

**Maharashtra Public Service Commission****Civil Services Exam – Mains Optional****Zoology****(Code No : 609)****Paper - I****Standard :** Degree**Total Marks :** 200**Nature of Paper :** Conventional Type**Duration :** 3 Hours

- Note:**
- 1) Answers to this paper must be written in English only.
  - 2) This paper will test the candidate's ability to comprehend, to analyse, to interpret, to criticise and to appraise subject matter related to the topics/sub topics mentioned below.
  - 3) It is expected from candidates to study the latest and recent developments and happenings pertaining to the topics/sub topics mentioned below.

**Section - A ( Marks : 50 )****Non-Chordata**

- 1) Concept of species and speciation
- 2) Characteristics of the subkingdoms-Protozoa, Parazoa and Metazoa.
- 3) Evolution of symmetry, segmentation and coelom in Metazoa.
- 4) **Protozoa :**
  - .01) Locomotion in Protozoa.
  - .02) Reproduction in Protozoa.
  - .03) Life cycle of Leishmania.
  - .04) Life cycle of Plasmodium.
  - .05) Life cycle of Paramecium.
  - .06) Parasitic protozoans and diseases.
- 5) **Porifera :**
  - .01) Canal Systems.
  - .02) Skeleton.
- 6) **Coelenterata :**
  - .01) Structure and life history of Obelia, Metagenesis.
  - .02) Polymorphism in Coelenterates.
  - .03) Coral reefs and their significance.
- 7) **Platyhelminthes and Aschelminthes :**
  - .01) Life Cycle of Fasciola hepatica.
  - .02) Life Cycle of Taenia solium.
  - .03) Life Cycle of Ascaris.
  - .04) Parasitic adaptations.
  - .05) Pathology and control of helminths - infecting man.
- 8) **Annelida :**
  - .01) Earthworm - Feeding and digestion, circulatory system, excretory system.

- .02) Coelom and coelomoducts in annelids.
- .03) Filter feeding.
- 9) **Arthropoda :**
  - .01) Salient features and phylogeny of Onychophora.
  - .02) Crustacean larvae.
  - .03) Mouth parts in insects (cockroach, mosquito, honey bee and butterfly).
  - .04) Metamorphosis in insects.
  - .05) Social life in termites and honey bees.
- 10) **Mollusca :**
  - .01) Salient features and phylogeny of Monoplacophora.
  - .02) Torsion and detortion in Gastropoda.
  - .03) Respiration in various groups of Mollusca.
- 11) **Echinodermata :**
  - .01) Water canal system in Echinodermata.
  - .02) Echinoderm larvae and their phylogenetic significance.
  - .03) Mechanism of locomotion and feeding in starfish, Asterias.

**Section - B ( Marks : 50 )**

**Chordata**

- 12) **Protochordata :**
  - .01) Structural organisation and affinities of **Balanoglossus**.
  - .02) Retrogressive metamorphosis in Urochordata.
  - .03) Feeding mechanism in **Amphioxus**.
- 13) **Pisces :**
  - .01) Migration in fishes.
  - .02) Respiratory organs and mechanism of respiration in fishes.
  - .03) Receptor and effector organs in fishes.
- 14) **Amphibia :**
  - .01) Origin of Amphibia.
  - .02) Parental care in Amphibia.
  - .03) Anatomical peculiarities and affinities of Urodela, Apoda and Anura.
  - .04) Neoteny.
  - .05) Morphological and physiological aspects of Metamorphosis in frog.
  - .06) Hibernation and Aestivation in amphibians.
- 15) **Reptilia :**
  - .01) Adaptive radiation in reptiles, Mesozoic reptiles, general characters and affinities of **Sphenodon**.
  - .02) Significance of temporal vacuities in classification of reptiles.
  - .03) Non-poisonous and poisonous snakes of India.
  - .04) General characters, aquatic adaptations and conservation of Chelonia.
- 16) **Aves :**
  - .01) Origin of birds.
  - .02) Flightless birds of world.
  - .03) Palate in birds.
  - .04) Bird migration.
  - .05) Flight adaptations in birds.
  - .06) Orientation and homing in birds.
- 17) **Mammals :**

- .01) Dentition in mammals.
- .02) Integument and its derivatives in mammals.
- .03) General characters of Prototheria, Metatheria and Eutheria.
- .04) General Evolution of horse and man.
- .05) Comparative account of aortic arches, urinogenital system, heart and brain in various groups of Chordata.

