CC1

- State the systematic position of the following animals (upto class) mentioning at least two diagnostic features of each taxon :
  (a) *Obelia* sp.
  (b) *Aurelia* sp. 2½+2½

❖ **Basics of Animal Classification:**

1. (a) What is homonymy and synonymy?
(b) State the salient features and demerits of five kingdom classification of Whittaker, 1969. 2+3

2. (a) What is taxonomic hierarchy?
(b) Give two examples of animal with trinomial nomenclature.
(c) Mention the informations to be provided while designating a holotype. 1+2+2
Write short notes on (b) International code of zoological nomenclature. 2½

- **Protista and Metazoa –**

Protozoa:

- Elaborate the process of conjugation in *Paramoecium* sp with suitable diagram. 5
- Describe briefly the process of flagellary movements of *Euglena* sp.
- (b) State the functions of contractile vacuoles. 4+1
  Write notes on : 2½+2½
- Erythrocytic schizogony
- Trophozoite of Entamoeba histolytica.
  Justify any two of the following statements with proper reasons : 2½+
- *Plasmodium sp.* is an apicomplexan animal
- Write short notes on (c) Locomotor organelles and locomotion in Sarcodina. 2½+

- **Metazoa:**

Mention the significance of radial symmetry. 2
(a) Explain the cyclomerism theory of metazoan evolution.
(b) Distinguish between homonomous and heteronomous metamerism with examples. 2½+2½

- **Porifera:**

Draw and describe the syconoid canal system and show the course of water flow with the help of a flow chart. 5
Distinguish between :
(a) Choanocyte and Pinacocyte. 2½

- **Cnidaria:**

(a) Why is the distribution of coral reef restricted to some parts of the world?
(b) What are zooids?
(c) Write the scientific name of Portuguese man-of-war. 2+2+1
Give example of animals having only polyp and only medusoid form. 2
Justify any two of the following statements with proper reasons : 2½+
(d) Sea-Pen is an anthozoan animal.

- **Ctenophora:**

(a) Mention the salient features of Phylum Ctenophora. 2

- **Platyhelminthes**

(a) What is flame cell?
(b) Mention the pathogenic symptoms of Loeffler's syndrome.
(c) How does metamerism differ from strobilization? 1+2+2
Justify any two of the following statements with proper reasons : 2½+
(c) Liver fluke is responsible for liver rot disease.
(b) What do you mean by measly pork and cysticercosis? 3

Nematoda:
What is lymphangitis? 1
Distinguish between : Digenea and Monogenea. 2½+
Justify any two of the following statements with proper reasons : 2½+
(b) Microfilaria is nocturnal in habit.
Write short notes (a) Parasitic adaptation of *Wuchereria bancrofti* 2½+

CC2

CC2 Question Bank

Transcription:

2018

1. What is function of sigma factor? 2
2. Briefly describe rho' -dependent transcription termination. 3
3. Elucidate the function of snRNA. 2
4. State the roles of activators and enhancer in eukaryotic transcription regulation. (2+2)
5. Describe the clover leaf model of tRNA. 3

2019

6. Enumerate the roles of Silencer and Repressor in eukaryotic transcription regulation. (1.5+1.5)
7. Goldberg-Hogness Box 5
8. What are CpG islands? Why are-they significant? 2
9. Mention the specific roles of IF1 and IF3 in prokaryotic transcription. 2
10. What is Guide RNA? State its importance. 2

2020

11. Define promoter clearance. 2

Translation:

2018

1. What is Shine Dalgarno sequence?
2. What are non-sense codons
3. Wobble hypothesis 5
4. What is amino-acetylation of tRNA? How does it help in protein synthesis? (1+3)
5. What is universality of genetic code? Give one example of, exception of universal genetic code. (2+1)
6. **2019**
7. Describe EF-T_U, and EF-T_U, cycle in prokaryotic translation process. 4
8. What are Amber, Ochre and Opal? 3
9. Comment on the role of IF1, IF2 and IF3.in bacterial translation. 4

10. Degeneracy of Genetic code. 5

2020

11. What is Degeneracy of Genetic code? 2

Post Transcriptional Modifications and Processing of Eukaryotic RNA:

2018

1. Methyl Capping 5
2. What is altermate splicing? Mention its merit in eukaryotes. (2+2)

2019

3. What is split gene? 2
4. Describe the spliceosome mediated RNA splicing mechanism of pre-mRNA with proper diagram. 3
5. Poly A tailing of Pre-mRNA. 5
6. What is Guide RNA? State its importance. 2
7. What is RNA editing? 2
8. Define split genes. 2

Molecular Techniques:

2018

1. Western Blotting 5
2. Principle of PCR. 5
3. Mention the features of Taq DNA polymerase in PCR. 2

2019

4. Write the principle of southern blotting and its uses. 3
5. What is the fundamental difference between DNA polymerase and Taq DNA polymerase? 2
6. State the utility of nitrocellulose membrane in any blot technique. 2
7.

