

**POST-GRADUATE COURSE**

**Term End Examination — June, 2023/December, 2023**

**ZOOLOGY**

**Paper-4A : BASIC PHYSICAL AND CHEMICAL PRINCIPLES**

Time : 2 hours ]

[ Full Marks : 50

Weightage of Marks : 80%

**Special credit will be given for precise and correct answer. Marks will be deducted for spelling mistakes, untidiness and illegible handwriting. The figures in the margin indicate full marks.**

1. Answer *two* questions : 9 × 2 = 18
  - a) Explain first law of thermodynamics. Mention two limitations of this law. Cite any two special cases with reference to this law. 5 + 2 + 2
  - b) Discuss briefly the mechanism of covalent bond formation with examples. State the characteristics of covalent compounds. What is coordinate covalency ? 5 + 2 + 2
  - c) Enumerate the salient characteristics of  $\alpha$ -particle,  $\beta$ -particle and  $\gamma$ -ray. Explain the meaning of half-life period of radioactive elements with example. ( 2 + 2 + 2 ) + 3
  - d) Define pH and pOH of a solution. What is a buffer solution ? Classify buffers. ( 2 + 3 ) + 1 + 3
2. Answer *three* questions : 6 × 3 = 18
  - a) Explain the meaning and significance of Gibbs free energy.
  - b) What do you mean by entropy ? Explain third law of thermodynamics. 4 + 2
  - c) Explain the mechanism of hydrogen bond formation. Comment on hydrogen bonds in biological system. 4 + 2
  - d) Write notes on the following :
    - i) hydrophobic bond
    - ii) energy-rich bond. 3 + 3
  - e) Explain the effects of radiations on biological systems.

- f) What is an indicator ? Give two examples of acid-base indicators and mention their pH range. What is a self indicator ?  $2 + 2 + 2$
3. Answer *two* questions :  $4 \times 2 = 8$
- a) Explain Henderson's equation.
- b) Give two examples of use of radioactive tracer in biology. State an advantage and a disadvantage of radiotracers.  $2 + ( 1 + 1 )$
- c) Define the following :  $1 \times 4$
- i) adiabatic process
- ii) isochoric process
- iii) isothermal process
- iv) isobaric process.
- d) Discuss the factors that favour ionic bond formation.
4. Answer *two* questions :  $3 \times 2 = 6$
- a) Define and exemplify open, closed and isolated systems.
- b) Write a note on Van der Waals forces.
- c) What do you mean by ionization and ionic product of water ?
- d) State the characteristics of radioactive decay.
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