

(d) o-cresol < m-cresol < o-cresol

19. The correct order of acid strength in the following oxides is –

(a) $\text{Cl}_2\text{O}_7 > \text{SO}_2 > \text{P}_4\text{O}_{10}$

(b) $\text{CO}_2 > \text{N}_2\text{O}_5 > \text{SO}_3$

(c) $\text{Na}_2\text{O} > \text{MgO} > \text{Al}_2\text{O}_3$

(d) $\text{K}_2\text{O} > \text{CaO} > \text{MgO}$

20. Solubility product of three salts MX, MX_2 , M_3X at 298 K is 4.0×10^{-8} , 3.2×10^{-14} , 2.7×10^{-15} . The solubility order of these salts in mol. dm^{-3} at this temperature is –

(a) $\text{MX} > \text{MX}_2 > \text{M}_3\text{X}$

(b) $\text{M}_3\text{X} > \text{MX}_2 > \text{MX}$

(c) $\text{MX}_2 > \text{M}_3\text{X} > \text{MX}$

(d) $\text{MX} > \text{M}_3\text{X} > \text{MX}_2$

21. The increasing order of melting point of halides follows -

(a) $\text{CuCl} < \text{NaCl} < \text{NaF}$

(b) $\text{NaF} < \text{NaCl} < \text{CuCl}$

(c) $\text{NaF} < \text{CuCl} < \text{NaCl}$

(d) $\text{CuCl} < \text{NaF} < \text{NaCl}$

22. IUPAC name of $m\text{-C}_6\text{H}_4\text{-(OH)COOCH}_3$ is

(a) Methyl (3-hydroxy) benzoate

TCS

CHEMISTRY APTITUDE TEST : STAGE II : 2014

Full Marks – 50

Time – 90 m

Answer all the Questions. There are 30 MCQ in Group A, each of 1 mark. Each MCQ has been provided with four alternative answers. Shade the correct answer with ball point pen in the appropriate box in the Answer-script. Overwriting in shading is liable to cancel the relevant answer. 0.25 mark will be deducted for wrong answer to each MCQ. Group B contains 10 Questions each of 2 marks – answer these questions in the space provided for in the Answer-script.

GROUP - A

Each question is provided with four alternative answers. Shade the appropriate box in the answer-script with a ball point pen. Don't overwrite while shading1x30 =30.

1. A radioactive element decays emitting one alpha (α) and two beta (β) particles. The daughter element is related to the parent element as –

(a) isobar (b) isotone (c) isotope (d) none of these

2. If the radius of Bohr's first orbit is x, then de Broglie wavelength of an electron in the third orbit will be –

(a) $2\pi x$ (b) $6\pi x$ (c) $9x$ (d) $\pi/3$

3. ΔH and ΔE for the reaction : $\text{Fe}_2\text{O}_3(\text{s}) + 3\text{H}_2(\text{g}) = 2\text{Fe}(\text{s}) + 3\text{H}_2\text{O}(\text{l})$, at constant temperature are related as –

(a) $\Delta H = \Delta E$ (b) $\Delta H = \Delta E + RT$ (c) $\Delta H = \Delta E + 3RT$
(d) $\Delta H = \Delta E - 3RT$

4. Which of the following molecules contains three unequal bonds ?

(a) BrF_3 (b) PCl_5 (c) SOCl_2 (d) OSF_2

5. The complexes $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2\text{O}$ and $[\text{Co}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$ are examples of –

- (a) Geometrical isomer (b) Linkage isomer (c) Ionisation isomer
(d) Co-ordination isomer

6. Oxidation number of 'S' in $\text{Na}_2\text{S}_4\text{O}_6$ is –

- (a) 2.5 (b) two S are +2 and two S are +3 (c) three S are +2 and one S is +3 (d) two S are +5 and two S are zero

7. Which one of the following is responsible for depletion of ozone in the atmosphere ?

- (a) Cl_2 (b) SO_2 (c) NO_2 (d) Chlorofluorocarbon (CFC)

8. Chlorine undergoes disproportionation in cold NaOH into Cl^- (aq) and OCl^- (aq). If M be the molar mass of chlorine, its equivalent weight would be –

- (a) M (b) 2M (c) $2M/3$ (d) $M/2$

9. The rate equation for the gas phase reaction : $2\text{NO}_2 + \text{F}_2 \rightarrow 2\text{NO}_2\text{F}$, is $38 \text{ dm mol}^{-1} \text{ s}^{-1}$ at 300 K. The order of the reaction is –