Gene Regulation:

2018

1. State the roles of activators and enhancer in eukaryotic transcription regulation. 2+2
2. Distinguish inducible operon and repressible operon. 3
3. Briefly describe the positive control of Lac Operon. 4
4. With proper reason state whether the following merozygote is constitutive or inducible system for β-galactosidase- I'o'z'Y-/ rO'ZY*. 3
5. State the role of histone acetylation in eukaryotic gene regulation. 4

2019

6. Briefly state the miRNA mediated gene-silencing mechanism. 3
7. What is Gratuitous Inducer? Give an example. 2
8. Epigenetic regulation. (SN) 5
9. What is DNMT? Mention its role in DNA methylation. 1+2
10. Lac repressor is an allosteric protein.'-Justify. 3
11. Why the O^c mutation in E. coli Lac operon is epistatic to the mutation? 3
12. Enumerate the roles of Silencer and Repressor in eukaryotic transcription regulation. 1.5+1.5

13. Which of the following merozygotes will produce β-galactosidase and β-galactoside permease if lactose is absent? Justify your answer with proper illustration:

(i) i'O'Z'Y /i 0'Z'Y

(ii) i'OZ Y' /i'O'ZY 4

2020

14. Explain the process of positive control of lactose operon. 5
15. Write short note on Histone methylation and acetylation. 5
16. Define 'Glucose Effect' in connection to Lactose operon. 2
17. Mention the function of β-galactosidase and permease. 2
18. State the function of miRNA. 2
19. Briefly mention the role of enhancer sequence. 2
20. Trp repressor is a positive allosteric protein– Explain. 2
21. Write at least two mechanisms of epigenetic gene regulation. 2

2021

22. Schematically represent the negative control of repressor protein for Lac operon. 3
23. DNA methylation. (SN) 2.5
24. State the role of leader sequence in the regulation of tryptophan operon. 2

CC3

Unit-1-Evolution of coelom

- Define coelom. Distinguish between schizocoelous and enterocoelous coelom with examples. (2+3)
- Define coelom. Write the differences between acoelomates and pseudocoelomates with example. What is the significance of coelom? 1+(2+1)+1
- Explain gonocoel theory with suitable diagram. 3
-

Unit-2-Annelida

1. What is parapodia? Where do you find it? 2
2. Classify Phylum Annelida up to class with suitable characters and examples. 5
3. Describe septal nephridia with proper illustration. Mention its role in excretion. (3+2)
4. Discuss the theories-on origin of metamerism in Annelida. 5
5. (a) What is chloragogen cells? (b) Write the main excretory product of earthworm. (c) Describe in brief about the excretory mechanism in earthworm. 1+1+3
6. 3. Distinguish between metamerism and pseudometamerism. Describe the types of metamerism found in annelids with examples. 1+4

Unit-3-Arthropoda:

2019

- What is meant by 'apposition image'? 2
- What is a termitarium and fungus garden? 2
- Structure of a typical gill in prawn and mechanism of respiration. 5
- Describe in brief the caste system in termite colony. 4
- Describe in brief the process of metamorphosis in lepidopteran insect. 5

2021

- Write the name and two important characteristic features of the class to which each of the following animals belong: 1×5
    (a) *Palaemon* sp.
    (b) *Julus* sp.
    (c) *Periplaneta* sp.
    (d) *Limulus* sp.
    (e) *Peripatus* sp.
- What is metamorphosis? Distinguish between holometabolous and hemimetabolous insects citing one example of each. Comment on the role of prothoracicotropic hormone in Lepidoptera. 1+2+2
- Distinguish class Insecta and Arachnida. Mention the unique feature of tracheal respiration in *Periplaneta* sp. 2+3
- What is resilin? 2
- What is the structural unit of the eye in cockroach? Explain it with suitable diagram. 1+(2+2)
- Write a short note on the fertile castes of termites. What is the role of nasutes in the colony? What happens if the queen is removed from a termite colony? 3+1+1
- Write the systematic position up to class of the following animals : Silver fish, 1+2

