ZOOLOGY

Paper : ZHT-101

(Non Chordate and Insect Organization)

Full Marks : 60 Time : $2\frac{1}{2}$ 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.

(Non Chordate)

1. Answer any **two** of the following : $2\frac{1}{2} \times 2 = 5$

   a) What is Pellicle? State its function.

   b) Schematically describe pattern generation during insect sound production.

   c) The multiplication of kinetoplasts is achieved by autonomous binary fission' – Justify.

2. Answer any **three** of the following : $5 \times 3 = 15$

   a) Describe the ultrastructure of mitochondria in Protozoa. Mention its function. 3+2

   b) Explain the mechanism of bioluminescence in insect. State its significance. 4+1

c) How angle of attack is formed to produce lift and negative lift during insect flight? What is a scutellar lever? 4+1

d) Describe the structural component of dorsal vessel in insect. 5

e) Comment on cellular differentiation in protozoans. 5

3. Answer any **one** of the following: 10×1=10

a) Write a note on sensory organelles and reaction for stimuli in protozoa. 6+4=10

b) Discuss the structural and functional differentiation of a malpighian tubule with proper diagram. What do you mean by cryptonephridial arrangement? State its function. 5+3+2=10

(Insect Organization)

4. Answer any **two** of the following: $2\frac{1}{2}\times2=5$

a) What is a Johnston's organ? State its funciton.

b) How acinus gland secretion is controlled in locust?

c) What is peritropic membrane?

5. Answer any **three** of the following: $5 \times 3 = 15$

a) Explain the structural and functional significance of filter chamber found in the insect mid gut. 5

b) What is biporons spinacle? Explain the mechanism of air passage in biporons spinacle. 2+3=5

c) State the function of tracheae in insect. What is the difference beween tracheae and traceoles? 3+2=5

d) What is sclerotization? Write down the pathway of the formation of tanned and untanned cuticle. 2+3=5

e) Illustrate the various structural components of a typical insect head. 5

6. Answer any **one** of the following: $10 \times 1 = 10$

a) Discuss the structural component of insect antennae. Explain any three modifications found in insect antennae. Cite examples. 5+3+2

b) Describe the structure of stomodaeal nervous system of insects with proper diagram. Name the two nerve centres of dentocerebrum and state their functions. 5+5

ZOOLOGY

Paper : ZHT-102

(Parasitology, Ecology and Environment)

Full Marks : 60 Time : $2\frac{1}{2}$ 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.

(Parasitology)

1. Answer any **two** of the following: $2\frac{1}{2} \times 2 = 5$

   a) State the characteristic features of ciliophora.

   b) How *Jrypanosoma* is transmitted from vertebrate to vertebrate?

   c) Name three species of *Schistosoma*.

2. Answer any **three** of the following: $5 \times 3 = 15$

   a) State the characteristic features of Centoda and Trematoda.

   b) Distinguish between schizogony and sporogony.

c) Mention the epidemiology and distribution of *Trichinella spiralis.*

d) Describe the morphology of *Diphyllobothrium latum* with a neat sketch.

e) Why "amoebiasis" is considered as a direct "Zoonotic" cum "morbid" disease?

3. Answer any **one** of the following: $10 \times 1 = 10$

a) Write a note on toxoplasmosin in the light of its zoonotic potential. 10

b) Describe the salient features and life cycle of *Heterodere rostochinensis.* Comment on its management practice. $(2+5)+3=10$

(Ecology and Environment)

4. Answer any **two** of the following: $2\frac{1}{2} \times 2 = 5$

a) What is Gaia hypothesis? Write down the criticism of the hypothesis. $1\frac{1}{2}+1=2\frac{1}{2}$

b) What is coefficient of community? $2\frac{1}{2}$

c) Define biogeochemical cycle. How does phosphorus cycle start? $1\frac{1}{2}+1=2\frac{1}{2}$

5. Answer any **three** of the following: $5 \times 3 = 15$

a) i) Differentiate between stochastic and deterministic model of population growth.

