

CALCUTTA UNIVERSITY  
BIOLOGY HONS. QUES. PAPERS (PART - I, II & III) - 2017

PART - I

FIRST PAPER - 2017

(Unit - I)

Full Marks - 50

1. Answer **any five** questions from the following : 2×5
- (a) What is ostiate heart? Give example. (b) What do you mean by reptoneurons chiastoneury condition? (c) How is polarity of sponge maintained? (d) What is bunodonty? (e) What is 'dynein arm'? (f) Distinguish between protostomes and deuterostomes. (g) What is proteroglyphous and opisthoglyphous fang? Give example of each. (h) What is heterochrony?

Group - A

Answer **any two** questions

2. (a) Discuss the evolutionary significance of polymorphism in siphonophores. 5
- (b) Discuss the evolutionary significance of metamerism in annelida. 5
3. Write notes on (**any two**) : 5×2
- (a) Evolutionary significance of body symmetry. (b) Blastopore. (c) Advancement of Leuconoid canal system over Syconoid canal system. (d) Role of cytoskeletal proteins in amoeboid locomotion.
4. (a) Describe in brief the structural organisation of *Trichoplax haerens* with reference to its cells orientated along dorsal and ventral surfaces. Comment on its feeding behaviour. 2+1
- (b) Write a note on the distribution of coral reefs of India. Mention the environmental threat factors associated with their survival. 2+1
- (c) Mention the ultrastructural characteristics of flagellum with proper illustration. 4
5. (a) Describe the structure of a typical gill of prawn. Add a note on the mechanism of respiration in prawn. 4+2
- (b) Describe the structure and function of tube feet with proper illustration. 4



**Group - B**Answer **any two** questions

6. (a) Give a brief note on the development of hair. Differentiate between Hypotrichosis and Hypertrichosis. 3+2

(b) Describe in brief the main aortic arches in Vertebrates. State its evolutionary significance. 3+2

7. Draw a schematic diagram of the transverse section of the pharynx region of amphioxus and label it. What are velum and velar reflex? Write a short note on the 'Wheel organ of Muller.' Why is the lancelet often considered as a 'generalised chordate'? 4+2+2+2

8. (a) Draw and describe the structure of accessory respiratory structure of *Anabas* sp. What is the basic difference between aerial accessory respiratory structures and aquatic accessory respiratory structures? 3+2

(b) What are the pigments associated with the colouration in birds? Add a note on conspicuous and cryptic colouration in birds. 3+2

9. Distinguish between (**any two**): 5×2

(a) Artiodactyla and Perissodactyla (b) Down feathers and Pin feathers (c) Protractor pterygoid muscle and digastric muscle of snake (d) Neurotoxic and haemotoxic venom.

**FIRST PAPER – 2017**

(Unit - II)

Full Marks - 50

Answer **Question No.1** and **any one** from **Group-A** and **three** from **Group-B**

1. Answer **any five** questions of the following: 2×

(a) What is hyperchromic shift of DNA molecule? (b) What do you mean by Robertsonian translocation? (c) What is frameshift mutation? (d) What are vSNARE and tSNARE? (e) Define replisome and replichore. (f) What is 'deletion loop'? (g) Mention the importance of 'Shine-Dalgarno Sequence.' (h) Distinguish between light and electron microscope. (i) What do you mean by mitochondrial bottle neck?

**Group-A**

2. (a) What is membrane fluidity? Briefly describe an experiment to prove fluidity of plasma membrane.

(b) Narrate the steps of glycosylation of secretory peptides in Golgi compartment. (2+4)+4

3. (a) State characteristic features of mtDNA.

(b) How can you study the internal organization of lipid bilayer of plasma membrane?

(c) Explain the term — 'limit of resolution' and 'magnification power' of light microscope. 3+4+(1½+ 1½)

4. (a) Briefly narrate the process of active transport across plasma membrane.

(b) What are 'forming face' and 'maturing face' of Golgi body?

(c) With suitable diagram state working principle of phase — contrast microscope. 3+(1½+ 1½)+(1+3)

**Group-B**

5. (a) How does a cell restrict its DNA replication once per cell cycle?