2022

- Distinguish between trachea and tracheoles. 2
- Comment on functional significance of tracheal tenidium. 2
- Give the scientific name of silver fish and cuttle fish. 2
- What is stomochord? 2
- Differentiate between malpighian tubules and malpighian corpuscles. 2
- Write the characteristics of eusocial insects. 2
- What role do the corpora cardiaca play in insect metamorphosis? 2
- Which arthropods possess only simple and only compound eyes? Mention their respective classes. Describe the structure of gill in prawn with labelled diagram. Briefly describe the process of respiration in prawn. (2+2)+(4+2)
- Justify the statements with proper reasons: 2x5
    i. Spider belongs to class Arachnida,
    ii. Termite is a social insect.
- Discuss briefly the mosaic image formation in cockroach eye. What role does juvenile hormone play in insect metamorphosis? 4+2
-

Unit- 4- Onychophora:

- *Peripatus* sp. is considered a connecting link between Annelida and Arthropoda. — Justify. 4
- State the typical features of *Peripatus* sp. Why *Peripatus* is considered as a connecting link between annelids and arthropods? 2+3
- Mention typical features of the Phylum Onychophora. Why are onychophorans considered as a connecting link between annelids and arthropods? What is strobilisation? 4+4+2

Unit- 5- Mollusca:

2019

- What is 'ink gland'? What is its function? 2
- Distinguish between connective and commissure. 2
- Write short notes on (a) Effect of torsion on the digestive system and nervous system of Gastropoda. 5
- Describe the respiratory structures in *Pila* sp. Add a note on the mechanism of respiration. 4+4
- Distinguish the following with example: (1) Scaphopoda and Bivalvia. (2.5)
- Why is *Pila* considered as an amphibious animal? Explain how radula helps in feeding in *Pila*. What is monopectinate gill? 2+2+1
- Define Torsion. Describe the effect of torsion on the nervous system of Pila with suitable diagram. 1+4
- Comment on different types of torsion exhibited by molluscs. 6
- Describe the feeding mechanism in *Pila* sp. 4
- Justify the statements with proper reasons: 2x5
  (a) *Pila* sp. is a gastropod.
  (b) Pseudocoelom is not a coelom.
  (c) Radula in mollusc.

Unit- 6- Echinodermata:

- Distinguish the following with example: Crinoidea and Holothuroidea. 2.5
- In which animal 'Aristotle's Lantern' is found? What is its function?
- Write short notes on (b) Components of a typical water vascular system in *Asterias* sp. 5
- Distinguish Auricularia and Bipinnaria larva. Briefly discuss the affinities of echinoderm larva with chordates. (2+4)
- Distinguish between ophiopluteus and echinopluteus. 2
- Write down the characteristics of class Holothuroidea with example. What are the different parts of water vascular system in Echinodermata and their functions? 2+3
- What is Aristotle's lantern? 1
- State the significance of Echinoderm larva. Differentiate between radial canal and ring canal. What is polian vesicle? Mention its function. 4+2+(2+2)
- Comment on the functions of tube feet and madreporite. 4

Unit-7- Hemichordata:

- Write short notes on (c) Inclusion of *Balanoglossus* sp. into its current systematic position. 5
- Why Balanoglossus is considered as an invertebrate chordate? Describe the mode of feeding and digestion in Balanoglossus sp. 1+2+2
- 'Tornaria larva exhibits clandestine evolution.' — Justify it. 4

Miscellaneous:

- Write the systematic position up to class of any two of the following animals: (2×2)
  (i) Sea hare, (ii) Silver fish, (iii) Cuttle fish.

