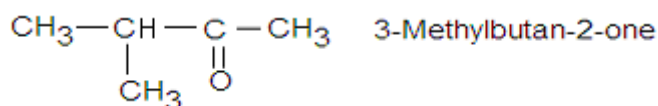


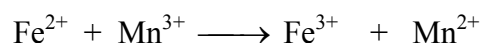
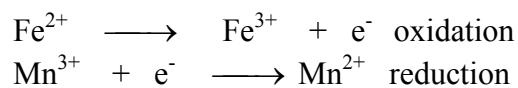
**DELHI PUBLIC SCHOOL
PRE-BOARD EXAMINATION
CHEMISTRY ANSWER KEY CLASS XII**

- Electrons and holes
- Anions = 2, Cations = 3, Formula = A_3B_2
- $L^2 \text{ mol}^{-2} \text{ s}^{-1}$
- Rate = $-\frac{1}{2} \times \frac{\Delta[A]}{\Delta t} = -\frac{1}{2} \times \frac{-0.1}{10} = 0.005 \text{ mol L}^{-1} \text{ min}^{-1}$
- (a) XeF_4 (b) XeO_3 .
- Secondary butyl chloride because it has a chiral carbon atom.

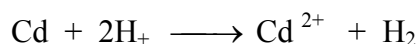
7.



- Amylose and amylopectin. Amylose is linear polymer of α -glucose while amylopectin is branched chain polymer of α -glucose.
- (a) Silicon doped with phosphorus forms *n*-type of semiconductor. Phosphorus contains one extra electron than silicon which can move easily through the crystal and is responsible for semiconductor properties.
(b) Copper is a metallic solid having metallic bonds while diamond is a covalent solid having covalent bonds. The metallic bonds are weaker than covalent bonds thus lesser amount of energy is required to break metallic bonds than covalent bonds.
- (a) It is clear from the values of E^0 that Mn^{3+} has a higher tendency to get reduced in comparison to Fe^{3+} . Hence on mixing Mn (III) solution and Fe (II) solution, Mn(III) gets reduced to Mn(II) and Fe(II) gets oxidized to Fe(III)



(b) Cell reaction:



$$E^0_{\text{Cell}} = E^0_{\text{right}} - E^0_{\text{left}}$$

$$= 0 - (-0.403) = 0.403 \text{ V}$$

$$E_{\text{Cell}} = E^0_{\text{Cell}} + \frac{0.059}{2} \log \frac{[\text{H}^+]^2 [\text{Cd}]}{p\text{H}_2 [\text{Ca}^{2+}]}$$

$$= 0.403 + \frac{0.059}{2} \log \frac{[0.2]^2}{[0.5][0.1]}$$

$$= 0.403 + 0.0295 \log 0.8$$

$$= 0.403 - 0.0028$$

$$= 0.400V$$

11. (a) In river water negatively charged clay particles are dispersed while in a sea water salts are dissolved or ions of potassium, sodium and magnesium are present. When river water comes in contact with sea water the dispersed clay or sand particles get coagulated due to positively charged ions present in sea water at the point of contact gradually river bed starts rising and delta is formed.

(b) Colloidal solution is made up of dispersed phase and dispersion medium. The size of the dispersed phase varies between 1nm to 100 nm in colloidal solution. If this size is made bigger the colloidal state changes to suspension and if this size is made smaller than 1nm it changes to true solution. Therefore, a particular substance in one solvent makes a colloidal solution and in another solvent it makes a true solution, For example, sodium chloride forms true solution when dissolved in water but forms colloidal solution when dispersed in benzene.

12. (a) It is because ΔH is $-ve$. In spite of $\Delta S = -ve$, ΔH is $-ve$ & ΔG is $-ve$. Hence it is spontaneous.

(b) In physical adsorption extent of adsorption decrease with increase in temperature whereas in chemical adsorption extent of adsorption first increases and decreases with increase in temperature.