(b) State mode of action of ligase in DNA replication.

(c) What is 'compensosome'? How does it work in male *Drosophila melanogaster*? 4+3+3

6. (a) What is eukaryotic mRNA turn-over?

(b) What is the importance of untranslated region (UTR) of mRNA?

(c) What is methyl capping? How is it happened with mRNA? .

(d) What are AMBER and OPAL? 2+2+(1+3)+2

7. (a) A heterozygous  $Iz^s/Iz^9$  female *Drosophila* was crossed  $Iz^9/Y$  male and  $F_1$  progeny was consisted of few wild type flies out of 10,000 mutant flies. Design a cross to justify the result.

(b) Briefly narrate the autoregulation of Sxl gene in female *Drosophila* and mention its functional status in male *Drosophila*.

(c) Tabulate different Bar eye mutation in *Drosophila* and comment on their cytogenetic basis. 3+4+ 3

8. (a) State chromosomal basis of Down Syndrome. Why this error occurs?

(b) Narrate the chromosome complement of attached X female and metafemale in *Drosophila*.

(c) The direction of shell coiling is determined by a single pair of alleles — dominant 'D' for dextral coiling and recessive 'd' for sinistral coiling. A phenotypically dextral snail is self fertilized and some of



heterozygous progeny exhibited sinistral phenotype. Explain the phenomenon citing genotype of snail and their progeny.

(2+2)+(1+1)+4

9. A cross between female *Drosophila* heterozygous for three third chromosomal mutations Ly, Sb and br and recessive mutant male yielded following  $F_1$  progeny.

Ly	Sb	br	— 404
+	+	+	— 422
Ly	+	+	— 18
+	Sb	br	— 16
Ly	+	br	— 75
+	Sb	+	— 59
Ly	Sb	+	— 4
+	+	br	— 2

(a) Find out correct gene order. (b) Estimate recombination frequency between the gene pairs. (c) Draw a linkage map of the genes. (d) Estimate co-efficient of coincidence and interference. (e) What would be the expected number of total progeny if some one wants to have 210 DCO classes? 2+2+2+2+2

### SECOND PAPER – 2017

(Unit - I)

Full Marks - 50

Answer **Question No.1** and **any four** from the rest

1. Answer **any five** from the following questions : 2×5

(a) What is Amphimixis? (b) Mention the type of cleavage found in Sea urchin. What is coeloblastula? (c) What is Koller's sickle? (d) Differentiate between permeating and non-permeating CPAs. (e) Define spermiogenesis. (f) State the role of Noggin. (g) What is resact? State its role. (h) Write any two applications of stem cells.

2. (a) Briefly describe the process of acrosome formation.

(b) Describe the process of development of eye in chick with reference to major inductive events occur during this process. 4+(4+2)

3. (a) Write about the significance of yolk in cleavage

(b) Describe about 'fast' block and 'slow' block to polyspermy. 4+(3+3)

4. (a) State the functions of Amnion and Allantois.

(b) Mention different steps of in-vitro fertilization. (2½+ 2½)+5

5. (a) Describe with diagram the process of primitive streak formation in chick.

(b) Write the process of oocyte cryopreservation. (3+2)+5

6. (a) State the classical experiments of H. Spemann and H. Mangold on organizer action.

(b) What is capacitation? Why is it required for fertilization?

(c) What is manchette? 4+(1+3)+2

7. (a) Draw and describe the fate map of chick-blastula.

(b) Write the important functions of placenta.

(c) Add a note on Nieuwkoop centre. 4+3+3

8. Distinguish between : 2×5

(a) Epiboly and emboly (b) Totipotent and pluripotent stem cell (c) Holoblastic and Meroblastic cleavage (d) Deciduous and non-deciduous placenta (e) Area opaca and area pellucida.