ii) What is doubling time of population? Explain in terms of exponential growth equation. $2+3=5$

b) Define niche. State different types of niches with example. Comment on niche overlapping. $1+3+1=5$

c) Explain the cybernetic nature and stability of the ecosystem. 5

d) How ozone is depleted in the stratosphere? 5

e) Discuss the environmental impact of green revolution. 5

6. Answer any **one** of the following: $10 \times 1 = 10$

a) What is stochastic fluctuation? How probability of extinction of a population in equilibrium is calculated at a particular time? How does the metapopulation concept relate to the spatial distribution of the population over geographic region? $1+4+5=10$

b) i) What is carrying capacity? Explain the stair-step type of survivorship curve with a suitable diagram.

ii) Briefly describe the Nitrogen-cycle in biosphere. Write different processes of Nirogen fixation. (2+3)+(3+2)=10

ZOOLOGY

Paper : ZHT-103

(Developmental Biology and Cytogenetics)

Full Marks : 60 Time : $2\frac{1}{2}$ 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.

(Developmental Biology)

1. Answer any **two** of the following: $2\frac{1}{2} \times 2 = 5$

   a) State the role of cortical notation in symmetry breaking event of *Xenopus* sp. $2\frac{1}{2}$

   b) State the role of bicoid and manos in the axis formation of *Drosophila* sp. $2\frac{1}{2}$

   c) How does diapedesis movement aid in germ cell migration in birds and reptiles? $2\frac{1}{2}$

2. Answer any **three** of the following: $5 \times 3 = 15$

   a) State the hormonal control of speratogenesis wih proper illustration. 3+2

b) Name the hox genes of autennopedial complex of *Drosophila* sp and state their function. $2\frac{1}{2}+2\frac{1}{2}=5$

c) What are the functions of Wunen and Columbus genes? $2\frac{1}{2}+2\frac{1}{2}=5$

d) Relate the function of P^{53} with the process of cell senescence. State the importance of morphogen gradient in embryonic development. $2\frac{1}{2}+2\frac{1}{2}=5$

e) Describe the steps of prevention of polyspermy during fertilization. 5

3. Answer any **one** from the following: $10\times1=10$

a) "The cellular proliferation is directly inhibited by cadhesin molecule." Justify the statement. How does β-catenin dependant wnt signalling pathway activate transcription facors? $3+7=10$

b) State the different types of specification with proper illustration during developmental process of embryo. Distinguish cord blood stem cell and Induced Pluripotent stem cells. $6+4=10$

4. Answer any **two** from the following: $2\frac{1}{2} \times 2 = 5$

a) What do you mean by fidelity of DNA replication? Name the *E.coli polymerase which has the highest processivity.*

$1\frac{1}{2} + 1 = 2\frac{1}{2}$

b) What is C-value paradox? Define pseudogene.

$1\frac{1}{2} + 1 = 2\frac{1}{2}$

c) What is the substrate of Cdc25? What did the characterization of the Weel$^+$ gene tell us about cell-cycle control? $1 + 1\frac{1}{2} = 2\frac{1}{2}$

5. Answer any **three** of the following: $5 \times 3 = 15$

a) Name two types of cancer classified according to the cells from which they arise. Why is the incidence of most human cancer increase with age? Point out one mechanism to explain how a pro-oncogene gets activated into an oncogene. 1+2+2

b) "The 'Rb' protein has been called the "master brake" of the cell cycle". State how is the brake released in mid to late 'G' to allow the cell to proceed to the 'S' phase. 5

c) Distinguish beween SINEs and LINEs. Why chloroplast DNA are conserved? 3+2

d) What are retro-transposon? In a circular DNA of 5400 basepain, where 10 is the number of basepain per turn and writhe = 0, then calculate Twist and the Linking number. 2+3

e) What is Philadelphia chromosome? Mention the mechanistic aspects in activation of proto-oncogene in Burkitt's lymphoma. 2+3

6. Answer any **one** from the following: 10×1=10

a) Distinguish among conservative, semi-conservative and dispersive mode of replication. Define and indicate the significance of Okazaki fragments. What is the function fo topoisomerase in DNA replication? What do you mean by extrachromosomal replication? 3+3+2+2

b) What is the role played by death wheel apoptosome in mammalian apoptosis? Explain the role of CDKIs in controlling cellular senescence with proper illustration. 5+5

ZOOLOGY

Paper : ZHT-104

(Animal Physiology, Biochemistry and Metabolic Processes)

Full Marks : 60 Time : $2\frac{1}{2}$ Hours

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

(Animal Physiology)

1. Answer any two of the following : $2\frac{1}{2} \times 2 = 5$

   a) What do you understand by oxygen dissociation curve?

   b) What is meant by actin treadmilling?

   c) Differentiate electrical synapse from chemical synapse.

