

QP Code: 22/PT/14/IVA

**POST-GRADUATE COURSE**

**Term End Examination — June, 2022/December, 2022**

**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) What is free energy ? Write down the application of energetics in biological field. 2 + 7
  - b) Why are radioactive elements hazardous to animals ? How can human be affected by radioactive elements ? What do you mean by radiation intensity ? Write down the characteristics of radioactive decay. 3 + 3 + 1 + 2
  - c) What is Gibbs free energy ? Deduce the Gibbs-Helmholtz equation. For a reaction at 27°C,  $\Delta G = - 24$  kcal and  $\Delta H = 3$  kcal, calculate  $\Delta S$ . 2 + 5 + 2
  - d) What is electrovalent bond ? Write down the factors favouring electrovalent bond formation. How do compounds having electrovalent bonds differ from other ionic compounds ? 2 + 4 + 3
2. Answer *three* questions : 6 × 3 = 18
  - a) What do you mean by covalent bonding ? Cite example. Which factor does favour the formation of covalent bond and why ? 2 + 1 + 3
  - b) How do you detect  $\alpha$ -particle,  $\beta$ -particle and  $\gamma$ -ray ? How would you determine the half-life of a radioactive compound ? What is the end product of radium and why ? 2 + 2 + 2

- c) State second law of thermodynamics. Cite an example to prove the law. 3 + 3
- d) How and why are H-bonds formed ? Arrange the following compounds in decreasing order of strength of H-bonds formation with justification :  
NH<sub>3</sub>, H<sub>2</sub>O, HF. 3 + 3
- e) What is a buffer ? What is the importance of buffer in biological system ? Write down the mechanism of action of buffers. 2 + 1 + 3
- f) What do you mean by 'Radiation chemical yield' ? How is the 'Radiation chemical yield' expressed mathematically ? Write down the advantages and disadvantages of radiotracers used in biological systems. 2 + 1 + 3
3. Answer *two* questions : 4 × 2 = 8
- a) Deduce the Henderson-Hasselbalch equation. Under what condition pKa is equal to pH ? 3 + 1
- b) What is standard state of a system and how can it be applied in biochemistry ? 1 + 3
- c) What do you mean by a radio tracer ? What is a radio labelled compound ? Write down the characteristics of a radio tracer. 1 + 1 + 2
- d) What do you mean by autoradiography ? Write down the application of autoradiography. 2 + 2
4. Answer *two* questions : 3 × 2 = 6
- a) What is hydrophobic bond ? How are micelles formed ? 1 + 2
- b) Why is the boiling temperature of ethyl alcohol greater than that of propane ?
- c) "Half-life of radium is 1600 years." Clarify the statement.
- d) What is Van der Waals force ? Which factors can change the value of Van der Waals force ? 1 + 2
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