (3) Both bond angle and bond length change
 (4) Both bond angle and bond length remains same

In Conformational isomers of ethane, dihedral angle changes, bond angle and bond length remains same.

22. A 20 litre container at 400 K contains $\text{CO}_2(\text{g})$ at pressure 0.4 atm and an excess of SrO (neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO_2 attains its maximum value, will be :

(Given that : $\text{SrCO}_3(\text{s}) \rightleftharpoons \text{SrO}(\text{s}) + \text{CO}_2(\text{g})$, $K_p = 1.6 \text{ atm}$)

- (1) 5 litre (2) 10 litre (3) 4 litre (4) 2 litre



23. A first order reaction has specific reaction of 10^{-2} sec^{-1} . How much time will it take for 20 g of the reactant to reduce to 5 g?

- (1) 238.6 sec (2) 138.6 sec (3) 346.5 sec (4) 693.0 sec

$$k = \frac{2.303}{t} \log_{10} \left(\frac{a}{a-x} \right)$$

$$10^{-2} = \frac{2.303}{t} \log_{10} \left(\frac{20}{5} \right)$$

$$t = 138.6 \text{ sec}$$

24. For a given reaction, $\Delta H = 35.5 \text{ kJ mol}^{-1}$ and $\Delta S = 83.6 \text{ JK}^{-1} \text{ mol}^{-1}$. The reaction is spontaneous at :
(Assume that ΔH and ΔS do not vary with temperature)

- (1) $T < 425 \text{ K}$ (2) $T > 425 \text{ K}$ (3) all temperature (4) $T > 298 \text{ K}$

For a spontaneous process, $\Delta G < 0$,

$$\Delta G = \Delta H - T\Delta S < 0$$

$$\text{At } \Delta G = 0, \quad T = \frac{\Delta H}{\Delta S} = \frac{35500}{83.6} = 425 \text{ K}$$

$$\Delta G < 0, \text{ when } T > 425 \text{ K}$$

25. In the electrochemical cell :

$\text{Zn} \parallel \text{ZnSO}_4 (0.01 \text{ M}) \parallel \text{CuSO}_4 (1.0 \text{ M}) \mid \text{Cu}$, the emf of this Daniel cell is E_1 . When the concentration of ZnSO_4 is changed to 1.0 M and that of CuSO_4 changed to 0.01 M , the emf changes to E_2 . From the following, which one is the relationship between E_1 and E_2 ? (Given, $\frac{RT}{F} = 0.059$)

- (1) $E_1 = E_2$ (2) $E_1 < E_2$ (3) $E_1 > E_2$ (4) $E_2 = 0 \neq E_1$

$$E_1 = E_0 - \frac{0.0591}{2} \log_{10} \left[\frac{0.01}{1} \right]^2$$

$$E_2 = E_0 - \frac{0.0591}{2} \log_{10} \left[\frac{1}{0.01} \right]^2$$

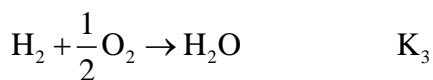
$$\therefore E_1 > E_2$$

26. An example of a sigma bonded organometallic compound is :

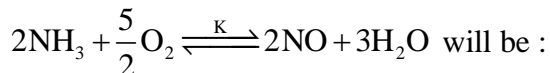
- (1) Ruthenocene (2) Grignard's reagent
(3) Ferrocene (4) Cobaltocene

Grignard reagent RmgX is an example of σ bonded organometallic compound.