13. (a) $NF_3 < PF_3 < AsF_3 < BiF_3$, because the electropositive character of the atom increases down the group, therefore the ionic character also increases.

(b) Hypophosphorous acid or phosphonic acid

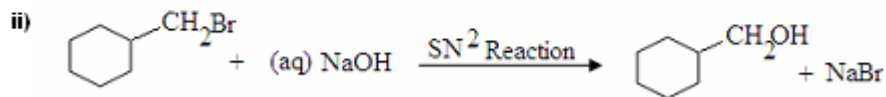
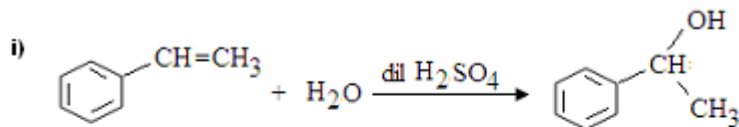
14. (a) It is due to:

(i) low enthalpy of dissociation of F – F bond.

(ii) high hydration enthalpy of F^- among halide ions.

(b) Fluorine is most electronegative element and cannot exhibit any positive oxidation state. Other halogens have d orbitals and therefore can expand their octet and show +1, +3, +5, +7 oxidation states

15.

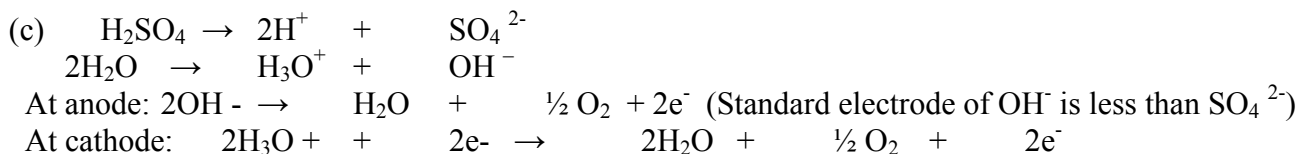
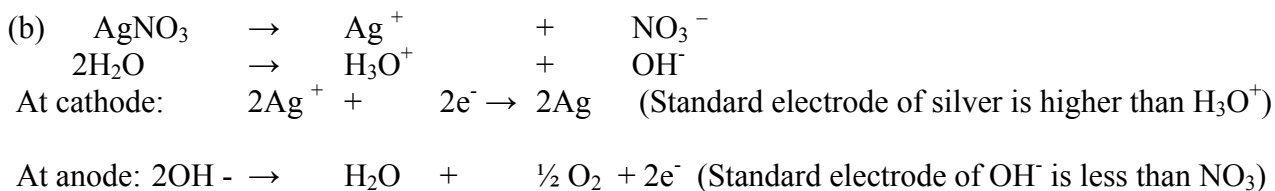
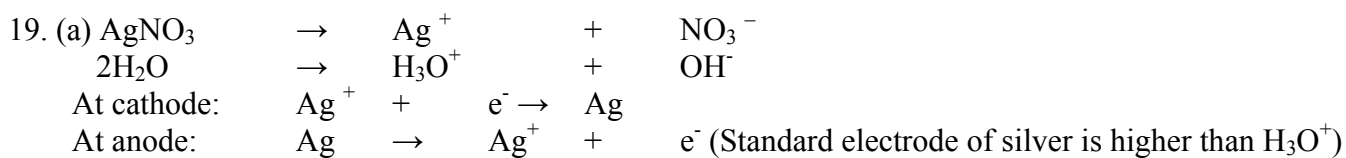
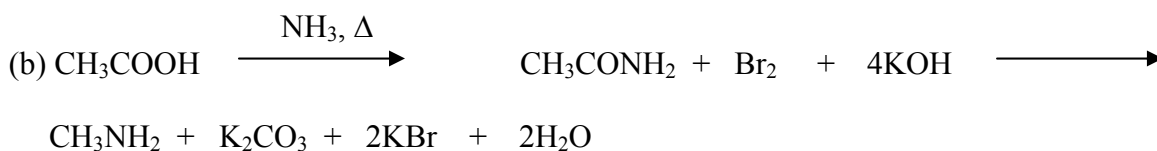
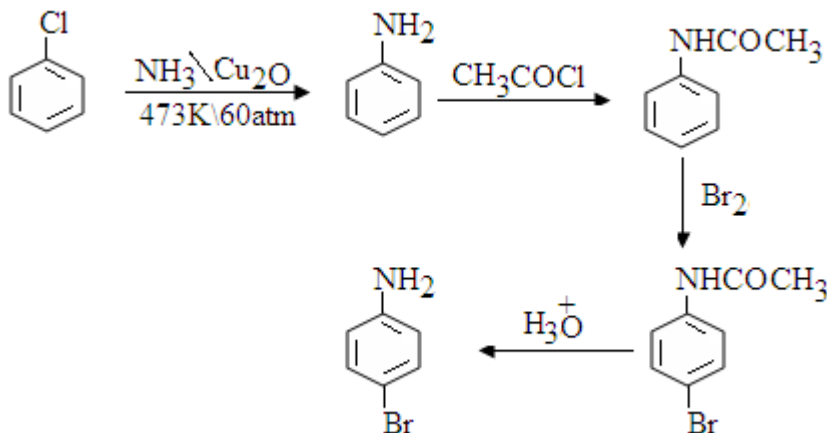