### PART – II

### THIRD PAPER – 2017

(Unit - I)

Full Marks - 50

Answer **Question No.1** and **any four** questions from the rest

1. Answer **any five** of the following : 2×5

(a) What is syrxin? (b) Mention two diagnostic features of prototheria. (c) What are Dipnoans? Give an example. (d) What is craniostylic jaw? (e) What is keratin fibre horn? Where is it found? (f) What is Hatschecks nephridium? (g) What is filoplumes? State its significance. (h) What is buccal funnel of lamprey? (i) What do you mean by thecodont dentition?

2. Place the following animals (**any four**) into their respective class and subclass / order with reasons mentioning at least two characters for each taxon (For Amphibia and Reptilia up to order and up to subclass for the rest) : 2½×4

(a) *Salpa* sp. (b) *Scoliodon* sp. (c) *Ambystoma* sp. (d) *Hemidactylus* sp. (e) *Columba* sp. (f) *Macropus* sp.



3. (a) Describe with suitable diagram the structure of pharynx in *Branchiostoma* sp.  
 (b) State the significance of Ascidinn tadpole in chordate phylogeny.  
 (c) State the importance of Axolotl Larva. 5+3+2
4. (a) Elucidate structural design of gills in chondrichthyes and osteichthyes.  
 (b) Describe the structure of physoclistous swim bladder with special reference to red gland and rete mirabilia. 5+5
5. (a) Comment on the modifications observed in reptilia i heart Over amphibian heart.  
 (b) State the functional and evolutionary significance of modification of aortic arches in mammals.  
 (c) Comment on accessory respiratory structure in *Anabas* sp. 4+4+2
6. (a) What are the various aerodynamic forces associated with bird flight?  
 (b) Describe the structure of ruminant stomach with labelled diagram and state the role of microorganisms in the process of digestion. 4+(4+2)
7. (a) Draw and describe the microscopic structure of mammalian hair with associated glands.  
 (b) Describe the structure of pronephros.  
 (c) What do you mean by proteroglyphous and opisthoglyphous fang? 5+3+2
8. (a) Briefly describe the hormonal and behavioural changes that occur before bird migration.  
 (b) Mention the causes of neoteny.  
 (c) Describe the structure of contour feather of bird with suitable diagram. (2+2)+3+3
9. Distinguish between **any four** of the following: 2½×4  
 (a) Artiodactyla and Perissodactyla. (b) Corpus callosum and Corpus striatum. (c) Scale of fish and scale of reptilia. (d) Endostyle and pygostyle. (e) Wolffian duct and Mullerian duct. (t) Ratitae and Carinatae.

### THIRD PAPER – 2017

(Unit – II)

Full Marks – 50

1. Answer **any five** questions : 2×5  
 (a) Distinguish between G-Protein receptor and steroid hormone receptor. (b) What is Grave's disease? (c) What do you mean by positive feedback system? (d) What is hypothalamo-hypophyseal portal system? (e) Define the role of Leydig cell. (f) What is c-19 steroid? (g) What do you mean by Kuffer cells? (h) State the name of a hormone released from zona-reticulata. (i) What do you mean by para-follicular cells?

#### Group – A

2. (a) Diagrammatically represent the histological features of liver.  
 (b) What is the function of macula-densa and juxtaglomerular cells?  
 (c) State the function of hepatocytes. 5+(2+2)+1
- Or,** (a) State the function of neuro-secretory cells of insects. What is bursicon?  
 (b) Make a suitable diagram of the structural organization of adrenal cortex.  
 (c) What is the role of C-Peptide ? (2+2)+4+2

#### Group – B

Answer **any three** questions

3. Write short notes on : 2½×4  
 (a) Exophthalmic goitre (b) Atretic follicles (c) Neurohypophysis  
 (d) Estrous cycle and menstrual cycle.
4. (a) Describe the role of insulin and glucagon in glucose homeostasis.  
 (b) Distinguish between competitive and non-competitive ELISA. 5+5
5. (a) Discuss the role of estrogen in oogenesis.  
 (b) Briefly describe the role of PTH in calcium homeostasis.  
 (c) State the function of renin. 4+4+2
6. (a) Describe how CAMP acts as second messenger.  
 (b) Describe the significance of RIA.  
 (c) Write down the role of glucose transporters. 4+4+2
7. Distinguish between the following : 2×5  
 (a) IDDM and NIDDM. (b) Diestrus and proestrus. (c)



Spontaneous and induced ovulation. (d) Epinephrine and Nor-epinephrine. (e) PKA and PLC.