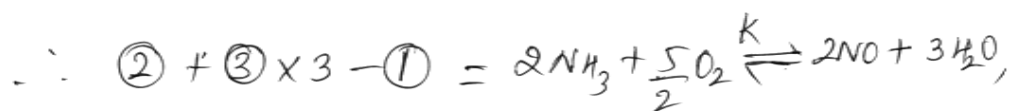
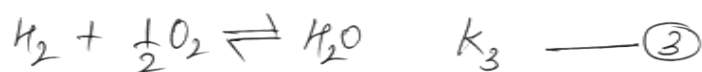
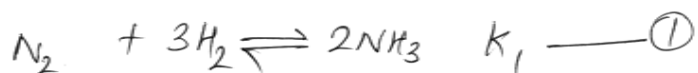
27. The equilibrium constants of the following are :



The equilibrium constant (K) of the reaction:

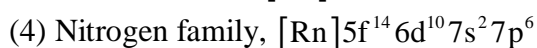
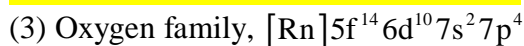
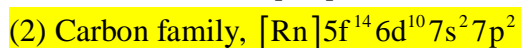
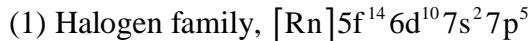


- (1) $K_1K_3^3/K_2$ (2) $K_2K_3^3/K_1$ (3) K_2K_3/K_1 (4) $K_2^3K_3/K_1$



$$K = K_2K_3^3/K_1$$

28. The element $Z = 114$ has been discovered recently. It will belong to which of the following family group and electronic configuration?



$Z = 114$ belongs to carbon family

29. Pick out the correct statement with respect to $[\text{Mn}(\text{CN})_6]^{3-}$

(1) It is sp^3d^2 hybridized and octahedral

(2) It is sp^3d^2 hybridized and tetrahedral

(3) It is d^2sp^3 hybridized and octahedral

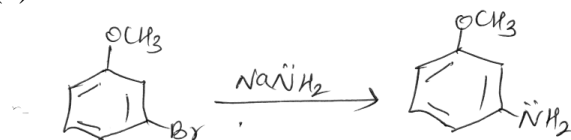
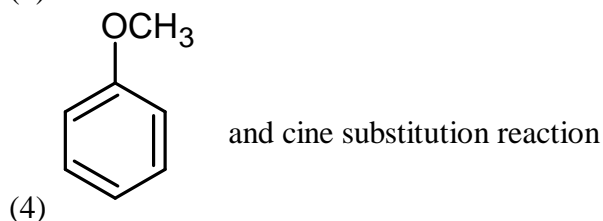
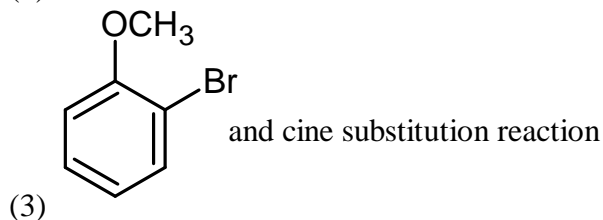
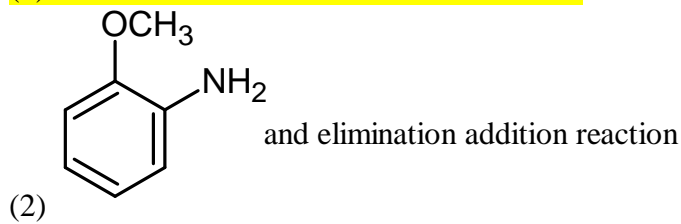
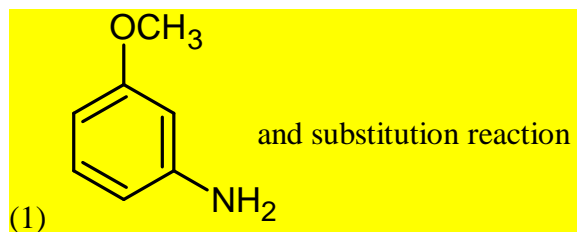
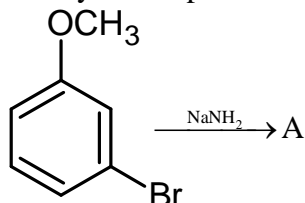
(4) It is dsp^2 hybridized and square planar



Pairing of e⁻s occurs in presence of en⁻ (strong field ligand).

∴ Hybridisation of $[\text{Mn}(\text{CN})_6]^{3-}$ is d^2sp^3 .