16. (a) 2,5 –Dimethylhexane-1,3-diol (b) 2-Bromo-3-methylbut-2-en-1-ol

17. (a) Add HNO_2 , secondary amine will form yellow oily compound while tertiary will form a salt soluble in water.

(b) It is due to the protonation of aniline to form $\text{C}_6\text{H}_5\text{NH}_3^+$, which is electron withdrawing hence *m*-directing.

18. (a)



$$20. (a) t_{99.9\%} = \frac{2.303}{k} \log \frac{[R_0]}{[R_0] - 99.9/100[R_0]} = 6.909/k$$

$$t_{1/2} = 0.693/k$$

$$\frac{t_{99.9\%}}{t_{1/2}} = \frac{6.909 \times k}{k \times 0.693} = 10$$



$$\frac{1}{2} \frac{d[\text{NH}_3]}{dt} = +\frac{d[\text{N}_2]}{dt} = +\frac{1}{3} \frac{d[\text{H}_2]}{dt}$$

$$-d[\text{NH}_3] = \text{Rate} = k[\text{NH}_3]^0$$

$$= 2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$+\frac{d[\text{N}_2]}{dt} = \frac{1}{2} \frac{d[\text{NH}_3]}{dt} = \frac{1}{2} \times 2.5 \times 10^{-4}$$

$$+\frac{d[\text{H}_2]}{dt} = -\frac{3}{2} \frac{d[\text{NH}_3]}{dt}$$

$$= \frac{3 \times 2.5 \times 10^{-4}}{2} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$= \frac{7.5 \times 10^{-4}}{2} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$= 3.75 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$$

Or

$$\text{Rate} = -\frac{d[\text{NH}_3]}{dt} = k[\text{NH}_3]^0$$

$$= 2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$\text{Rate of production of N}_2 = \frac{+d[\text{N}_2]}{dt} = \text{Rate}$$

$$= 2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$\text{Rate of production of H}_2 = \frac{+d[\text{H}_2]}{dt} = 3 \times \text{Rate}$$

$$= 3 \times 2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$= 7.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$$

21. (a) If the metal is in liquid state then the entropy is higher of metal than solid state. For the reduction process the value of entropy change is more positive when the metal formed is in liquid state than the metal oxide reduced in the solid state. Thus the value of Gibb's free energy becomes more negative and the reduction becomes easier.
- (b) Because in this redox reaction, all the reactants and products are solid at room temperature. At high temperature when Cr melts, the reaction proceeds rapidly.
- (c) When impure ore is mixed with water and pine oil in a tank and steam is passed through it, gangue particles are wetted by water while the ore by oil. Thus, the sulphide ore rises in the form of a foam while the gangue impurities settled at the bottom of the container.

