2009

ZOOLOGY

PAPER—Z-401

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

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

GROUP—A

(*Animal Physiology*)

1. Answer any *two* questions out of four: 2 × 2

(*a*) What is the role of Vitamin A in visual cycle ?

(*b*) How is neurotransmitter release in a synapse initiated ?

(*c*) Why receptor blocker cannot be withdrawn abruptly ?

(*d*) State the importance of vascular connection between hypothalamus and pituitary.

2. Answer any *two* questions out of four : 4 × 2

(*a*) Describe the two basic means of regulation of heart pumping in details. 4

(*b*) Explain the different functional states of voltage-gated Na-channels. Why is Na-channel impermeable to other ions ? 2 + 2

(*c*) List the important metabolic processes involving calcium. What is Hyperkalemia ? 3 + 1

(*d*) How hormones modulate the activity of adenylate cyclase. 4

3. Answer *one* question out of two: 8×1

(*a*) (*i*) Graphically compare the ionic basis of the action potential curve in a typical nerve fibre with that of a cardiac muscle cell. $3 + 3$

(*ii*) Why conduction of action potential is always in a forward direction? 2

(*b*) Write short notes on any *four*: 2×4

(*i*) Pacemaker potential

(*ii*) Neurotransmitter–definition and categories

(*iii*) Homeostatic regulation of blood glucose concentration

(*iv*) Conducting systems of heart

(*v*) Coenzyme function of Niacin and Riboflavin

(*vi*) EC_{50}

(*vii*) Hormones secreted from Adenohypophysis

(*viii*) Effect of venous return on cardiac output.

GROUP—B

(*Adaptation & Evolution*)

4. Answer any *two* questions : 2×2

(*a*) What is a molecular clock and what is its role ?

(*b*) State the deleterious effects of *ROS*.

(*c*) In the term genetic drift, what is drifting ? Why is this an appropriate term to describe this phenomenon ?

(*d*) Mention the advantages and disadvantages of *Panting*.

5. Answer any *two* of the following: 4×2

(*a*) With regard to *genetic drift*, are the following statements true or false? If a statement is false, explain why.

(*i*) over the long run genetic drift will lead to allele fixation or loss.

(*ii*) when a new mutation occur within a population, genetic drift is more likely to cause the loss of the new allele rather than the fixation of the new allele.

(*iii*) genetic drift promotes genetic diversity in large populations.

(*iv*) genetic drift is more significant in small populations.

(*b*) Illustrate the role of carotid rate in brain cooling.

(*c*) What are the consequences of *tinkering* in evolutionary process?

(*d*) Discuss the mechanism of increasing the number of genes in course of evolution.

6. Answer any *one* of the following: 8 × 1

(*a*) (*i*) A recessive allele for *red hair* (r) has a frequency of 0·2 in population I and a frequency of ·01 in population II. A famine in population I causes a number of people in population I to migrate to population II, where they reproduce randomely. It is estimated that 15% of the population II consists of people who migrated from population I. What will be the frequency of red hair in population II after migration?

(*ii*) *Cystic fibrosis* is a recessive autosomal trait. In certain Caucasian populations, the number of people born with this disorder is about 1 in 2500. Assuming a Hardy -Weinberg equilibrium for this trait, what are the frequencies of the normal and *CF* allele? What are the genotypic frequencies of heterozygous individuals?

(*b*) (*i*) What do you mean by *Founder effect* and mention its roles in speciation?

(*ii*) Distinguish between *paralog* and *ortholog*. Explain it citing examples of α- and β-globin gene in human and horse evolution.

(*iii*) How diving mammals avoid *nitrogen necrosis*? 2 + 4 + 2