- (a) 0 (b) 1 (c) 2 (d) 3

10. If 10 g of a non-volatile solute dissolved in 100 g benzene, raises b.p. of the solution by 1°C , then the molar mass of the solute is [given K_b for benzene = $2.53 \text{ K kg mol}^{-1}$],

- (a) 223g (b) 233g (c) 243g (d) 253 g

11. Which of the following trihalides does not undergo hydrolysis ?

- (a) NCl_3 (b) PCl_3 (c) NF_3 (d) BiCl_3

12. On electrolysis, carnalite gives

- (a) Mg only (b) K only (c) Mg and Cl only
(d) Mg and K only

13. Which of the following anions cannot be formed by boron ?

- (a) BH_4^- (b) $\text{B}(\text{OH})_4^-$ (c) BO_2^- (d) BF_6^{3-}

14. Which of the following polyhalides is not known ?

- (a) I_3^- (b) F_3^- (c) Br_3^- (d) Cl_3^-

15. Copper sulphate forms a complex anion in excess KCN solution, the anion is –

- (a) $\text{Cu}(\text{CN})^-$ (b) $\text{Cu}_2\text{Cu}(\text{CN})^-$ (c) $[\text{Cu}(\text{CN})_4]^{3-}$ (d) $[\text{Cu}(\text{CN})_4]^{2-}$

16. Which of the following reactions will not occur spontaneously ?

- (a) $\text{F}_2 + 2\text{Cl}^- \rightarrow 2\text{F}^- + \text{Cl}_2$ (b) $\text{I}_2 + 2\text{Br}^- \rightarrow 2\text{I}^- + \text{Br}_2$
(c) $\text{Br}_2 + 2\text{I}^- \rightarrow 2\text{Br}^- + \text{I}_2$ (d) $\text{Cl}_2 + 2\text{I}^- \rightarrow 2\text{Cl}^- + \text{I}_2$

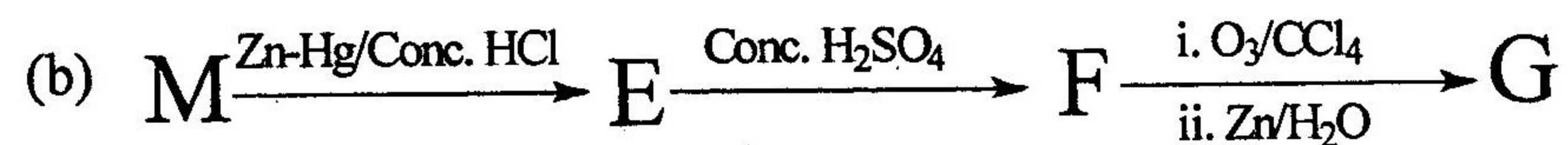
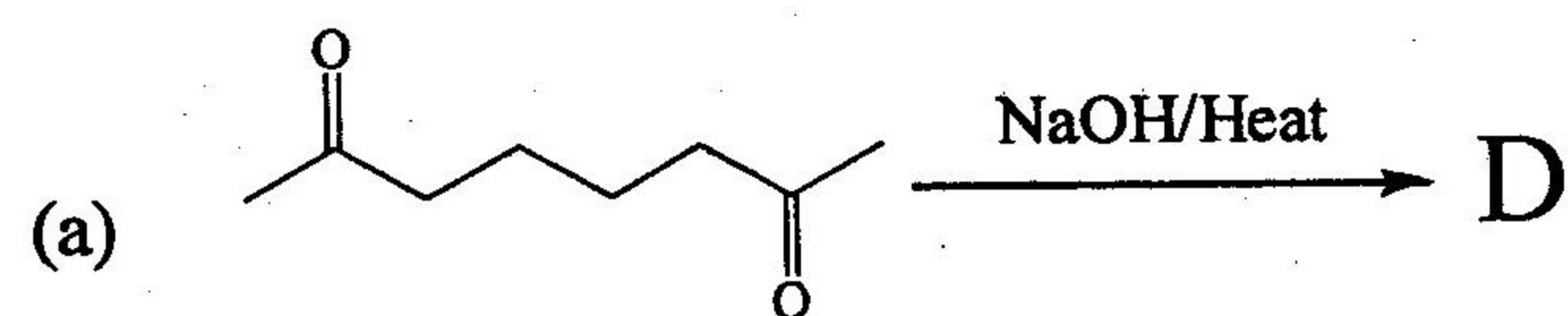
17. The hybridisation of Mn in MnO_4^- and its shape is –