22. (a) Nitrogen can form $p\Pi-p\Pi$ multiple bonds with another nitrogen to give N_2 molecule but phosphorous cannot form multiple bonds due to repulsion of non-bonded electrons of the inner core in it, thus form P_4 molecule having single bond. Due to this reason nitrogen shows little tendency for catenation. N-N bond is weaker than the single P-P bond because of high interelectronic repulsion of the non bonding electrons due to small bond.

(b) Sulphur exists as S_2 molecule in vapour state which has two unpaired electrons in the antibonding Π orbital like O_2 molecule. So sulphur exhibits paramagnetism.

(c) In Bismuth +3 oxidation state is more stable than +5 oxidation state because of inert pair effect of 6s electrons. Therefore, +5 oxidation state can be changed to +3 oxidation state easily and bismuth acts as a strong oxidizing agent due to this change in oxidation state.

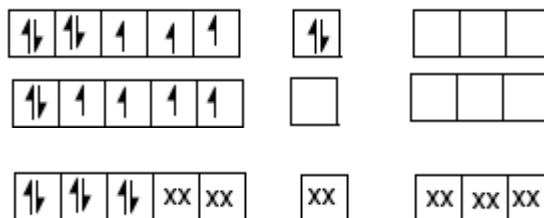
23. (a) If the d-orbitals used in hybridization are of lower shell than the s- and p-orbitals then $(n-1)d^2 nsp^3$ type of complexes are formed and are called inner orbital or low spin complexes. For example, in $K_4[Fe(CN)_6]$, 3d, 4s and 4p orbitals take part in the hybridization, therefore it is inner orbital complex.

If the d-orbitals used in hybridization are of the same principal energy level as that of s- and p-orbitals, the complexes are of $ns^2 nd^2$ type and are called outer orbital complexes or high spin complexes. For example, $[FeF_6]^{3-}$, 4s, 4p and 4d orbitals take part in hybridization therefore it is outer orbital complex.

(b) In $[Co(NH_3)_6]^{3+}$ the oxidation state of cobalt is +3. It means four unpaired electrons out of the total six electrons are present in the d-orbitals. Under the influence of ligand molecules these unpaired electrons get paired and two orbitals of d-sub shell were made available for d^2sp^3 hybridisation. Six electron pairs from 6 molecules of ammonia were donated to the six hybridized orbital. Because of the absence of any unpaired electron, the complex was found to be diamagnetic, and due to d^2sp^3 hybridisation the geometry was found to be octahedral. It is an inner orbital complex because 3d and 4s and 4p orbitals are used in hybridization.

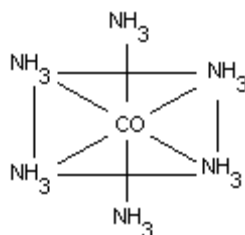
Configuration of Co atom

Configuration of Co^{3+}

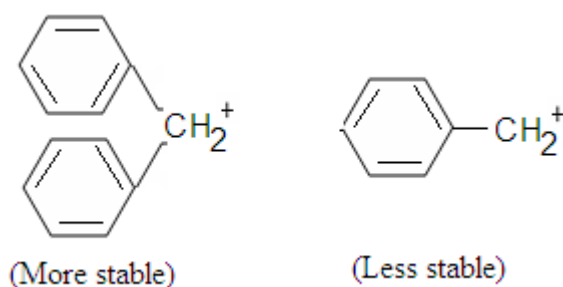


Formation of $[Co(NH_3)_6]^{3+}$

Octahedral geometry



24. (a) Easeness of hydrolysis depends upon the stability of intermediate carbocation. Because of the presence of two phenyl groups, carbocation of $C_6H_5CHClC_6H_5$ gets stabilized more by resonance in comparison of the carbocation of $C_6H_5CH_2Cl$ in which only one phenyl group is present.