- Mention the systematic position of L*imulus* sp., *Aphrodite* sp. and *Sepia* sp. ($1+1^1/_2$) X 4

CC4

UNIT-1-PLASMA MEMBRANE:

1. Distinguish facilitated diffusion and secondary active transport. 2
2. Write short notes on - Membrane asymmetry. 5
3. Write short notes on - Desmosome. 5
4. Describe the structure and function of tight and gap junction. 4
5. Define membrane fluidity. 1
6. Briefly describe an experiment to prove the fluidity of plasma membrane. 4
7. Write short notes on - Zonula adherence. 5
8. Compare and contrast on- Active transport and passive transport. 2½
9. Compare and contrast on- Simple diffusion and facilitated diffusion. 2½
10. Distinguish active transport and facilitated diffusion. 2
11. Define and explain membrane asymmetry. 1+3
12. What is RBC ghost? Mention its utility. 1+1
13. What are Lipid rafts? State its significance. 1+1
14. What is tight junction? 2
15. Write short notes on – fluidity of plasma membrane. $2^1/_2$
16. Briefly describe the fluid mosaic model of plasma membrane with diagram. 4
17. Write a note on the different types of membrane proteins with examples. 4
18. Briefly describe an experiment to prove the asymmetry of plasma membrane. 4
19. Write short notes on - freeze etching? 5
20. Write short notes on – freeze fracture technique. 5
21. What is glycocalyx? Write the functions of it. 2+3

UNIT-2- CYTOPLASMIC ORGANELLES I (ER, GA & LYSOSOME):

ER:

1. Clathrin coated vesicle (SN). 5
2. Distinguish between N-linked and O-linked glycosy'lation. 2
3. What is meant by N-linked glycosylation of proteins? 2
4. State the process of N-linked glycosylation in Endoplasmic reticulum. 3
5. Define vesicular transport. 2
6. Mention the role of COPI, COPII and clathrin coated vesicles in intracellular transport. (1+1+1)
7. What do you mean by protein glycosylation? State its significance. 2
8. Write short notes on -V Snare and ‘T Snare. 5

GA:

9. Define cis-trans polarity of Golgi. 2
10. Which organelle is known as ‘traffic police’ and why? 2
11. Describe the modification of secretory protein in Golgi. 5
12. Define cis/forming face and trans/maturing face of Golgi. 2
13. Cis-trans polarity of Golgi (SN). 5

14. State the role of Golgi-Reticulum-Lysosome (GERL) system in protein translocation. 3

Lysosome:

15. Diagrammatically explain lysosomal protein modification in Golgi. 3
16. Inspite of highly acidic contents of lysosome, the membrane of the organelle is not destroyed. — Explain. 2
17. What is secondary lysosome? 2
18. What is lysosome! Describes its polymorphic forms. 2+4
19. Discuss the origin of lysosomes. 4
20. What is molecular processing? 2
21. What are stabilizers and labilizers of lysosome? 3
22. How does the acidity is maintained in lysosome?
23. What is KFERO?
24. What is the role of lysosome in fertilization?
25. . What is the role of lysosome in metamorphosis?
26. What is the relation between lysosome and cancer?
27. What is the role of lysosome in arthritis disease?
28. What is storage disease?
29. What is the role of lysosome in this disease?
30. What is the role of lysosome in seed germination?
31. How silicosis is caused by lysosome?

UNIT-3- CYTOPLASMIC ORGANELLES II:

Mitochondria:

2019

1. How oxidative phosphorylation and mitochondrial respiratory chain are coupled? 2
2. Why is mitochondrion considered as semi-autonomous organelle? 2

2021

3. Mitochondria is Semi-autonomous — Explain. Distinguish between glyoxisome and peroxisome. 3+2

2022

4. Name two enzymes of inner mitochondrial membrane. 2
5. Explain the endosymbiotic hypothesis of mitochondrial origin. 3

Review:

1. Describe ultrastructure of mitochondria with suitable diagram. Enumerate briefly the features of mt DNA. 6+4
2. Describe ultra microscopic and chemical structure of DNA containing cell organelle with suitable diagram. 10
3. How does mt DNA differ from nuclear DNA? 5
4. What is $\mathbf{F_0F_1}$ synthase complex? 2
5. WHY mt DNA is considered to be unique? 4
6. Describe ultrastructure of mitochondria cristae with suitable diagram. 4
7. Name one uncommon enzymes found in outer membrane, inner membrane, inner membrane space and matrix of mitochondria. Comment on their function. 4+4
8. S. N. on mt DNA. 5

9. Name one enzymes found in outer membrane, inner membrane, inner membrane space and matrix of mitochondria. Comment on their function. 4+4
10. What is electron transport chain? What are the sources of substrates of electron transport chain? 2+4
11. What do you mean by oxidative phosphorylation? Briefly describe the chemiosmotic theory of Oxidative phosphorylation? 2+4
12. Why mitochorndrion is called "Power house" of the cell? 3
13. What is Fernandez-Moran subunit? 2
14. What do you mean by OSCP? 2
15. What is the role of thermogenin? 2
16. Which is the only mitomembrane bound enzyme in TCA cycle? 2
17. What are the mobile carriers in the electron transport chain? 2

