IIT-JEE-Chemistry-Mains-2005

1. Monomer A of a polymer of ozonolysis yields two moles of HCHO and one mole of CH3COCHO.
(a) Deduce the structure of A.
(b) Write the structure of "all cis"—form of polymer of compound A.

2. Fill in the blanks

(a) 235U92 + 0n1 ® 137A52 + 97B40 + ……….

(b) 82Se34 ® 2 −1e0 + ……….

3. (a) Calculate the amount of calcium oxide required when it reacts with 852 g of   P4O10.
(b) Write the structure of P4O10.

4. An element crystallizes in fcc lattice having edge length 400 pm. Calculate the maximum diameter of atom which can be placed in interstitial site without distorting the structure.
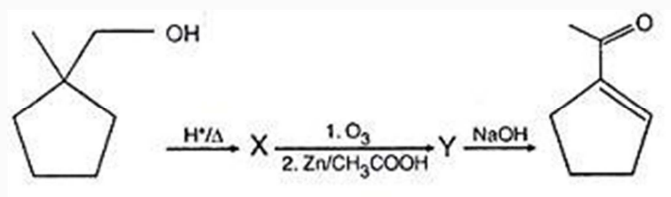
5. 20% surface sites have adsorbed N2. On heating N2 gas evolved from sites and were collected at 0.001 atm and 298 K in a container of volume is 2.46 cm3. Density of surface sites is 6.023 × 1014/cm2 and surface area is 1000 cm2, find out the number of surface sites occupied per molecule of N2.

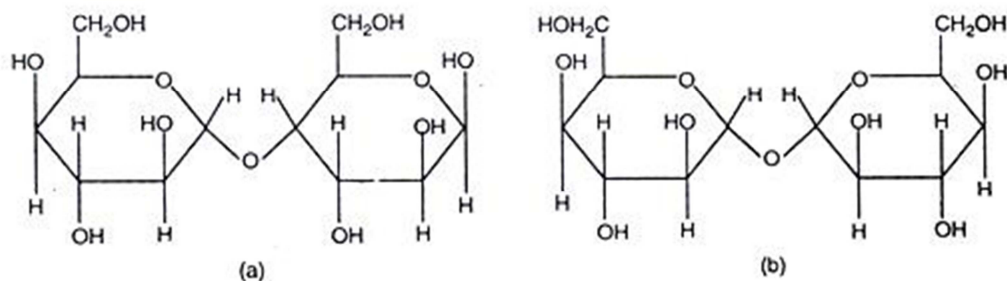**6.** Predict whether the following molecules are iso-structural or not. Justify your answer.
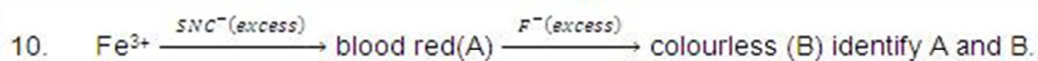
(i) NMe3
(ii) N(SiMe3)3

7.

Identify X and Y.

8. Which of the following disaccharide will not reduce Tollen's reagent?

(a)   (b)

9. Write balanced chemical equation for developing a black and white photographic film. Also give reason why the solution of sodium thiosulphate on acidification turns milky white and give balance equation of this reaction.

10. $Fe^{3+} \xrightarrow{SNC^-(excess)}$ blood red(A) $\xrightarrow{F^-(excess)}$ colourless (B) identify A and B.

(a) Write IUPAC name of A and B.
(b) Find out spin only magnetic moment of B.