#### FOURTH PAPER – 2017

(Unit – I)

Full Marks – 50

Answer *Question No.1* and *any four* from the rest

1. Answer *any five* : 2×5
  - (a) Write the importance of primitive streak. (b) What is decidua basalis? (c) Distinguish between invagination and delamination. (d) Differentiate between GIFT and ZIFT. (e) What is seroamniotic raphe? (f) What do you mean by competence? (g) Distinguish between Animal pole and Vegetal pole. (h) What is Midblastula transition (MBT) ? (i) Distinguish between Dextrotropic cleavage and Laetropic cleavage.
2. (a) State the role of chordin and  $\beta$ -catenin in embryogenesis. 2+2
  - (b) Distinguish between 'Nebenkern' and 'Mitochondrial cloud' 2
  - (c) Give an account of the growth phase of oogenesis. 4
3. Write notes on the following: 2½×4
  - (a) Inner cell mass of blastocyst and its significance. (b) Significance of yolk in patterning cleavage. (c) Effect of mutation of bindin receptors on egg vitelline membrane. (d) Role of Pa×6 as competence factor in eye development.
4. Write notes on (*any two*) : 5×2
  - (a) Contact and recognition of male and female gametes in Mammals. (b) State the process of formation of amnion and chorion in chick. (c) "Metabolic activation of egg during fertilization" — describe.
5. (a) Write about the fate of the three germ layers formed after gastrulation in frog. 5
  - (b) What is a Secondary organiser ? Discuss the involvement of secondary organiser for the development of brain in vertebrates. 2+3
6. (a) Enumerate the process of formation of neural tube in chick with suitable diagram. Add a note on the role of inducing factors on neural induction. 6+2
  - (b) What is heteroplastic transplantation? 2
7. (a) Why is capacitation required before fertilization ? Explain the molecular events that take place during capacitation. 2+4
  - (b) Describe with labelled diagram the acrosome reaction in sea urchin. 4

8. (a) Discuss the role of dorsal lip of blastopore as Primary organiser with the help of Spemann and Mangold's experiment. 4
  - (b) How do freezing cells in ultra-low temperature maintain their integrity? 2
  - (c) Explain the development of Prosencephalon in Chick with suitable diagrams. 4

#### PART – III

#### FIFTH PAPER – 2017

(Unit – I)

Full Marks - 50

1. Answer *five* questions from the following: 2×5
  - (a) What is opsonisation? (b) Distinguish between Gram-positive and Gram-negative bacteria. (c) Define adjuvant with example. (d) Define innate immunity. (e) What is hypervariable region of immunoglobulin? State its significance. (f) What are affinity and avidity of antibody? (g) Define Pasteurization. What do you know by HTST pasteurization? (h) What are GALT and CALT? (i) What are cytokines? Give examples.

#### Group – A

Answer *any one* from the following questions

2. (a) Differentiate synthetic or defined and non-synthetic or complex media. State the use of selective and differential media in the identification of microorganisms. 2+5
  - (b) In what ways sterilization differs from disinfection? What is phenol coefficient? 2+1
3. (a) Enumerate the mode of transmission and symptoms of cholera. 3+2
  - (b) Add a note on cholera toxin and its mode of action. 5

#### Group - B

Answer *any two* from the following questions

4. (a) Describe asexual stages of life cycle of *Plasmodium vivax* with suitable illustration. 5
  - (b) What do you mean by biological vector? Cite example. 2
  - (c) Cite major differences between hard ticks and soft ticks, with examples. 3