30. Identify A and predict the type of reaction



\therefore Nucleophilic Substitution reaction.

31. It is because of inability of ns^2 electrons of the valance shell to participate in bonding that:

(1) Sn^{2+} is reducing while Pb^{4+} is oxidizing

(2) Sn^{2+} is oxidizing while Pb^{3+} is reducing

(3) Sn^{2+} and Pb^{2+} are both oxidizing and reducing

(4) Sn^{4+} is reducing while Pb^{4+} is oxidizing

Sn^{2+} is reducing in nature as it does not show inert pair effect and Pb^{4+} is oxidising as Pb^{2+} is more stable than Pb^{4+} as Pb shows inert pair effect.

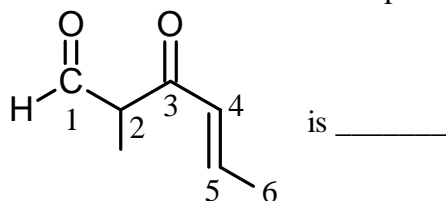
32. Which of the following statements is not correct?
- (1) Insulin maintains sugar level in the blood of a human body.
 - (2) Ovalbumin is a simple food reserve in egg white.
 - (3) Blood proteins thrombin and fibrinogen are involved in blood clotting.
 - (4) Denaturation makes the proteins more active.

Denaturation makes the protein to lose its biological activity.

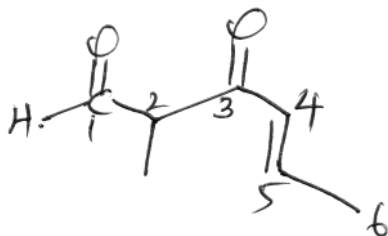
33. Which is the incorrect statement?
- (1) $\text{FeO}_{0.98}$ has non stoichiometric metal deficiency defect
 - (2) Density decreases in case of crystals with Schottky's defect.
 - (3) $\text{NaCl}(s)$ is insulator, silicon is semiconductor, silver is conductor, quartz is piezo electric crystal.
 - (4) Frenkel defect is favoured in those ionic compounds, in which sizes of cation and anions are almost equal.

Frenkel defects is shown by the ionic compounds in which there is a difference in sizes of cation and anion.

34. The IUPAC name of the compound



- (1) 3 - keto - 2 - methylhex - 4 - enal
- (2) 5 - formylhex - 2 - en - 3 - one
- (3) 5 - methyl - 4 - oxohex - 2 - ene - 5 - al
- (4) 3 - keto - 2 - methylhex - 5 - enal



According to the IUPAC rules, the correct IUPAC name is

3 - keto - 2 - methylhex - 4 - enal

35. The reason for greater range of oxidation states in actinoids is attributed to:
- (1) The radioactive nature of actinoids
 - (2) actinoid contraction
 - (3) 5f, 6d and 7s levels having comparable energies
 - (4) 4f and 5d levels being close in energies

5f, 6d and 7s levels have comparable energies, so actinoids shows greater range of oxidation state.

36. Extraction of gold and silver involves leaching with CN^- ion, Silver is later recovered by:
- (1) Liqation
 - (2) Distillation
 - (3) zone refining
 - (4) Displacement with Zn

Silver is recovered by adding Zn, as it is most electropositive metal.

37. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solution of their salts are put under an electric field?
- (1) Na
 - (2) K
 - (3) Rb
 - (4) Li

Li^+ is small cation is highly hydrated in aqueous solution, hence its mobility is lowest.

38. Which of the following is dependent on temperature?
- (1) Molality
 - (2) Molarity
 - (3) Mole fraction
 - (4) Weight percentage

Molarity depends on volume and volume depends on temperature.

39. If molality of the dilute solutions is doubled, the value of molal depression constant (K_1) will be:
- (1) doubled
 - (2) halved
 - (3) tripled
 - (4) unchanged

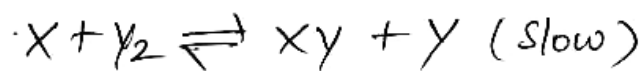
K_f is property of solvent.

