

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. THIRD SEMESTER EXAMINATION, DECEMBER 2011

SECOND YEAR

CHEMISTRY (General)

Date : 24/12/2011

Time : 10.30 am – 1.30 pm

Paper : III

Full Marks : 75

[Use separate Answer Books for each group]

Group – A

Unit - I

Answer **any three** from the following :

- Define most probable speed.
 - Obtain the expression correlating temperature and most probable speed from Maxwell's equation of distribution of molecular speeds.
 - Explain why the most probable speeds of carbon monoxide and dinitrogen gas are same. [1+3+1]
- Draw P vs V curves for a real gas and a van der Waals gas at various temperatures ($T < T_C$, $T = T_C$ and $T > T_C$) [1½+1½]
 - Clearly mention at which region there is discrepancy between the two curves. [2]
- Define collision frequency and collision number. [2]
 - Establish a relation between the above two. [2]
 - What is the dimension of viscosity coefficient? [1]
- What do you mean by compressibility factor Z? Show graphically the variation of Z with pressure of a real gas at a constant temperature. [1+2]
 - Indicate the two postulates of the kinetic theory of gas which are not applicable in the case of real gases. [2]
- Starting from van der Waals gas equation arrive at the reduced equation of state. [3]
 - Explain what is the message of the law of the correspondence of state on the light of the above equation. [2]

Unit - II

Answer **any two** from the following :

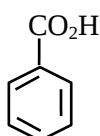
- Prove that for an ideal gas $\bar{C}_p - \bar{C}_v = R$ [3]
 - Prove that in a reversible isothermal expansion of an ideal gas net work done $= -RT \ln \frac{V_f}{V_i}$
(V_f , V_i are the final and initial volumes, T is the temperature) [2]
- Molar heat of combustion of ethylene, carbon and hydrogen at a particular temperature are $-1407 \text{ KJ mol}^{-1}$, -395 KJ mol^{-1} and -286 KJ mol^{-1} respectively. Calculate the molar heat of formation of ethylene at the same temperature. State the law used to solve the above problem. [4+1]
- What is Joule-Thomson co-efficient of a gas? Discuss the principle of liquefaction of a real gas on the basis of Joule-Thomson co-efficient. [2+3]

Group – B

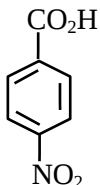
Unit - I

Answer **any three** from the following :

- Which one of the following is more acidic and why? [2]

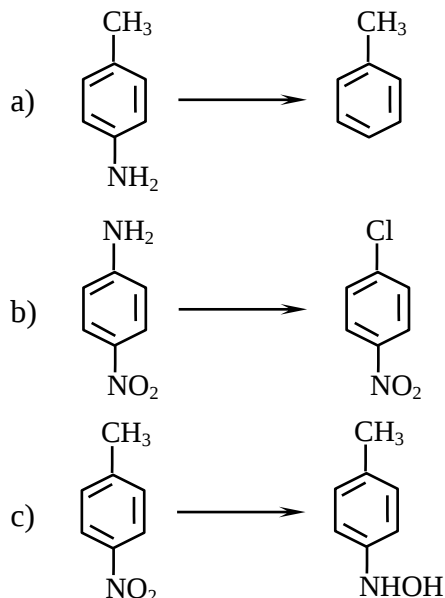


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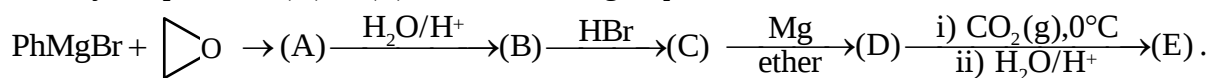


- b) Write down the B_{AC}2 mechanism of the hydrolysis of ethyl benzoate in dilute sodium hydroxide. [3]
10. a) How can you separate methylamine and dimethylamine from their mixture? [3]
 b) Using Gabriel's phthalimide synthesis carry out the following transformation. [2]
 $\text{BrCH}_2\text{COOC}_2\text{H}_5 \rightarrow \text{CH}_2(\text{NH}_2)\text{COOH}$.

11. Outline the steps for the following transformations : [1½+1½=2]



12. Identify the products (A) to (E) in the following sequence of reactions. [5]



13. Write short notes on (any two) : [2½×2]

- Reimer-Tiemann reaction
- Chaisen rearrangement
- Nitration of Phenol

Unit - II

Answer any two from the following :

14. Write notes on : [2½×2]

- Perkin reaction
- Claisen condensation

15. a) What happens when—

- benzaldehyde is warmed with 25% aqueous alcoholic KCN solution?
- benzaldehyde is warmed with 50% aqueous NaOH solution?

[2+2]

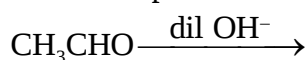
b) Choose the appropriate reagent from the list of carry out the reduction of benzaldehyde to toluene.

List of reagents : (i) Na, C₂H₅OH, (ii) Mg/Hg, ether, (iii) N₂H₄.HCl, HOCH₂CH₂OH, KOH, (iv) H₂, Pd, BaSO₄, (v) LiAlH₄

[1]

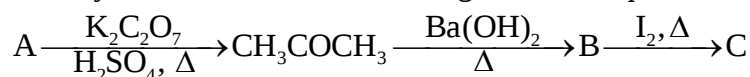
16. a) Predict the product of the following reaction. Give mechanism

[2]



b) Identify A, B and C in the following reaction sequence.

[3]



Group – C

Unit – I

Answer **any three** from the following :

17. a) HF gives both acid salt, KHF_2 and neutral salt, KF but HCl gives only the neutral salt, KCl—why? [2]
b) Though electronegativity of fluorine is less than chlorine, electronegativity of fluorine is greater than chlorine— explain. [3]
18. a) SiCl_4 forms adduct with NH_3 but CCl_4 does not explain. [2]
b) SiH_4 has higher boiling point than CH_4 . While the boiling point of SiCl_4 is lower than that of CCl_4 —Explain. [2]
c) PbCl_4 is readily decomposed to PbCl_2 and Cl_2 explain. [1]
19. a) Starting with BCl_3 how would you obtain Borazine? [2]
b) What happens when sodium thiosulphate solution is separately added to (i) AgNO_3 (ii) FeCl_3 [1½+1½]
20. Give a comparative account of the chemistry of N, P, As, Sb and Bi with special reference to their oxidation states, hydrides and halides. [1+2+2]
21. Write short notes on : (**any two**) [2½×2]
a) Dry ice
b) Heavy water
c) Polythionic acids

Unit - II

Answer **any two** from the following :

22. a) The chemistry of Be is different from all other elements of Gr II explain. [2]
b) Give the flow chart for the Extraction of pure Li from its ore. [3]
23. Write short notes on (**any two**) [2½×2]
a) Electroplating
b) Galvanizing
c) Alloy and amalgam
24. a) Give the extraction procedure of pure Au from its ore. Give relevant equations. [4]
b) What do you mean by 24 carat gold? [1]