- (a) sp^3 , tetrahedral (b) dsp^2 , square planar
(c) d^3s , tetrahedral (d) sp^3d^2 , octahedral

18. The correct order of acidity of three isomeric cresols is –

- (a) m-cresol < p-cresol < o-cresol
(b) m-cresol < o-cresol < p-cresol
(c) o-cresol < p-cresol < m-cresol

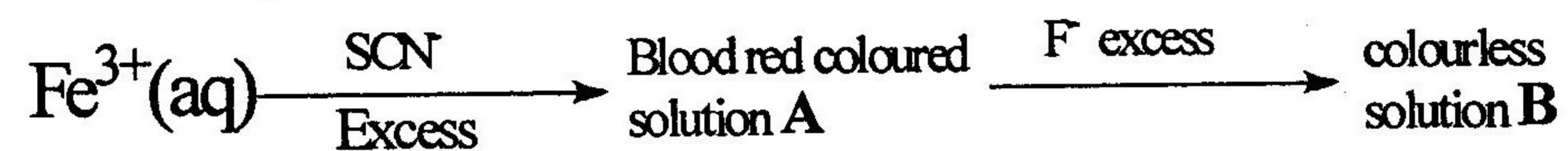
37. Identify 'A' 'B', 'C' and 'D' in the following reactions :



38. Calculate pH of a buffer solution containing 0.2 M sodium acetate and 0.1 M acetic acid.

Given that : $K_a = 1.8 \times 10^{-5}$

39. Identify 'A' and 'B' in the following reactions:



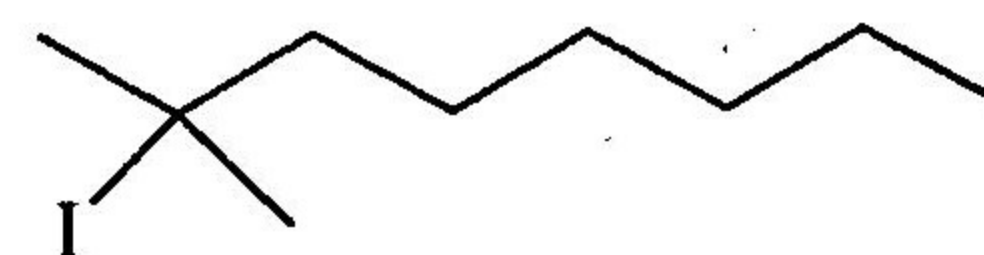
40. The ratio of average molecular velocities of two gases X and Y at constant temperature is 3:1. Find the ratio of their molar masses M_x and M_y .

(b) Methyl (4-hydroxy) benzoate

(c) Ethyl (2-hydroxy) benzoate

(d) Methyl (2-hydroxy) benzoate

23. How many distinct alkenes are produced when the following alkyl halide undergoes E^2 -elimination ?



(a) 2 (b) 3 (c) 4 (d) 5

24. Identify the products A and B in the reaction: $\text{CH}_3\text{-CH=CH-O-CH}_3 + \text{HI} \xrightarrow{0^\circ\text{C}} \text{A} + \text{B}$

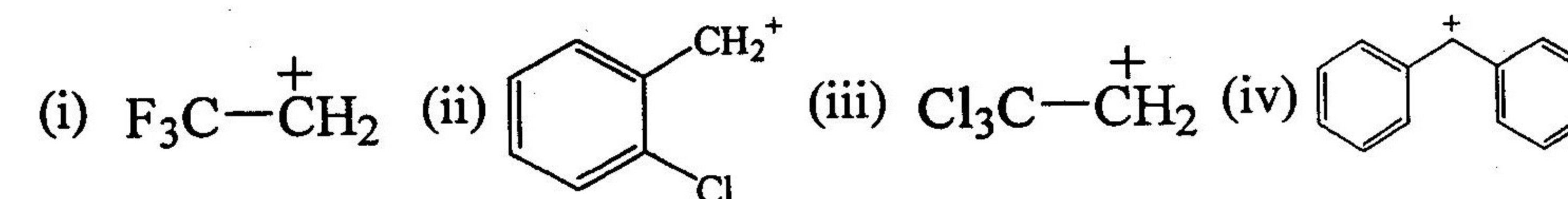
(a) CH_3OH and $\text{CH}_3\text{-CH=CH-I}$