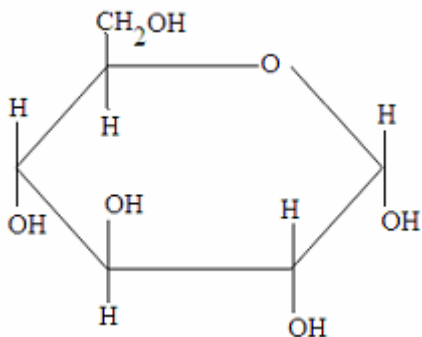


b) A base (OH^-) is nucleophile also, therefore there is always a competition between substitution and elimination reaction. When alkyl halide are treated with some base\ nucleophile in aq.KOH, OH^- ions will act as a strong nucleophile and substitute halide ions from alkyl halides to give alcohols because of the high polarity of water. On the other hand in alcoholic KOH, elimination reaction is preferred because of the low polarity of solvent (alcohol) and alkenes are obtained.

(c) because it converts KI to corresponding HI and then oxidizes to I_2 as conc. sulphuric acid is a good oxidizing agent

25.(a) It indicates that $-CHO$ group of glucose is not free, but it is present in cyclic hemiacetal form.

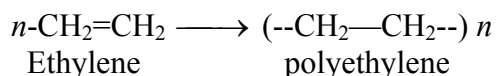
(b)



(b) Nucleoside is formed by the combination of nitrogen base and a pentose sugar and $Nucleoside + H_3PO_3 = Nucleotide$. In nucleoside and nucleotide base is on C-1 of sugar. While in nucleotide, phosphoric acid is present on C-5 of sugar.

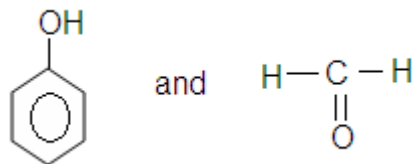
26. (a) On the basis of the method of synthesis, polymers may be of two types:

(i) **Addition polymers:** When monomer units add with each other to form polymer without the elimination of smaller molecules like H_2O , HCl , $R-OH$ etc. is called addition polymer. In this type of polymerization, monomer units are always unsaturated compound. Example- polyethylene is formed due to the addition of ethene molecules, polyvinyl chloride (PVC) is formed due to the addition of vinyl chloride molecules.



ii) **Condensation polymers:** When the monomer units (same or different) add to each other and eliminate some smaller molecules like H_2O , HCl , $R-OH$ etc. during the formation of polymer, it is called condensation polymer. In this type of polymerization both monomer units contain at least one functional group (both monomers have different functional groups). Example- Nylon-6,6 is formed due to the condensation of hexamethylene diamine and adipic acid molecules.

(b) The strong monomers of Bakelite are phenol and formaldehyde.



27. (a) Aspirin has antiblood clotting action, so it is used in the prevention of heart attack.

- (b) Acidity is caused due to excessive release of hydrochloric acid in stomach, which can be neutralised by sodium bicarbonate or Mg or Al hydroxide. But excessive use of these substances would make the stomach alkaline and force the production of more acid. But cimetidine and ranitidine do not react directly with acid, instead they prevent the interaction with the receptor present in the stomach wall because of which lesser amount of acid is produced and acidity is controlled.
- (c) Antidepressant drugs are required to inhibit the enzymes which are responsible to catalyse the degradation of noradrenaline. Inhibition of such enzymes slow down the process of metabolism of noradrenaline and thus reduces the effect of depression.

