

U.G. 4th Semester Examination-2025

ZOOLOGY

[MAJOR]

Course Code : ZOO-MJ-T-5

(Biochemistry)

[NEP-2020]

Full Marks : 40

Time : $2\frac{1}{2}$ Hours

The figures in the right hand margin indicate marks.

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

1. Answer any five of the following: 2×5=10
 - a) Differentiate between glycogenolysis and glycogenesis.
 - b) Define zwitterion. Explain it by taking glycine as an example at physiological pH.
 - c) Why are allosteric enzymes considered as biological "switches"? Justify with one suitable example.
 - d) What is meant by charging of fatty acid?
 - e) How α -ketoglutarate is formed by oxidative deamination?

[Turn Over]

- f) Why urea cycle is called as ornithine cycle?
- g) A certain enzyme has a high K_m and low V_{max} for a substrate. What does this suggest about the enzyme-substrate affinity and catalytic efficiency?
- h) What is the Ramachandran plot? Mention its significance in understanding protein structure?

2. Answer any **two** of the following: $5 \times 2 = 10$

- a) Explain the oxidative and non-oxidative phases of the pentose phosphate pathway with a simplified diagram. Mention its physiological significance. $4+1$
- b) Describe the β -oxidation pathway for an 18-carbon fatty acid (stearic acid). Calculate ATP yield and energy balance. $3+2$
- c) Compare the mechanism of transamination and oxidative deamination. How are they linked with urea cycle? $3+2$
- d) Draw and derive the Lineweaver-Burk plot from the Michaelis-Menten equation. Discuss the effect of competitive and non-competitive inhibition on K_m and V_{max} using graphical comparison. $3+2$

3. Answer any **two** of the following: $10 \times 2 = 20$

- a) Describe the Glycolytic pathway with all key steps and enzymes involved. How is the pathway regulated hormonally and allosterically? Which enzyme will remain active at pH 1.5 and why? An enzyme-catalyzed reaction has $V_{max} = 2.4 \mu\text{mol/min}$ and $K_m = 3 \text{ mM}$. Calculate the reaction velocity (v) when: $[S] = 1 \text{ mM}$ and $[S] = 6 \text{ mM}$. $4+3+1+2$
- b) What is the significance of F_1 particle in oxidative phosphorylation? Why metabolic pathway is referred both as 'pentose phosphate pathway' and 'HMP shunt'? How does temperature and substrate concentration affect enzyme activity? $3+3+4$
- c) Describe the clover leaf model of tRNA. Explain the difference between A-DNA, B-DNA, and Z-DNA. Compare the structural features of α -helix and β -sheet. Why is the tertiary structure critical to protein function? What are the differences between motif and domain? $2+2+2+2+2$

- d) Discuss the organization and role of the electron transport system (ETS) in mitochondria with a clear diagram. What are the roles of uncouplers and inhibitors in oxidative phosphorylation? Explain the Chemiosmotic theory and ATP synthase mechanism.

5+2+3