40. Mechanism of a hypothetical reaction $X_2 + Y_2 \rightarrow 2XY$ is given below:

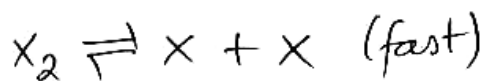
- (i) $X_2 \rightarrow X + X$ (fast) (ii) $X + Y_2 \rightarrow XY + Y$ (slow)
(iii) $X + Y \rightarrow XY$ (fast)

The overall order of the reaction will be:

- (1) 1 (2) 2 (3) 0 (4) 1.5



$$\text{rate} = k [X][Y_2] \text{ --- (1)}$$



$$K_{eq} = \frac{[X]^2}{[X_2]} ; [X] = K_{eq}^{1/2} \cdot [X_2]^{1/2} \text{ --- (2)}$$

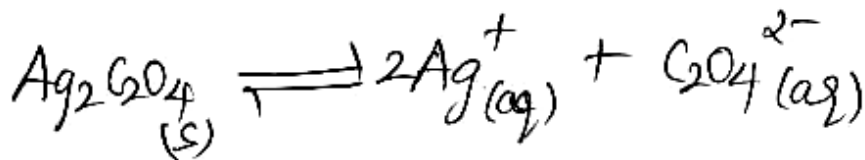
from equation (1) and (2)

$$\text{rate} = k \cdot K_{eq}^{1/2} \cdot [X_2]^{1/2} [Y_2]$$

\therefore Overall order of reaction is 1.5.

41. Concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is $2.2 \times 10^{-4} \text{ mol L}^{-1}$ solubility product of $Ag_2C_2O_4$ is:

- (1) 2.42×10^{-8} (2) 2.66×10^{-12}
(3) 4.5×10^{-11} (4) 5.3×10^{-12}



$$2s = 2.2 \times 10^{-4} \text{ mol L}^{-1}; s = 1.1 \times 10^{-4} \text{ mol L}^{-1}$$

$$K_{sp} = (2s)^2 \cdot s = 4s^3$$

$$K_{sp} = 4 (1.1 \times 10^{-4})^3$$

$$K_{sp} = 5.3 \times 10^{-12} \text{ mol}^3 \text{ L}^{-3}$$

42. Match the interhalogen compounds of column I with the geometry in column II and assign the correct code.

Column I		Column II	
(a)	XX'	(i)	T – shape
(b)	XX'_3	(ii)	Pentagonal bipyramidal
(c)	XX'_5	(iii)	Linear
(d)	XX'_7	(iv)	Square – pyramidal
		(v)	Tetrahedral

Code:

- | | | | | |
|-----|-------|-------|-------|------|
| | (a) | (b) | (c) | (d) |
| (1) | (iii) | (iv) | (i) | (ii) |
| (2) | (iii) | (i) | (iv) | (ii) |
| (3) | (v) | (iv) | (iii) | (ii) |
| (4) | (iv) | (iii) | (ii) | (i) |

XX' – Linear

XX'_3 – T-shape

XX'_5 – Square – pyramidal

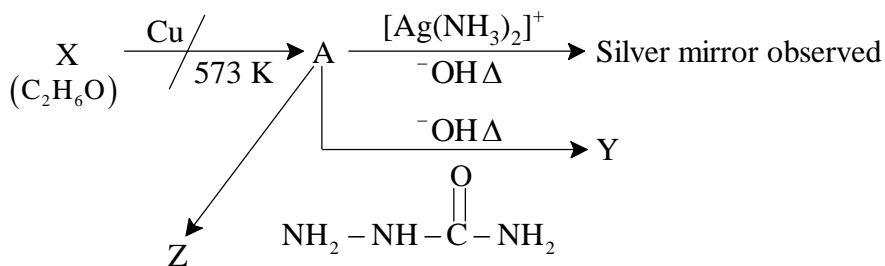
XX'_7 – Pentagonal bipyramidal

43. Which one of the following statements is not correct?

- (1) Catalyst does not initiate any reaction.
- (2) The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium.
- (3) Enzymes catalyse mainly bio – chemical reactions.
- (4) Coenzymes increase the catalytic activity of enzyme.