2. Answer any three of the following: $5 \times 3 = 15$

   a) What is Ht buffer? Describe about poisoning effects of CO. 2+3

b) Explain the role of Ca^{2+} in synaptic transmission. What is the fate of acetylcholine hydrolysis? 4+1

c) State four major types of Respiratory Pigments & their distribution. What do you understand by 'T' & 'R' states of haemoglobin? 3+2=5

d) Explain the role of ATP hydrolysis for understanding muscle contraction. What is the function of profilin? 3+2=5

e) Discuss the Bohr effect and Humberger effect. $2\frac{1}{2}+2\frac{1}{2}=5$

3. Answer any **one** of the following: $10\times1=10$

a) With a simple experiment prove that ATP is required for actin-myosin interaction during muscle contraction. With a diagram, describe the structure of myosin V. What is meant by critical concentration of actin? Actin filament grow fast at one end than the other. – Explain. 3+3+2+2

b) Give the anatomic structure of pre-and post-synaptic functions. Briefly describe the mechanism of transmission of nerve action potential through it. 5+5

4. Answer any **two** of the following: $2\frac{1}{2} \times 2 = 5$

a) How does HSP 90 participate in protein remodelling in a stressed cell?

b) What are SNARE proteins? Name the two categories of SNARE proteins.

c) Why do you think interconversion of 3-phosphoglycerate and 2-phosphoglycerate is important for glycolysis?

5. Answer any **three** of the following: $5 \times 3 = 15$

a) In the conversion of glyceraldehyde 3 phosphate (G3P) to dihydroxy acetone phosphate (DHAP), the reaction has a ΔG^0 of – 1840cal/mol. If the initial concentration of G3P and DHAP are equal, then what is the value of ΔG? (RTCn1=0)

How ATP can convert a reaction to energetically favourable state $(\Delta G < 0)$?

$2\frac{1}{2} + 2\frac{1}{2}$

b) What are signal sequence or signal peptides? Name the different types of coated vesicles used in the vesicular transport of the cell.

How do anterograde transport vasicles differ from retrograde transport vesicle? 2+1+2

c) Why are polar amino acids more soluble in water than the nonpolar ones? Provide the structures of a hydroxyl group containing non-polar amino acid and a negatively charged amino acid. 3+2

d) Explain how you can linearize Michaelis-Menten equation. If you alter the Kinetics of a reaction by increasing K_m & leaving V_{max} alone how will the Lineweaves - Burk plot change? 3+2

e) How HMG-reductase is controlled by phosphorylation and dephosphorylation? Why PFK-1 catalysed reaction is irreversible under cellular conditions? 2+3

6. Answer any **one** of the following: 10×1=10

a) i) How can you describe bisubstrate reaction with 'ping-pong' mechanism? What are the different types of reversible inhibitions working in enzyme-substrate reaction? Treatment of an enzyme E with compound Y doubles K_m & leaves V_{max} unchanged.

Comment on the compound Y and draw a representative graph of the treatment compared to control (No treatment). 2+3

ii) Schematically write how mevalonate is formed during cholesterol biosynthesis. Explain in detail the process of reverse cholesterol transport. 2+3

b) i) Discuss how in gluconeogenesis the irreversible reactions of glycolysis are bypassed. Give an example of a reaction where glycosdic bond formation occurs. 3+2

ii) What is meant by exergonic reaction? Give an example of the same from glycolysis. One of the common effects of alchohol intoxication is the accumulation of lactate in the blood -- Explain why this effect occurs. 1+1+3