

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.

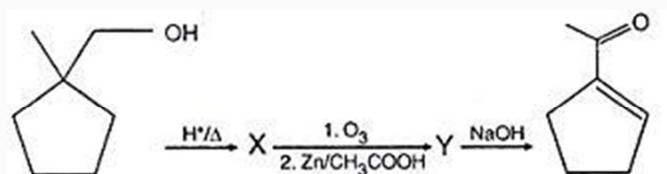
5. 20% surface sites have adsorbed N₂. On heating N₂ gas evolved from sites and were collected at 0.001 atm and 298 K in a container of volume is 2.46 cm³. Density of surface sites is 6.023 × 10¹⁴/cm² and surface area is 1000 cm², find out the number of surface sites occupied per molecule of N₂.

6. Predict whether the following molecules are iso-structural or not. Justify your answer.

(i) NMe₃

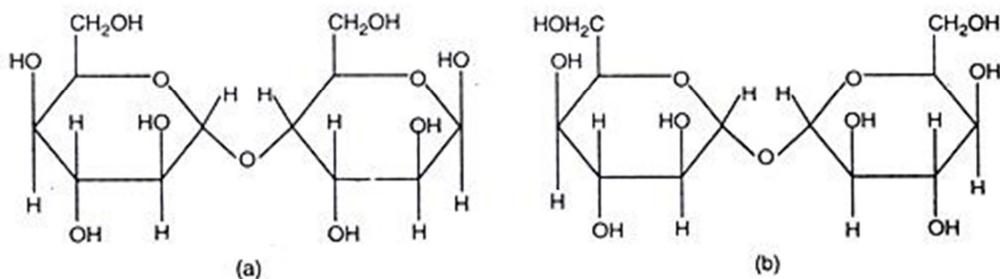
(ii) N(SiMe₃)₃

7.

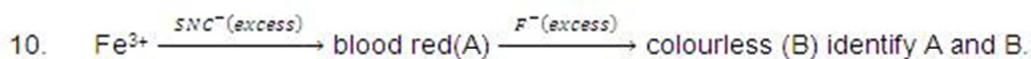


Identify X and Y.

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



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.



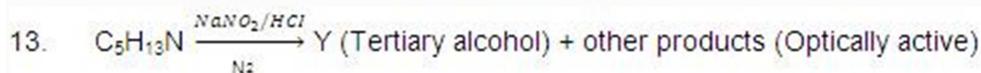
- (a) Write IUPAC name of A and B.
 (b) Find out spin only magnetic moment of B.



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

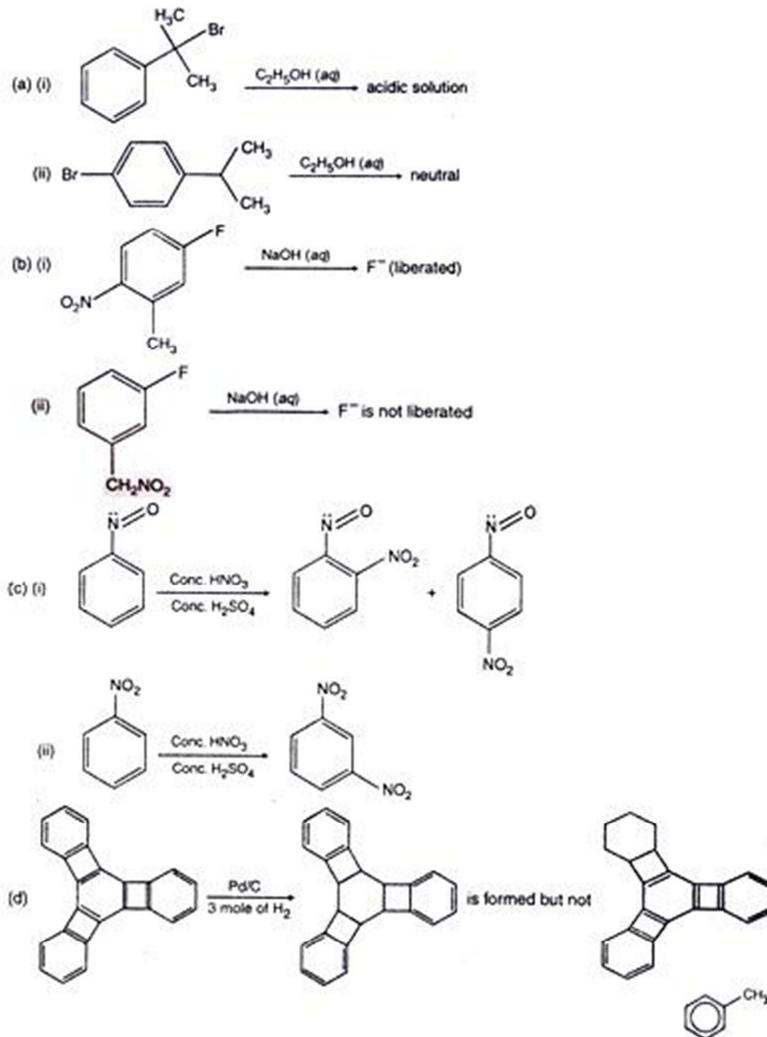
Assuming ideal gas condition. Calculate

- (a) Order of reaction
 (b) Rate constant
 (c) Time taken for 75% completion of reaction.
 (d) Total pressure when $P_x = 700$ mm
12. (a) Calculate velocity of electron in first Bohr orbit of hydrogen atom (Given $r = a_0$)
 (b) Find de-Broglie wavelength of the electron in first Bohr orbit.
 (c) Find the orbital angular momentum of 2p-orbital in terms of $h/2\pi$ units.

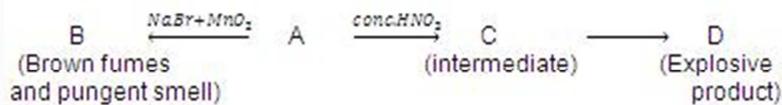


Find X and Y. Is Y optically active? Write the intermediate steps.

14. Giver reasons :



15.



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

16.



Identify the metal M and hence MCl_4 . Explain the difference in colours of MCl_4 and A.

17. $m_{\text{obs}} = S m_i x_i$

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

(a) Write stable conformer for $Z-CH_2-CH_2-Z$ in Newman's projection.

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

(b) Write most stable meso conformer of



If (i) $Y = CH_3$ about C_2-C_3 rotation and

(ii) $Y = OH$ about C_1-C_2 rotation.

18. (a) Calculate ΔG_{rxn} of the following reaction