5. (a) Write a note on malignant malaria. 3  
 (b) Name the Indian vector responsible for Kala-azar. What is L-Dbody? Describe the life cycle stages of *L. donovani* with proper illustration. 1+1+5
6. (a) Describe the structure of microfilaria of *W. bancrofti* with labelled diagram. 4+2  
 (b) Highlight the possible causes of microfilarial periodicity. 3  
 (c) Name the infective stage of *Fasciola* sp. 1

**Group – C**Answer **any one** from the following questions

7. (a) Describe the structure of T-cell receptor complex. 3  
 (b) Write a note on APEs. 3  
 (c) Discuss precisely the mode of action of humoral and cell mediated Immune response. 4
8. (a) What is complement system? Describe the classical pathway of complement activation. 1+3  
 (b) What is monoclonal antibody? How does HAT medium facilitate selection of B-cell hybridoma? 1+3  
 (c) Draw and label the structure of an immunoglobulin molecule. 2

**FIFTH PAPER – 2017****(Unit – II)****Full Marks – 50**Answer **Question no. 1** and **any four** from the rest

1. Answer **any five** of the following : 2×5  
 (a) Distinguish between oncogene and tumour suppressor gene.  
 (b) What do you mean by differential splicing? Give example. (c) Define base excision repair with proper example. (d) What is Cooley's anaemia?  
 (e) Name one restriction enzyme and its restriction site. (f) What is G-RNA? State its importance. (g) Why Xeroderma pigmentosa is considered as genetic disease? Mention its cause. (h) What is suicide gene? Give example. (i) What is composite transposon?
2. (a) State the role of cdk and Cyclin in G 1-M transition in yeast. 4  
 (b) Why 'S' phase is called the most active phase of Eukaryotic cell cycle? 2  
 (c) What is hydrops foetalis? Differentiate between thalassaemia major and thalassaemia minor. 2+2

3. (a) Explain the term complementation with the help of Benzer's rII locus experiment. Define the term recon. 3+1  
 (b) State briefly the roles of P<sub>53</sub> and P<sub>21</sub> genes in Cancer. 4  
 (c) State the importance of VNTR. 2
4. (a) In a negatively controlled repressed state of *lac* operon, how many molecules of  $\beta$ -galactosidase is synthesized per cell of *E. coli*? 3 – 5  
 (b) Why is O<sup>c</sup> mutation in *E. coli* *lac* operon epistatic to the r<sup>s</sup> mutation? 2  
 (c) What is IPTG? Mention its role. 2  
 (d) Which of the following merozygotes will produce  $\beta$ -galactosidase, if lactose is absent?  
 (i) i<sup>+</sup>o<sup>c</sup>z<sup>+</sup>y<sup>-</sup> / i<sup>+</sup>o<sup>p</sup>z<sup>-</sup>y<sup>+</sup> (ii) i<sup>+</sup>o<sup>c</sup>z<sup>-</sup>y<sup>+</sup> / i<sup>-</sup>o<sup>+</sup>z<sup>+</sup>y<sup>-</sup>  
 —Justify with proper illustration. 4
5. (a) Delineate the role of leader sequence in the regulation of tryptophan operon. 4  
 (b) Why sickle cell anaemia is called molecular disease? 2  
 (c) What is haploinsufficiency? How does it affect the cancer sensitivity? 1+3
6. (a) What are retrotransposon and retroposon? 3  
 (b) Illustrate with diagram the process of inversion and duplication generation by transposable element. 2+2  
 (c) Mention the salient feature of 'P'-element. 3
7. (a) Mention the characteristic features of YAC with a suitable diagram. 3+1  
 (b) Explain *ex-vivo* and *in vivo* gene therapy. Which one is more acceptable in medical science and why? 2+1+1  
 (c) How self ligation process of a vector could be minimized? 2
8. Write brief notes on **any four** of the following : 2½×4  
 (a) DNA methylation (b) cDNA library (c) RB protein (d) RT-PCR (e) Cosmid.

