Civil Services (Main) Examination, 2012

ZOOLOGY
(Paper II)

Time Allowed : Three Hours **Maximum Marks : 300**

QUESTION PAPER SPECIFIC INSTRUCTIONS

(Please read each of the following instructions carefully before attempting questions)

There are EIGHT questions divided in two Sections.
Candidate has to attempt FIVE questions in all.
Question Nos. 1 and 5 are compulsory and out of the remaining, any THREE are to be attempted choosing at least ONE question from each Section.
The number of marks carried by a question/part is indicated against it.
Wherever any assumptions are made for answering a question, they must be clearly indicated.
Word limit in questions, wherever specified, should be adhered to.

SECTION 'A'

1. (a) How does the structure of antibody give its specificity of functions? Add a note on the causes of allergic reaction. **15**

(b) On your answer-book, write down the name of each of the ganglia marked (i) to (vii) in the diagram below on the parasympathetic and sympathetic divisions of autonomic nervous system:

[Figure: Diagram of the autonomic nervous system drawn on either side of the brain stem and spinal cord; the organs are drawn as small unlabelled sketches. Left half headed “Parasympathetic Nervous System”, right half headed “Sympathetic Nervous System”. The brain stem shows the origins of cranial nerves labelled III, VII, IX and X; the spinal cord below is divided into segments, with T1 (first thoracic), L1, L5 and S1, S2, S3, S4, S5 labelled. Left (parasympathetic) side: four ganglia drawn as circles with dashed pointers – (iii) the ganglion on nerve III supplying the eye; (ii) a ganglion on the nerve VII pathway supplying a small gland just below the eye; (i) a second ganglion on the nerve VII pathway, just below (ii), supplying a gland drawn as a solid black body; (iv) a ganglion on the nerve IX pathway supplying a gland below it. Nerve X runs down to the heart, lungs, stomach, upper gut and intestine, and fibres from sacral segments S2–S4 run to the lower gut, urinary bladder and reproductive organs, with small terminal ganglia on or near the organs (unmarked). Right (sympathetic) side: a chain of paravertebral ganglia beside the spinal cord from the neck to the sacral region, with fibres to the head, heart and lungs; three larger prevertebral ganglia receive fibres from the thoracic and lumbar chain: (v) the uppermost, supplying stomach, liver, pancreas and nearby abdominal organs; (vi) below it, supplying the intestine; (vii) the lowest, at lower lumbar level, supplying the urinary bladder and lower pelvic organs.]

How do they regulate the visceral and reflex functions of the body? **15**

(c) Compare the role of pancreatic and intestinal glandular secretions in the digestion of food. **15**

(d) Differentiate between the mechanism of capacitational changes in the mammalian sperm under in vitro and in vivo conditions. How are these sperms stored and used in artificial insemination and in vitro fertilization? **15**

2. (a) Differentiate between polytene and lampbrush chromosomes on the basis of their structure and functions. **20**

(b) Using suitable examples of natural and induced mutations, discuss their role in the evolution of species. **20**

(c) Compare the action of steroidal and peptide hormones at organismal and cellular levels. **20**

3. (a) Define the types of cell receptors and enumerate their role in signal transduction/cell-cell interaction. **20**

(b) Discuss the trends in primate evolution that began as an adaptation for arboreal life. **20**

(c) What controls heartbeat, and the rate at which blood flows through the circulatory system? **20**

4. (a) Differentiate between principles and methods of DNA cloning and whole animal cloning. **20**

English version compiled from published transcriptions and cross-checked across sources; not a facsimile of the official UPSC question paper.

Optional Province · optionalprovince.com

(b) What are morphogens? How do they function during various stages of morphogenesis (use frog/chick as an example)? **20**

(c) Draw a diagram to show the arrangements of various types of contractile proteins in skeletal muscles, and explain the bioenergetics of contraction. **20**

SECTION 'B'

5. (a) Give the chemical composition of mammalian semen (use humans as example). How does seminal fluid contribute to sperm survival, capacitation and acquisition of fertilizing ability? **15**

(b) Compare the structure and function of 30s and 70s ribosomes. **15**

(c) What is DNA motif? How does it facilitate DNA replication and transcription? **15**

(d) Through a chequerboard, display the various types of genetic code (4^3). Identify the initiation, termination and nonsense codon, and explain their functions. **15**

6. (a) Discuss the interactive role of thyroxine and prolactin during various phases of growth and differentiation in amphibian metamorphosis. **20**

(b) What is Rh factor and how is it determined? What is the cause and what is/are the symptom(s) of erythroblastosis fetalis, and how can it be corrected? **20**

(c) With suitable examples, compare the chemical structure and functions of acetylcholine (in cholinergic neuron), adrenaline (in adrenergic neuron) and serotonin/5-hydroxytryptamine/γ-aminobutyric acid (in peptidergic neurons). **20**

7. (a) Enumerate the factors responsible for cell senescence and death. **20**

(b) Give the causes and symptoms of heritable diseases in man due to defects in Y-chromosomes and autosomes. **20**

(c) How do isolation factors facilitate speciation? **20**

8. (a) What is mitotic cell cycle? How does it differ from meiotic cell cycle? Add a note on their molecular regulation. **20**

(b) Mention the role of ion channels (= ion gates) and ion pumps in cell functions with appropriate examples and diagrams. **20**

(c) What are transgenic animals? How are they produced and utilized in eco-rehabilitation/conservation and in human welfare? **20**

Optional Province · optionalprovince.com