(b) $\text{CH}_3\text{CH=CHOH}$ and CH_3I

(c) $\text{CH}_3\text{CH}_2\text{CHO}$ and CH_3I

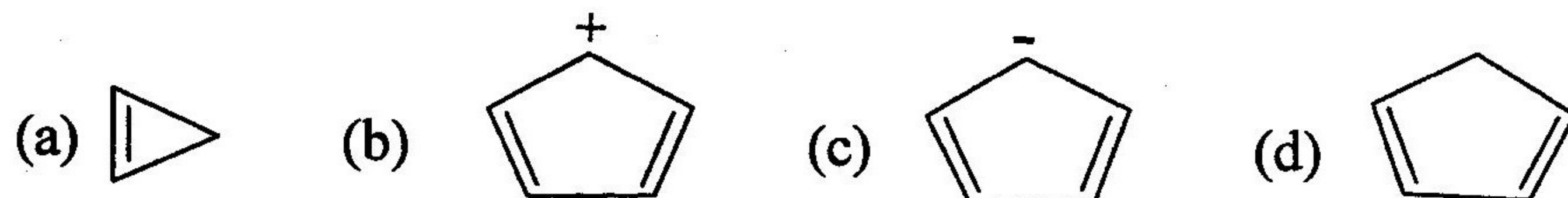
(d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ and CH_3I

25. The correct decreasing order of stability of the following carbocations is



(a) $\text{iv} > \text{iii} > \text{ii} > \text{i}$ (b) $\text{iv} > \text{ii} > \text{iii} > \text{i}$ (c) $\text{iii} > \text{iv} > \text{ii} > \text{i}$ (d) None of these

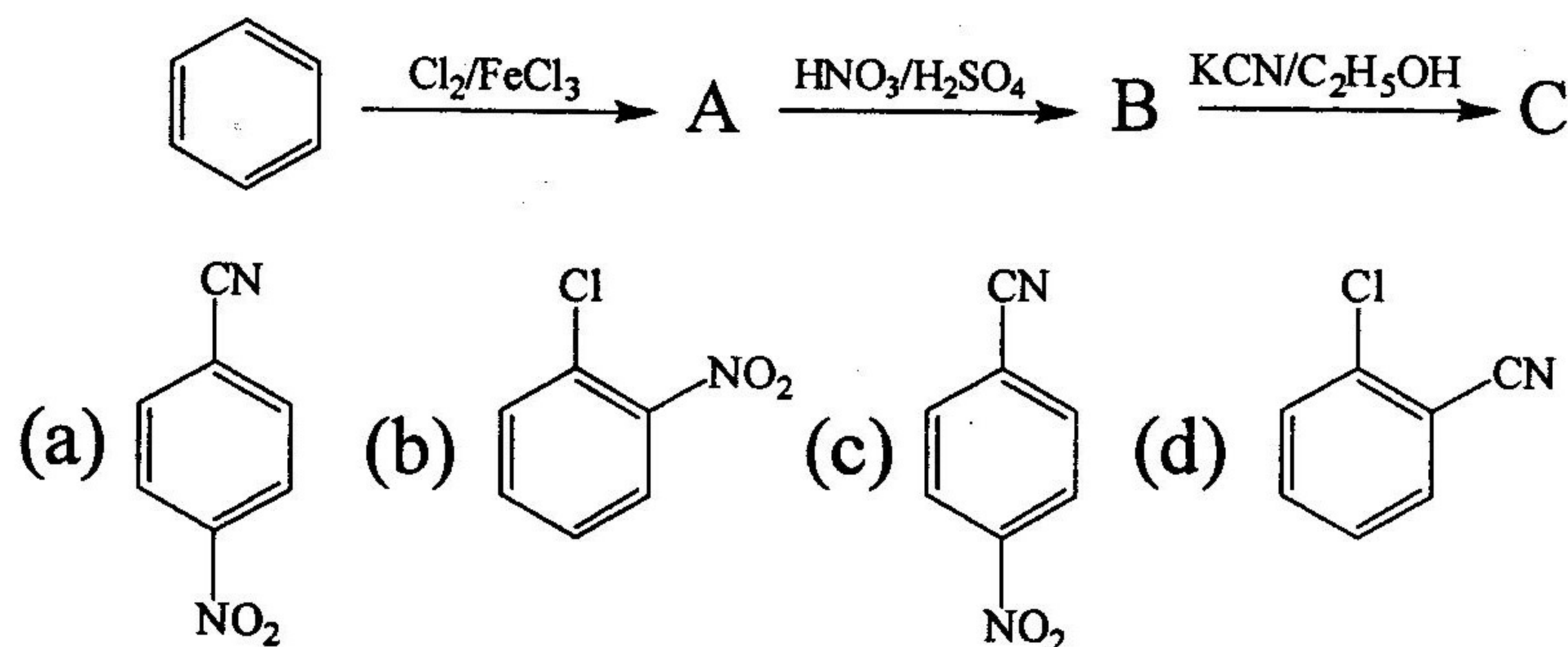
26. Which of the following is expected to be aromatic ?