**SIXTH PAPER – 2017****(Unit – I)****Full Marks – 50**Answer **Question No. 1** and **three** questions from **Group- A** and **one** question from **Group- B**

1. Answer **any five** questions from the following : 2×5  
 (a) How does Law of Superposition help to determine Geological



time scale? (b) Name the biogeographical regions where *Neoceratodus* sp., *Cryptobranchus* sp., *Phrynosoma* sp. and *Hylobates* sp. are found. (c) Which age is termed as "Age of fishes" and why? (d) Define Mendelian Population. (e) What is traphallaxis? (f) Write the full form of IUBS and ICZN. (g) Define subspecies with example. (h) How does holotype differ from homotype? (i) Why is recognition of kinship important in social behaviour of animals?

### Group – A

#### (Evolution and Systematics)

Answer **three** question from the following

2. (a) Explain the mechanism of dispersal of catadromous and anadromous animals. 5  
(b) Discuss the xeric adaptation of camel against heat and sand storm. 5
3. (a) Explain how could industrial melanism be sited as an example of directional selection. 5  
(b) Explain the role of migration affecting Hardy-Weinberg equilibrium. 5
4. (a) Trace the origin of mammals from therapsid reptiles with special reference to the evolution of teeth. 5  
(b) Define Mullerian mimicry with an example. 2  
(c) Discuss  $C^{14}$ -method for fossil dating. 3
5. Write short notes on : 4×2½  
(a) Limitations of Biological species concept. (b) Discontinuous distribution. (c) Significance of gene pool in microevolution. (d) Archaic mammals.
6. Distinguish between : 4×2½  
(a) Panmictic and apomictic species. (b) Cladistic and phenetic classification. (c) Microtaxonomy and Macrotaxonomy. (d) Linnaean hierarchy and Taxonomic key.

### Group - B

#### (Animal Behaviour)

Answer **one** question from the following

7. (a) How does circadian rhythms differ from circannual rhythms? Where is the circadian clock located? — Cite one example from the animal kingdom. How could you determine the relationship between exogenous and endogenous stimuli in circadian rhythm found in animals? 1+(1+1)+3

(b) How pheromones control the social behaviour of honey bee? 4

8. Write notes on **two** of the following : 5×2

- (a) Significance of sterile castes in a termite colony. (b) Reciprocal altruism hypothesis. (c) Role of male fish in parental care. (d) Konrad Lorenz — experiment to explain imprinting.

### SIXTH PAPER – 2017

#### (Unit – II)

#### Full Marks – 50

Answer **Question No.1** and **any four** from the rest

1. Answer **any five** questions : 2×5

- (a) What is Ramsar site? Name the only Ramsar site present in West Bengal. (b) What is Biotic potential? (c) What do you mean by solar flux and solar constant? (d) What do you mean by Ecological Efficiency? (e) What is Kyoto Protocol? (f) Define 'Life Table.' (g) Distinguish between closed and open community. (h) Distinguish between ex situ and in situ conservation. (i) Give one example each from Schedule I Part I and Schedule I Part III of Indian Wildlife Protection Act.

2. (a) Define productivity. Why wetlands are highly productive?

- (b) What do you mean by character displacement? Give one example.

(c) With examples define point source pollutant and non-point source pollutant. (2+3)+(2+1)+2

3. (a) Explain Genetic diversity and Ecosystem diversity.

- (b) How is photochemical smog formed from atmospheric pollution?

(c) Mention the role of light as an abiotic ecological factor with reference to animal metabolism and locomotion.

(d) What is ozone depletion? 3+2+4+1

4. (a) What do you mean by megadiversity countries? Comment on biodiversity conservation through FREEP in India.

(b) Distinguish between National Park and Sanctuary.

(c) Distinguish between autotrophic and heterotrophic succession.

(d) Which of the following community is more (i) rich and (ii) diverse and why?



