Roll No. .....

Total No. of Questions : **9**] [Total No. of Printed Pages : **8**

(2094)

UG (CBCS) Ist Year (Suppl.) Examination

1806

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) Using Van der Waals equation derive the relationship.

(b) What are real gases ? Why they deviate from ideal behaviour ?

(c) Define critical temperature, critical pressure and critical volume. [4,3,3]

2. (a) Define surface tension. Describe drop number method for determining surface tension of a liquid.

(b) Explain the effect of temperatrue on Maxwell's distribution of speed.

(c) Define mean free path. What is the effect of temperature and pressure on mean free path ?

[4,3,3]

Section–B

3. (a) What are the elements of symmetry in crystallography ? Describe each of them.

(b) Describe with suitable example 'The defects in crystals'.

(c) Explain the crystal structure of NaCl with diagram.

[5,3,2]

4. (a) Describe the various factors affecting the rate of a reaction.

(b) Derive an expression for rate constant for reactions of first order.

(c) Define activation energy. How can it be calculated using Arrhenius equation ? [4,3,3]

Section–C

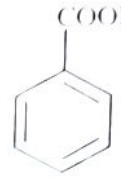
5. (a) Discuss the mechanism of :

(i) Halogenation of benzene

(ii) Sulphonation of benzene

(b) What are S_N1 reactions ? Discuss the mechanism, stereochemistry and energy profile diagram for S_N1 reactions.

(c) Complete the following reactions :

(i) 

+ NaOH $\xrightarrow[\text{Heat}]{CaO}$

(ii) 

+ 2O $\xrightarrow{CrO_2Cl_2}$ [4,3,3]

6. (a) Discuss the addition-elimination mechanism of nucleophilic aromatic substitution reaction in aryl halides.

(b) Write the following reactions :

(i) Williamson's ether synthesis

(ii) Sandmeyer reaction

(iii) Gattermann reaction

(c) Explain the relative reactivity of aryl halides with respect to alkyl halides. [4,3,3]

Section–D

7. (a) Discuss the preparation of alcohols :

(i) From reduction of esters

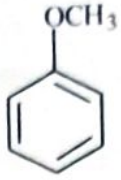
(ii) From Grignard reagent

(b) Explain the mechanism of :

(i) Reimer-Tiemann reaction

(ii) Houben-Hoesch reaction

(c) Complete the following reactions :

(i)  + HI ⟶ ..... + ...

(ii) $CH_3OC_2H_5 + HI \longrightarrow$ ..... + ...

[4,4,2]

8. (a) How can you prepare aldehydes and ketones from acid chlorides and nitriles ?

(b) Write mechanisms of :

(i) Cannizzaro's reaction

(ii) Clemensen reduction [5,5]

Section–E

(Compulsory Question)

9. (A) Multiple Choice Questions :

(i) According to kinetic theory of gases, the average kinetic energy :

(a) is proportional to temperature

(b) decreases with rise in temperature

(c) is always constant for a particular gas

(d) is zero at 0°C

(ii) For a crystal having intercepts 1, ∞ and ∞, the Miller indices are :

(a) (100)

(b) (101)

(c) (110)

(d) (111)

(iii) The low reactivity of benzene is due to :

(a) sp^2 hyberdised carbon atom

(b) Presence of 3π bonds

(c) Presence of hexagonal ring

(d) Delocalisation of π electrons

(iv) Reaction of formaldehyde with Grignard reagent followed by hydrolysis yields :

(a) 1° alcohol

(b) 2° alcohol

(c) 3° alcohol

(d) All of these

(v) Benzoin condensation is catalysed by :

(a) OH^-

(b) CN^-

(c) H^+

(d) H_2, Ni or $LiAlH_4$ [1×5=5]

(B) Fill in the blanks :

(i) The temperature at which a real gas behaves like an ideal gas for an appreciable range of pressure is called ..... .

(ii) The rate of reaction is independent of concentration of reactant for a ..... order reaction.

(iii) When alkyl halide is treated with aqueous solution potassium hydroxide, ... is formed.

(iv) Phenols are ..... acidic than alcohols.

(v) In the presence of anhydrous aluminum chloride benzene react with methyl chloride to form ..... . [1×5=5]