

Write the answer to each **Unit** in a separate answer-book.

**2021**

**BIOCHEMISTRY — GENERAL**

**Second Paper**

**Full Marks : 100**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**Group - A**

**Unit-I**

**(Marks : 25)**

Answer **any two** questions.

1. (a) Deduce Kirchhoff's relation for variation of enthalpy change with temperature.  
 (b) Define specific conductance and molar conductance. Mention their units.  
 (c) What is Raoult's law? Write short note on CMC.  
 (d) What is viscosity co-efficient? How does viscosity coefficient of liquid vary with temperature?  
3+(2+2)+(2+2)+1½
  
2. (a) What is Joule Thomson effect? Write down the significances of the Joule Thomson coefficient.  
 (b) A Carnot's engine works between 127°C and 227°C. Calculate the efficiency of the engine.  
 (c) What is calomel electrode? What are its uses? What is temperature coefficient of a cell?  
 (d) What is Born-Haber cycle? Write its application.  
 (e) What is electronegativity?  
3+3+3+2½+1
  
3. (a) How does atomic size vary across a period and down a group in the periodic table?  
 (b) Define lattice energy of an ionic solid.  
 (c) What is standard hydrogen electrode and what is its potential?  
 (d) Distinguish between isothermal and adiabatic processes.  
 (e) Calculate the pH of a buffer solution containing 0.250(M) acetic acid and 0.1(M) sodium acetate at 25°C ( $K_a$  of acetic acid =  $1.8 \times 10^{-4}$ )  
3+2+2½+2+3
  
4. (a) Discuss Le Chatelier's principle of chemical equilibrium.  
 (b) Using VSEPR theory, draw the structure of the following molecules :  
 (i)  $\text{PCl}_5$  (ii)  $\text{NH}_3$   
 (c) What are surface active agents? Give examples.

**Please Turn Over**

(d) Write short notes on the following :

(i) Double salt and Complex salt.

(ii) Radius-ratio rule.

2+4+2½+(2+2)

### Unit-II

(Marks : 25)

Answer *any two* questions.

5. (a) Compare the basicity of urea and guanidine.

(b) Draw the structure of a porphyrin ring.

(c) Acetal formation reaction may be used for protecting carbonyl groups in the presence of bases. —Why?

(d) Write a short note on E2 reaction. Give a suitable example.

3+3+3+3½

6. (a) The rate of addition of HCN to a carbonyl compound increases in the presence of traces of NaCN.— Explain.

(b) Write a short note on Ozonolysis Reaction.

(c) Draw the energy profile for an exothermic S<sub>N</sub>2 reaction.

(d) Why does acetic acid behave as an acid in aqueous medium?

2½+3+4+3

7. (a) What are metalloporphyrins? What are heterocyclic compounds?

(b) Synthesize : CH<sub>3</sub>CH<sub>2</sub>OH from CH<sub>3</sub>MgI.

(c) Discuss the mechanism of S<sub>N</sub>1 reaction with an example. Why is this mechanism designated as S<sub>N</sub>1?

(d) Aniline is less basic than methylamine in aqueous medium.— Explain.

4+3+3+2½

8. (a) Predict the products when *cis*-2-butene is treated with an alkaline solution of potassium permanganate at room temperature.

(b) Show the mechanistic steps of electrophilic addition of bromine across double bond of alkene.

(c) Compare and explain the rate of nucleophilic addition to the following compounds :

CH<sub>3</sub>CHO, (CH<sub>3</sub>)<sub>2</sub>C = O, (Me<sub>3</sub>C)<sub>2</sub>C = O

(d) Explain why only α-H in saturated carbonyl compounds take part in aldol condensation reactions.

4+3+3+2½

( 3 )

**T(II)-Biochemistry-G-2**

**Group - B**

**Unit-III**

**(Marks : 25)**

Answer *any two* questions.

9. (a) Describe Ping-Pong reaction with example.  
(b) What is the significance of  $K_M$  and  $V_{max}$ ?  
(c) Derive Michaelis–Menten equation. 5+5+2½
10. (a) Give an example of prosthetic group which is involved in carboxylation reaction. Describe briefly with reaction.  
(b) Give an example of metal ion requiring enzyme mentioning the name of the metal ion, enzyme and the reaction.  
(c) What is activation energy? Describe with diagram. 5+5+2½
11. (a) Under which condition Michaelis–Menten constant  $K_M$  deduces to  $K_d$  dissociation constant?  
(b) Draw Lineweaver Burk Plot for enzyme catalysed reaction.  
(c) What is  $K_{cat} / K_M$ ?  
(d) Describe sequential bisubstrate reaction with example. 4+3+3+2½
12. (a) What is allosteric enzyme? Define positive effectors and negative effectors of allosteric enzyme with proper example. Explain with diagram.  
(b) What is feedback inhibition? Give proper example.  
(c) Define specific activity of enzyme. Give its unit. (2+2+2)+(2+2)+2½

**Unit-IV**

**(Marks : 25)**

Answer *any two* questions.

13. (a) Differentiate between plant and animal cell.  
(b) Write down four key features of eukaryotic cell.  
(c) Why lysosome is significant within a cell?  
(d) Draw the structure of chloroplast. 4+4+2+2½
14. (a) What is phagocytosis? Describe the process of phagocytosis with diagram.  
(b) Define granular and agranular leucocytes.  
(c) Describe digestion of proteins. 5+4+3½

**Please Turn Over**

- 15.** (a) How oxygen and carbon-dioxide is transported? Describe the role of haemoglobin in this transport process.
- (b) Describe the mechanism of HCl formation in stomach.
- (c) Define neurotransmission. Give two examples of neurotransmitters. 5+5+2½
- 16.** (a) Describe the function of the following organelles :
- (i) Endoplasmic reticulum
- (ii) Nucleus
- (iii) Golgi apparatus.
- (b) How bile salts help in lipid digestion?
- (c) Describe the functions of TSH, FSH and LH. 6+3½+3
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