	Number of Individuals	
	Species X	Species Y
Community A	50	50
Community B	99	1

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

5. (a) Distinguish between flagship and umbrella species.  
 (b) Discuss Density-Dependent regulation of populations.  
 (c) Mention two criteria for assigning biodiversity hotspot status of an area.  
 (d) Ecosystems are capable of self maintenance and self regulation— Explain  
 (e) State the significance of EIA. 2+2+2+2+2
6. (a) Draw the pyramid of the following populations, comment on their nature and give example in each type—

Ages	Populations		
	A	B	C
Pre-Reproductive period	900	900	300
Reproductive period	600	800	800
Post-Reproductive period	300	300	400

- (b) Distinguish between r and k selected species. 6+4
7. (a) What is hyperparasitism?  
 (b) What do you mean by eutrophication?  
 (c) Mention two objectives of project tiger. Name two sites of project tiger in West Bengal.  
 (d) Suggest how noise pollution can be reduced. 2+2+(2+1)+3
8. Write explanatory notes on (any two) : 5×2  
 (a) Acidification of soil. (b) Logistic growth curve and Logistic growth rate curve. (c) Law of thermodynamics and energy flow in ecosystem. (d) Xerosere and Hydrosere. (e) IUCN categories of threatened species.

SEVENTH PAPER – 2017

(Unit - I)

Full Marks - 50

Answer Question No. 1 and any four from the rest

1. Answer **any five** of the following: 2×5  
 (a) What is ovaprim ? State its role in aquaculture. (b) What is reeling? (c) Name two American breeds of fowl. (d) What is honey dew? How does it affect host plant? (e) What do you understand by “goodness of fit”? (f) What is pebrine disease? (g) Write the chemical composition and uses of fish meal. (h) Briefly explain “Poison distribution.” (i) “The LD<sub>50</sub> value of DDT for rat is 100 mg/kg” — explain.
2. (a) Mention scientific names of two brackish water prawn species in India. Give a comparative account of extensive and semi-intensive prawn farming. 2+3  
 (b) What is median? How does it differ from mean?

The following table gives the marks in zoology of a batch of 10 students :

Roll No.	1	2	3	4	5	6	7	8	9	10
Marks	33	36	28	40	42	25	37	32	35	43

Calculate the arithmetic mean of marks in zoology among the students. 1+1+3

3. (a) How would you identify a queen in a bee hive? Explain the terms “bee pasturage” and “emergency queen”. How is nectar changed into honey by honey bees? 1+2+2  
 (b) State the properties of coefficient of correlation.

A bag contains 07 male and 10 female cockroaches. What will be the probability of taking out one female cockroach from the bag? 3+2

4. (a) Give an account of the different strains of Mulberry silk moth based upon its voltinism. Give a brief account of silk products and their uses. 3+2

(b) A test cross of monohybrid gray mouse to an albino strain results in 64 gray and 48 albino progeny. Test the goodness of fit of these data to a 1 : 1 ratio, using the Chi-square test (use 5% level of significance and assume that for 1 degree of freedom,  $\chi^2_{0.05} = 3.84$ ). 5



5. (a) Give an account of the life-cycle of a jute pest studied by you. State its control measures. 3+2

(b) What do you mean by null hypothesis and alternative hypothesis? What is two-tailed t-test? 3+2

6. (a) What do you mean by dual cattle breed? Write briefly the chief characteristics of Sahiwal and Jersey. 1+2+2

(b) Ten students got the following marks in Ecology and Genetics:

Roll No.	1	2	3	4	5	6	7	8	9	10
Marks in Ecology	78	36	98	25	75	82	90	62	65	39
Marks in Genetics	84	51	91	60	68	62	86	58	53	47

Calculate the correlation coefficient. 5

7. (a) Enumerate the differences between Natural, Cultured and Imitation pearl. Give an account of acute and chronic toxicity.

(b) An IQ test was performed in 5 persons before and after they are trained. The results are as follows :

Candidates	A	B	C	D	E
IQ before training	110	120	123	132	125
IQ after training	120	118	125	136	121

Test whether there is any change in IQ after the training programme. (It is given that  $t_{0.01} = 4.6$  for df 4).

8. Write notes on **any four** of the following :

2½×4

(a) Artificial insemination in cattle (b) Merits and Demerits of Tilapia Culture in India (c) Establishment of Caste in a bee colony (d) Utility of IPM (e) Role of GnRH in induced breeding (f) Homogeneity Chi-square (g) Merits and Demerits of standard-deviation.