

Roll No. ....

Total No. of Questions : 9]  
(2042)

[Total No. of Printed Pages : 8

**UG (CBCS) 1st Year Annual Examination**  
**2006**

**B.Sc. CHEMISTRY**

**(States of Matter, Chemical Kinetics and  
Functional Organic Chemistry)**

(Core)

**Paper : CHEM 102**

**Time : 3 Hours]**

**[Maximum Marks : 50**

*Note :- Attempt five questions in all, selecting one question from each Section. Question No. 9 is compulsory.*

**Section-A**

1. (a) What are the postulates of kinetic theory of gases ? Derive kinetic gas equation.
- (b) Explain Maxwell-Boltzmann distribution of molecular velocities.
- (c) What are the causes of deviation of gases from ideal behaviour ?

5,3,2

2. (a) Using Van der Waals equation, derive the relationship :

$$P_C V_C = \frac{3}{8} RT_C$$

- (b) Define Viscosity. How can you determine the coefficient of viscosity of a liquid using Ostwald viscometer ?

- (c) Explain the effect of temperature on surface tension.

5,3,2

### Section-B

3. (a) What are the elements of symmetry in crystallography ? Explain Bragg's method used for the X-ray diffraction studies of crystal structure.
- (b) What are point defects ? Explain different types of point defects in stoichiometric crystals.
- (c) What is law of constancy of interfacial angles ? 5,3,2
4. (a) Define order of a reaction. Derive expression for rate constant and half-life period for a first order reaction.

(b) Explain any *two* methods for determination of order of a reaction.

(c) Why are reactions of higher order rare ? 5,3,2

### Section-C

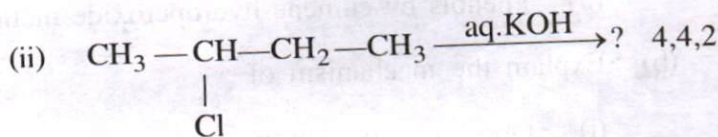
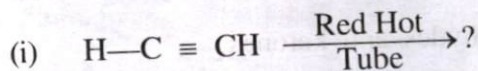
5. (a) Discuss the mechanism of :

(i) Nitration of benzene

(ii) Friedel-Craft Alkylation

(b) What are  $S_N^1$  reactions ? Discuss the mechanism, stereochemistry and energy profile diagram for  $S_N^1$  reactions.

(c) Complete the following reactions :



6. (a) Write the products formed when ethyl bromide is reacted with :

(i) Alc. KOH



- (ii)  $\text{NaNO}_2$
  - (iii)  $\text{AgNO}_2$
  - (iv)  $\text{Na}$ , ether
- (b) What is elimination-addition reaction in aryl halides ? Explain with mechanism giving evidences.
- (c) Compare the reactivity of alkyl and allyl halides towards nucleophilic substitution reactions. 4,4,2

### Section-D

7. (a) Discuss the following :
- (i) Preparation of alcohols by reduction of aldehydes and ketones
  - (ii) Phenols by cumene hydroperoxide method
- (b) Explain the mechanism of :
- (i) Oppenauer oxidation
  - (ii) Reimer-Tiemann reaction
- (c) How can you distinguish  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols by Luca's test ? 4,4,2

8. (a) How can you prepare aldehydes and ketones from :

(i) Acid chlorides

(ii) Nitriles

(b) Write mechanism of :

(i) Benzoin condensation

(ii) Wolff-Kishner reduction

4,6

### Section-E

9. (A) Multiple Choice Questions :

(i) Which one of the following pair of gases shows only positive deviations from ideal behaviour ?

(a)  $\text{H}_2$ ,  $\text{CH}_4$

(b)  $\text{H}_2$ , He

(c)  $\text{H}_2$ , CO

(d) CO,  $\text{CO}_2$

(ii) The fraction of the total volume occupied by atoms present in a simple cube is :

(a)  $\frac{\pi}{6}$

(b)  $\frac{\pi}{4}$

(c)  $\frac{\pi}{3\sqrt{2}}$

(d)  $\frac{\pi}{4\sqrt{2}}$

(iii) A reaction  $P \rightarrow Q$  is completed 25% in 25 min, 50% completed in 25 min. if [P] is halved, 25% completed in 50 min if [P] is doubled. The order of the reaction is :

(a) 1

(b) 2

(c) 3

(d) 0



(iv) In the nitration of benzene with conc.  $\text{HNO}_3$  and conc.  $\text{H}_2\text{SO}_4$  to form nitrobenzene, nitric acid acts as :

- (a) an acid
- (b) a catalyst
- (c) a base
- (d) an oxidising agent

(v) A primary alkyl halide would prefer to undergo :

- (a)  $\text{S}_{\text{N}}^1$  reaction
- (b)  $\text{S}_{\text{N}}^2$  reaction
- (c) Racemisation
- (d)  $\alpha$ -elimination

1×5=5

(B) Fill in the blanks :

- (i) Toluene reacts with chlorine in the presence of  $\text{FeCl}_3$  to form .....
- (ii) On distillation with conc.  $\text{H}_2\text{SO}_4$ , glycol forms .....

(iii) Butanal is ..... reactive than butanone towards nucleophilic reagents.

(iv) The CGS unit of co-efficient of viscosity is .....

(v) Two crystalline substances having similar chemical composition and same crystal shape are called .....  $1 \times 5 = 5$