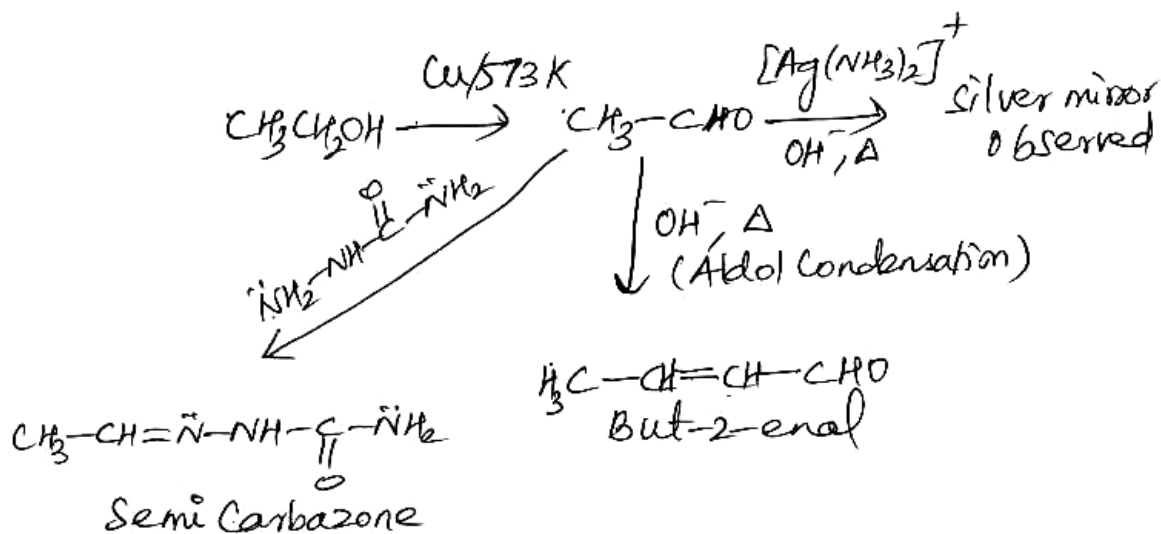
The value of equilibrium constant does not change in the presence of a catalyst in the reaction at equilibrium.

44. Consider the reactions:



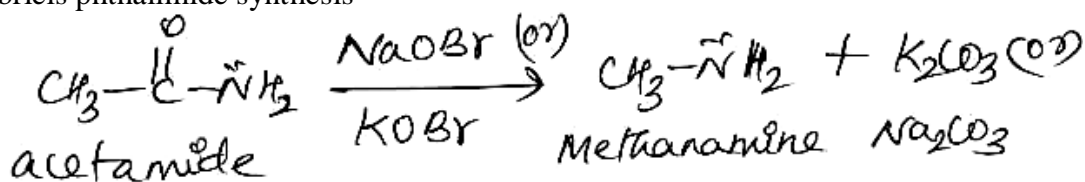
Identify A, X, Y and Z

- (1) A – Methoxymethane, X – Ethanoic acid, Y – Acetate ion, Z – hydrazine.
- (2) A – Methoxymethane, X – Ethanol, Y – Ethanoic acid, Z – Semicarbazide.
- (3) A – Ethanal, X – Ethanol, Y – But – 2 – enal, Z – Semicarbozone.**
- (4) A – Ethanol, X – Acetaldehyde, Y – Butanone, Z – Hydrazone.



45. Which of the following reactions is appropriate for converting acetamide to methanamine?

- (1) Carbylamine reaction
- (2) Hoffmann hypobromamide reaction**
- (3) Stephens reaction
- (4) Gabriels phthalimide synthesis



This reaction is Hoffmann hypobromamide reaction.