RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. SECOND SEMESTER EXAMINATION, MAY 2012

FIRST YEAR

Date : 28/05/2012 **CHEMISTRY (General)**

Time : 11 am – 2 pm Paper : II Full Marks : 75

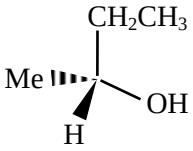
[Use Separate Answer Books for each Group]

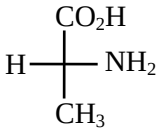
Group - A

Unit – I

Answer **any three** of the following :

1. a) Define plane of symmetry with an example. [2]
   b) Assign R/S configurational designation at the chiral centres of the following molecules : [2]

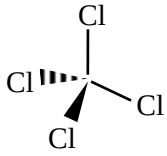
i) 

; ii) 

   c) Write the 3D structure of (R)-2-bromopropanoic acid. [1]

2. a) What are enantiomers and diastereoisomers in organic chemistry? Illustrate with examples. [3]
   b) How would you convert acetylene to acetone? [2]

3. a) Write the structure of the following compounds in Fishcher projection formula. [2]
      i) D-Glyceraldehyde
      ii) Meso tartaric acid
   b) Write the structure of the following compounds :
      i) (Z)-2-butene
      ii) (E)-1-chloro-2-iodoethene
   c) Indicate the symmetry elements present in the following molecule. [1]



4. a) Write a note on Friedel-Craft reaction. [3]
   b) Write down the mechanism of the following reaction : [2]

$$H_2C=CH_2 + Br_2 \rightarrow H_2C(Br)-CH_2(Br)$$

5. Predict the product(s) in the following reactions : [5]

$$H-C\equiv C-H \xrightarrow{NaNH_2} (A) \xrightarrow{MeI} (B) \xrightarrow[BaSO_4]{H_2/Pd} (C) \xrightarrow{B_2H_6} (D) \xrightarrow[H_2O_2]{OH^-} (E)$$

Unit – II

Answer **any two** of the following :

6. a) Discuss Nucleophilic substitution unimolecular (S_{N^1}) reaction on the following points : [4]
   (i) Examples, (ii) Mechanism, (iii) Rate equation, (iv) Energy profile diagram

b) Give the correct answer of the following : [1]

When parachloronitrobenzene is treated with sodium methoxide the type of the reaction is—

i) Aromatic electrophilic substitution

ii) Aromatic nucleophilic substitution

iii) Aromatic nucleophilic addition

7. a) Discuss (S_{N^1}) reaction of alkyl halides with a suitable example. [3]

b) Trimethyl acetaldehyde undergoes Cannizzaro reaction but acetaldehyde does not. —Explain. [2]

8. a) Predict the products(s) of the following reactions : [3]

i) $PhCHO + HCHO \xrightarrow{NaOH(50\%)}$

ii) $CH_3 - \overset{O}{\overset{||}{C}} - OC_2H_5 \xrightarrow{NaOC_2H_5}$

iii) $PhCHO \xrightarrow[AgNO_3]{Ammoniacal}$

b) Ethyl methyl ketone undergoes haloform reaction but diethyl ketone does not. —Explain

Group - B

Unit–I

(Answer **any three** questions)

9. a) Give the comparative plots of Maxwell distribution of velocity at two different temperatures T_1 and T_2 ($T_1 > T_2$). Also mention two features of this type of graphical plot. [1+2]

b) Calculate the $\bar{c}_v$ for N_2 molecule, using law of equipartition of energy. [2]

10. a) State two postulates of the Kinetic theory of gas. Derive the equation $Pv = \frac{1}{3}mnc^2$, where the symbols have their usual significance. [1+3]

b) Calculate the most probable speed of a CO_2 molecule at 27 ºC. [1]

11. a) The rate of diffusion of N_2 and CO are same under identical condition of temperature and pressure. Explain. [2]

b) Viscosity of gas increases with temperature — Explain. [2]

c) Explain continuity of state. [1]

12. a) Write down the van der Waal's equation of state for 1 mole of a real gas describing each term clearly. [2]

b) Van der Waal's constants for nitrogen are a = 1.38 atm-litre^2/mole^2, b=0.039 litres/mole. Two moles of nitrogen were contained in a vessel of 5 litres at 40ºC. What pressure will it exert? What would be the pressure for an ideal gas at similar condition? State the reason of differences between pressures of real gas (N_2) and the ideal gas. [3]

13. a) What will happen if a glass capillary tube be dipped in water and mercury separately? Explain the observation. [2]

b) Define the term viscosity coefficient (η). What is the unit of η in C.G.S. system. Write down the dimension of η. [3]

Unit-II

(Answer **any two** questions)

14. a) Define intensive and extensive property. Find out the intensive and extensive property from the following: [3]

Molar enthalpy, Internal energy, Volume, Temperature.

b) State and explain the zeroth law of Thermodynamic. [2]

15. a) Obtain the relation Pv^{γ} =constant for an adiabatic reversible process of an ideal gas. Symbols have their usual meaning. [2]

b) Compare the P vs V curve for an ideal gas under isothermal reversible and adiabatic reversible expansion. [2]

c) For the reaction

$$C(s) + O_2(g) = CO_2(g) + 94 \text{ Kcal}$$

What is the ΔH of this reaction? State whether it is an exothermic or endothermic reaction. [1]

16. a) Derive Kirchoff's equation showing the variation of heat of reaction with temperature. [3]

b) State and explain Hess's law of constant heat summation with example. [2]

Group - C

Unit – I

Answer **any three** of the following :

17. a) 1g of carbon from an archaeological sample gives 9·4 counts per min. 1g of carbon made from a recently cut tree gives 15·3 counts per min. under the same conditions. How old is the sample? (Given $t_{1/2}$ for ^{14}C = 5557 years) [3]

b) Write down the electronic configuration of an element with its name and symbol having atomic number 33. Indicate the position of the element in the modern version of periodic table. [2]

18. a) Distinguish between electronegativity and electron-affinity. On what factors does electronegativity depends? Express Electronegativity in terms of Alred-Rochow Scale. [3]

b) Electron affinity of noble gases are zero where as ionisation energy of noble gases are very high. — Explain. [2]

19. a) Write short notes on (**any one**) : (i) super acids, (ii) HSAB principle. [3]

b) Give an account on radioactive hazards. [2]

20. a) What is acid-base indicators? For the titration of ACOH vs NaOH, what indicators you should use, explain your answer with reasons. [3]

b) Write down the conjugate acid/base of the following

OH^-, SO_4^{2-}, H_2CO_3, H_3O^+ [2]

21. a) State Bronsted-Lowry concept of acids and bases. [3]

b) The first ionization energies increase in general as we go across the second period as shown below with the exception of B and O. —Explain

	Li	Be	B	C	N	O	F	Ne
I_1(ev)	5·4	9·3	8·3	11·3	14·5	13·6	17·6	21·6

[2]

Unit – II

Answer **any two** of the following :

22. a) Give a comparative account of carbon and silicon with respect to their Hydrides or Chlorides. [3]

b) Explain why NH_3 is more polar than NF_3. [2]

23. a) Phosphorous trichloride and nitrogen trichloride do not produce similar compounds on hydrolysis. —Explain. [3]

b) Write a short account on Inorganic graphite. [2]

24. a) State with equations what happens when— [3]

i) Stannous chloride solution is first slowly added to a solution of mercuric chloride and finally added in excess.

ii) A pinch Sodium bismuthate is added to the acidified solution of Manganous sulphate.

b) Why is CO_2 a gas whereas silica is a solid? —Explain. [2]