11. $2X(g) \circledR 3Y(g) + 2Z(g)$

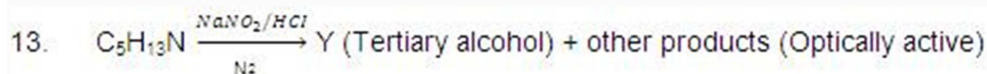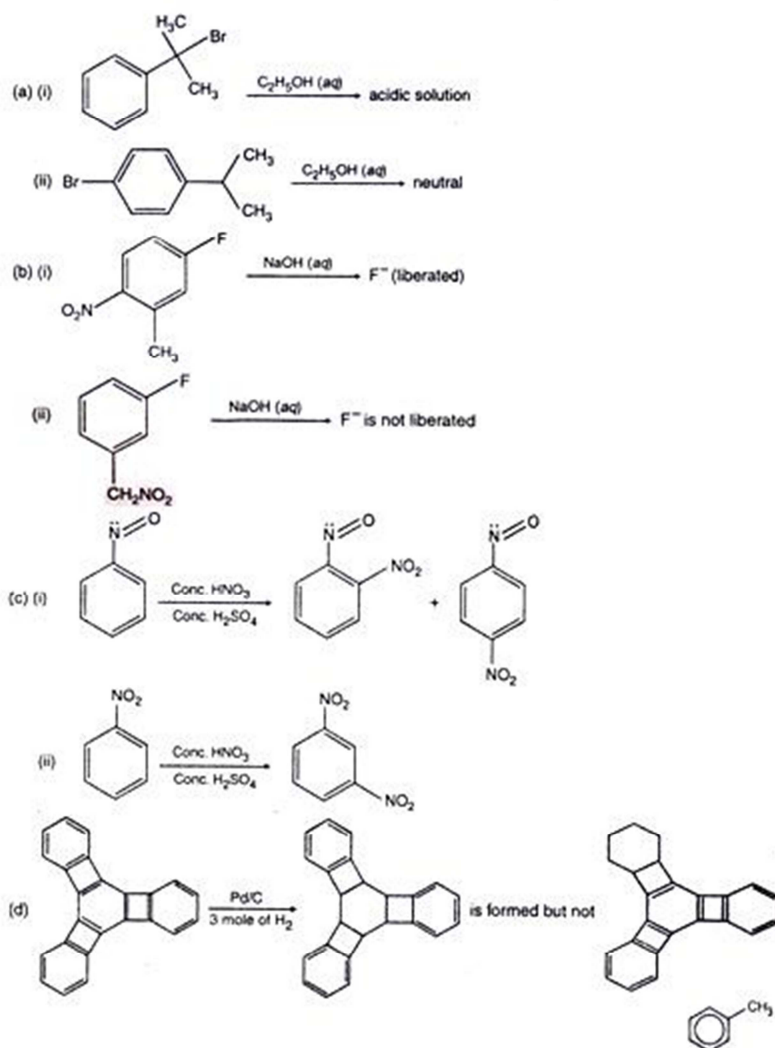| Time (in Min)	0	100	200
Partial pressure of X (in mm of Hg)	800	400	200

Assuming ideal gas condition. Calculate
(a) Order of reaction
(b) Rate constant
(c) Time taken for 75% completion of reaction.
(d) Total pressure when $Px = 700$ mm

12. (a) Calculate velocity of electron in first Bohr orbit of hydrogen atom
(Given $r = a0$)
(b) Find de-Broglie wavelength of the electron in first Bohr orbit.
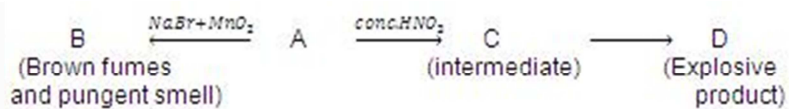(c) Find the orbital angular momentum of 2p-orbital in terms of h/2p units.

13. $C_5H_{13}N \xrightarrow[N_2]{NaNO_2/HCl}$ Y (Tertiary alcohol) + other products (Optically active)

Find X and Y. Is Y optically active? Write the intermediate steps.

14. Giver reasons :

15.

B $\xleftarrow{NaBr+MnO_2}$ A $\xrightarrow{conc.HNO_3}$ C $\longrightarrow$ D

(Brown fumes and pungent smell)   (intermediate)   (Explosive product)

Find A, B, C and D. Also write equations A to B and A to C.

16.

(B) $\xleftarrow{Moist\ air}$ MCl_4 $\xrightarrow{Zn}$ (A)

(White fumes having smell)   (M = transition element colourless)   (Purple colour)

Identify the metal M and hence MCl4. Explain the difference in colours of MCl4 and A.

17. $\mu_{obs} = \Sigma \mu_i x_i$

Where μ_i is the dipole moment of stable conformer and x_i is the mole fraction of that conformer.

   (a) Write stable conformer for Z—CH2—CH2—Z in Newman's projection.

      If $\mu_{solution}$ = 1.0 D and mole fraction of anti form = 0.82, find μ_{Gauche}

   (b) Write most stable meso conformer of

$$CHDY$$
$$|$$
$$CHDY$$

      If (i) Y = CH3 about C2—C3 rotation and

       (ii) Y = OH about C1—C2 rotation.

18. (a) Calculate DGro of the following reaction

$$Ag^+_{(aq)} + Cl^-_{(aq)} \rightarrow AgCl_{(s)}$$