27. Which of the following is able to convert ethyne into dichloroethanal ?

- (a) $\text{KMnO}_4 / \text{Conc. HCl}$ (b) Chlorine water (c) $\text{CrCl}_3 / \text{Conc. H}_2\text{SO}_4$ (d) $\text{MnO}_2 / \text{Conc. HCl}$

28. Ascertain C in the following scheme of reactions:



29. α -D-glucopyranose and β -D-glucopyranose are mutually-

- (a) Anomers (b) Epimers (c) Enantiomers (d) Tautomers

30. The monomer unit of natural rubber is -

- (a) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$ (b) $\text{CH}_2=\text{CH}_2$ (c) $\text{C}_6\text{H}_5-\text{CH}=\text{CH}_2$ (d) $\text{CH}_2=\text{C}(\text{CH}_3)-\text{CH}=\text{CH}_2$

GROUP - B

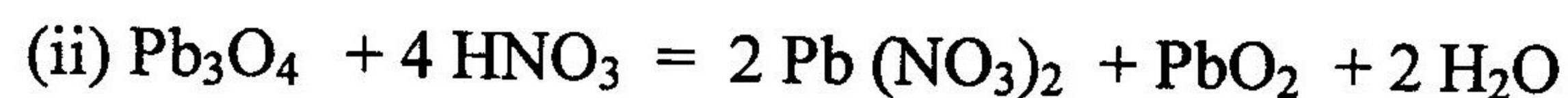
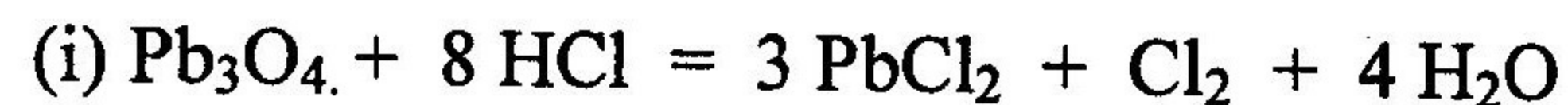
31. The reaction $2\text{N}_2\text{O}_5(\text{g}) \rightarrow 2\text{N}_2\text{O}(\text{g}) + \text{O}_2(\text{g})$, obeys the rate law, $\text{rate} = k[\text{N}_2\text{O}_5]$, where, $k = 0.0084 \text{ s}^{-1}$. If 2.5 moles of N_2O_5 are taken in a 5-litre flask, how many moles of N_2O_5 would remain after 1 minute ?

32. Which of the C-H bond between $\text{C}_{\text{sp}^3}-\text{H}$ and $\text{C}_{\text{sp}}-\text{H}$ is stronger and why ?

33. The brown colour of an acidified dilute iodine solution in aqueous KI solution deepens on addition of a nitrite, but the colour of the solution is discharged with the addition of a sulphite - explain.

34. When an electron jumps from first orbit ($n = 1$) to the third orbit ($n = 3$) in hydrogen atom, calculate the wavelength of the energy absorbed. Given, $R = 109677 \text{ cm}^{-1}$, $c = 3 \times 10^{10} \text{ cm s}^{-1}$.

35. Pb_3O_4 reacts differently with conc. HCl and conc. HNO_3 as:



Explain why ?

36. How would you carry out the following conversions ? Give only equations with reaction conditions.

- (a) Phenol \rightarrow Adipic acid (b) Acetyl chloride \rightarrow Propan-1,2-diol