**Section - C ( Marks : 50 )**

**Physiology**

- 18) **Osmoregulation & Thermoregulation :**
  - .01) Osmoregulation in freshwater and marine fishes.
  - .02) Osmoregulation in terrestrial animals.
  - .03) Poikilothermy and homeothermy.
- 19) Physiology of digestion.
- 20) Physiology of respiration, respiratory pigments.
- 21) Cardiac cycle, pace maker and blood composition and functions.
- 22) Physiology of excretion.
- 23) Eye and its working.
- 24) Ear and its working.
- 25) **Structure and functions of following Endocrine glands :**
  - .01) Hypothalamus.
  - .02) Pituitary gland.
  - .03) Thyroid.
  - .04) Parathyroid.
  - .05) Islets of Langerhans.
  - .06) Adrenal.
  - .07) Pineal.
- 26) Chemical nature, source and mode of action of aminergic, peptidergic and steroidal hormones.
- 27) Hormonal control of reproduction in male and female mammals.
- 28) Mechanism of impulse conduction and synaptic transmission, Neurotransmitters.
- 29) Physiology of muscle contraction.

**Section - D ( Marks : 50 )**

**Environmental Science**

- 30) Role of abiotic factors (temperature and light) on animal life.
- 31) Impact of inter and intraspecific biotic factors.
- 32) Types of ecosystems.
- 33) Energy flow and food chain at trophic levels.
- 34) Biogeochemical cycles.
- 35)
  - .01) Biosphere
  - .02) Impact of ozone layer
  - .03) Greenhouse Effect.
- 36) Methods and importance of water conservation, water quality standards and interlinking of rivers in India.
- 37) **Adaptations :**
  - .01) in freshwater animals.
  - .02) in desert animals.
  - .03) in marine animals.

- .04) in terrestrial animals.
- 38) Pollution :**
- .01) Air pollution.
  - .02) Water pollution.
  - .03) Land pollution.
  - .04) Biodegradation, biotransformation and biomagnification of pollutants.
  - .05) Trace metals as pollutants.
  - .06) Municipal solid waste disposal.
  - .07) Pesticides as pollutants and their toxic effects on plants, animals and soil.
- 39) Wild Life :**
- .01) Present status of wild life in India.
  - .02) Sanctuaries and National Parks in Maharashtra.
  - .03) Project Tiger and conservation of tigers.
  - .04) Red Data Book, Endangered and Biome Restricted Species.
- 40) Ethology :**
- .01) Diurnal and seasonal rhythms.
  - .02) Biological clock.
  - .03) Impact of hormones and pheromones on behaviour.
  - .04) Modes of communication in animals.
  - .05) Physiology of learning in animals.
  - .06) Mimicry and coloration.

### Paper - II

**Standard :** Degree

**Total Marks :** 200

**Nature of Paper :** Conventional Type

**Duration :** 3 Hours

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### Section - A ( Marks : 50 )

#### Cell Biology

- 1) Structure and functions of cell organelles :**
  - .01) Plasma membrane.
  - .02) Mitochondria.
  - .03) Golgibodies.
  - .04) Endoplasmic reticulum.
  - .05) Ribosomes.
  - .06) Nucleus.
  - .07) Cytoskeleton.
- 2) Cell division :**
  - .01) Mitosis.
  - .02) Meiosis.