28 (a)

$$\begin{aligned}P_1 &= x_1 P_1^0 \\ \Delta P_1 &= P_1^0 - P_1 \\ \Delta P_1 &= P_1^0 - P_1 x_1 \\ \Delta P_1 &= P_1^0 (1 - x_1) \\ x_2 &= 1 - x_1 \\ \Delta P_1 &= x_2 P_1^0 \\ \frac{\Delta P_1}{P_1^0} &= \frac{P_1^0 - P_1}{P_1^0} = x_2 \\ &= \frac{P_1^0 - P_1}{P_1^0} = \frac{n_2}{n_1 + n_2} \\ &= \frac{P_1^0 - P_1}{P_1^0} = \frac{n_2}{n_1} = \frac{M_2 \times M_1}{M_1 \times M_2}\end{aligned}$$

(b) Molar mass of Ethylene glycol = $2 \times 12 + 4 + 2 \times 17$
= $24 + 4 + 34 = 62$ g
Mass of solution = $222.6\text{g} + 200 = 422.6$ g

Molarity of the solution

$$\begin{aligned}&= \frac{\text{Mass of Ethylene glycol}}{\text{Molar mass of Ethylene glycol}} \times \frac{1000}{\text{Mass of solvent (H}_2\text{O)}} \\ &= \frac{222.6}{62} \times \frac{1000}{200} = 17.95\end{aligned}$$

Further, the volume of solution

$$= \frac{\text{Mass of solution}}{\text{density}} = \frac{422.6}{1.072} = 394.22\text{ml}$$

Thus the molarity

$$\begin{aligned}&= \frac{\text{Mass of Ethylene glycol}}{\text{Molar mass of Ethylene glycol}} \times \frac{1000}{\text{Volume of solution}} \\ &= \frac{222.6}{62} \times \frac{1000}{394.22} = 9.11\text{M}\end{aligned}$$

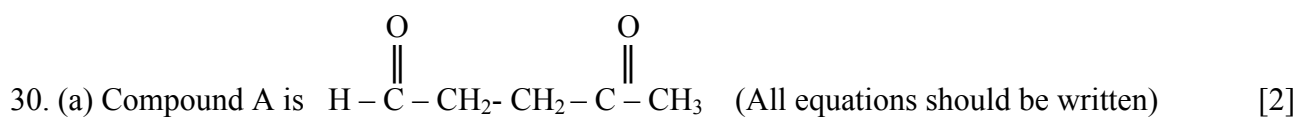
- 29 (a) (i) +2 because both of them have lower values of $IE_1 + IE_2$
(ii) Pt metal can form the compounds in +4 oxidation state more easily because the sum of first four ionization enthalpies for Pt is less than Ni.

(b) (i) The lowest oxide is basic because the metal is present in lower oxidation state, some of the d-electrons are not involved in bonding and thus its nuclear charge is not very high due to this reason these oxide can donate electrons and behave like a base. In the oxide of higher oxidation state have the tendency to accept the electrons, due to the high effective nuclear charge in these oxide, so they are acidic in nature.

MnO	Mn_2O_3	MnO_4	MnO_2	Mn_2O_7
+2	+3	+ 8/3	+ 4	+7
(Basic in nature)		(Amphoteric in nature)		(Acidic)

(ii) Zn^{2+} has completely filled d-orbital ($3d^{10} 4s^0$) so no d to d transition is possible in it, hence its salt will be white. In Cu^{2+} ($3d^9 4s^0$) salts d to d transition is possible due to incomplete d-orbitals. During this d to d transition the energy corresponding to red light is absorbed and remaining part of white light i.e; blue colour appears for Cu^{2+} salts.

(iii) Because the highest oxidation state of metal in oxoanions is stabilized by O^{2-} ion, therefore the meta shows highest oxidation state in oxoanions. Example: $\text{Cr}_2\text{O}_7^{2-}$ (dichromate) and MnO_4^- (permanganate) have the highest oxidation states of metal Cr(VI) and Mn(VII)



(b) [1+1+1]