- .03) Cell cycle events at molecular level.
- .04) Apoptosis.
- 3) Chromosome - structure and function, Lampbrush and Polytene chromosomes.
- 4) **DNA structure and function :**
  - .01) Watson - Crick model of DNA .
  - .02) Replication of DNA in Eukaryotes and Prokaryotes.
  - .03) Types of DNA and RNA .
  - .04) Mitochondrial DNA .
- 5) Genetic code.
- 6) Gene transcription and translation.

**Section - B ( Marks : 50 )**

**Genetics and Molecular Biology**

- 7) **Genetics :**
  - .01) Mendel's Laws of inheritance.
  - .02) Crossing over, linkage, multiple alleles.
  - .03) Polyploidy.
  - .04) Mutations (gene and chromosomal).
  - .05) Genetic significance of blood groups.
  - .06) Genetic disorders in man, syndromes.
- 8) **Molecular Biology and Biotechnology :**
  - .01) Eugenics.
  - .02) Cloning techniques, cloning vectors.
  - .03) Cell line preparation.
  - .04) Types and application of stem cells.
  - .05) Haemopoietic system.
  - .06) Applications of cloning technology in medical and veterinary sciences.
  - .07) Human Genome.
  - .08) DNA finger printing.
  - .09) Transgenic animals.
  - .10) PCR, Southern and Western blotting, SDS-PAGE.
- 9) **Bioinformatics :**
  - .01) Introduction to Bioinformatics.
  - .02) Bioinformatics tools/ Softwares.
  - .03) Protein sequence databases.
  - .04) Genome databases.
  - .05) Phylogenetic analysis.
  - .06) Bioinformatics and Pharmaceutical industry.
  - .07) National Centre for Biological Information.

**Section - C ( Marks : 50 )**

**Biochemistry and Immunology**

- 10) **Biochemistry :**
  - .01) Structure of carbohydrates, lipids, amino acids, proteins, saturated and unsaturated fatty acids, cholesterol and steroids.
  - .02) Energy reactions - Glycolysis, Krebs' cycle, Electron transfer chain, Oxidative phosphorylation.
  - .03) Nature of enzymes, Mechanism of enzyme reactions.
  - .04) **Vitamins :** types, sources and functions.
- 11) **Immunology :**

- .01) Immunoglobulins and Immunity, antigenic and antibody vaccines, DNA vaccines and edible vaccines.
- .02) Monoclonal antibodies.
- .03) Cellular and humoral immune reactions.
- .04) Innate and Adaptive immunity.
- .05) AIDS, causes and remedies.
- .06) ELISA.

**Section -D ( Marks : 50 )**  
**Developmental Biology**

- 12) Gamete Biology :**
- .01) Mechanism of spermatogenesis, oogenesis, vitellogenesis and egg membrane formation.
  - .02) Molecular mechanism of Fertilization, acrosome reaction and sperm penetration, In-vitro fertilization, sperm preservation.
  - .03) Parthenogenesis - causes, mechanism and significance.
  - .04) Types of eggs.
- 13) Embryology :**
- .01) Types of cleavages.
  - .02) Types and mechanism of gastrulation.
  - .03) Foetal Membranes and their functions.
  - .04) Formation, types and functions of Placenta.
  - .05) Organizer concept and embryonic induction .
  - .06) Mechanism of regeneration.
- 14) IVF :**
- .01) Embryo transfer techniques, GIFT, Test tube baby.
  - .02) Male and female contraceptives and population control.
  - .03) Immunocontraception.
- 15) Development :**
- .01) Organogenesis of nervous system, eye, heart and kidney in frog.
  - .02) Teratogenesis in man.
  - .03) Aging in man.
- 16) Economic Zoology :**
- .01) Vermiculture.
  - .02) Prawn Culture.
  - .03) Sericulture.
  - .04) Apiculture.
  - .05) Lac culture.
  - .06) Pearl culture.
  - .07) Fish culture (Freshwater and marine).
  - .08) Poultry.

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