Peroxisomes:

2019

1. Distinguish between peroxisome and oxisome. 2

Centrosome (Kinetochore and centromeric DNA):

2019

1. Write S.N. on -Centriole. 5

2021

2. Write S.N. on -Kinetochore 5

2022

3. Name two kinetochore associated protein. 2

UNIT-4-CYTOSKELETON:

1. (a) Mention the name of **accessory proteins** of microfilament and microtubule. 3
   (b) State the functional significance of following cytoskeleton proteins-Cofilin, Spectrin, Cadherin. 4+(2+2+2)
2. Write short notes on- intermediate filament. 5
3. Write short notes on- microfilament 5
4. Write short notes on- microtubules. 5
5. What microtubular organization centre (MTOC)? Describe the different steps in microtubule assembly. 2+4
6. Describe the role of kinesin and dyneins in intracellular transport. 2+2
7. What are the roles of profilin, Vasp, cofilin and Arp in amoeboid locomotion? 2+2+2
8. What are the functions of talin, vinculin and α-actinin in amoeboid movement? 2+2+2
9. What is the effect of colchicine in microtubule assembly?
10. What is effect of temperature on microtubule assembly?
11. What is the effect of microtubule concentration on its assembly?
12. What are the actin-binding proteins?
13. What are the actin-crosslinking proteins?
14. What is the role of concavlin-A in signal transduction?
15. What is keratin filaments? What is its function?
16. What is glial filament? What is its function?
17. What is vimentin?
18. What is synemin?
19. Name two genetic diseases that are caused due to cytoskeletal deformities.

UNIT-5-NUCLEUS

1. Both histones and non-histones proteins are essential for DNA packaging in eukaryotic cell. However, these classes of proteins are fundamentally dissimilar in a number of ways. Describe how differ in terms of —
   (a) their protein characteristics
   (b) their interaction with DNA
   © their role in DNA packaging. 3+3+4
2. Discuss the structure of nucleosome, their hierarchical packaging with suitable diagram. 5
3. Write shorts notes on (any two): 2½+2½
   (a) Nuclear pore complex
   (b) Philadelphia chromosome.
4. Distinguish between euchromatin and heterochromatin. 2
5. Describe tripartite organization of nucleolus. What are sub nucleolar components of nucleolus? 2+2
6. Explain the higher order chromatin packaging with suitable diagram. 4

UNIT-6-CELL CYCLE

1. Briefly mention the process of G2 - M progression in yeast. 4
2. 'S-phase is most active in eukaryotic cell cycle'-Justify this statement. 2
3. What is maturation promoting factors? 2
4. Mention the conditions/mechanisms by which mammalian cell can cross restriction point. 3
5. P53 is the gurdian of genome'-Explain. 3
6. Explain the process **of G2-M** transition in cell cycle. 2
7. Define cyclin and CDK. 2
8. Mention the role of Growth factors, P53 protein and Retinoblastoma [Rb] protein during mammalian **G1-S** transition. 2½+2½+2½
9. Mention cell cycle check points. 2
10. Mention DNA damage check point. 4
11. What is replication licensing factor? 2
12. State the control of single replication on S phase of a normal cell cycle. 4
13. State the role of P27/p21/ATM/ cdc 25/ cycling E /cdc13 in cell cycle. Each objective 2.
14. Explain the role of P53 in DNA damage checkpoint. 4
15. Define APC/C. 2

CANCER

1. State the characteristics of neoplastic cell. 2/4
2. Distinguish between the benign and malignant tumour 2
3. What is metastasis. 2
4. Cancer cells do not require growth factors for survival - explain. 3
5. Cancer is a molecular disease - explain 3
6. What are proto-on cogene and tumour suppressor gene? 2
7. Distinguish V onc and c onc 2

8. Mention the process of conversion of proto-oncogene to oncogene by point mutation/translocation/virus/deletion 4
9. Proto-oncogene mutation are dominant but that for TSG is recessive-explain 4
10. What is haplo-insufficiency? 2
11. Explain or distinguish sporadic and hereditary retinoblastoma. ¾
12. State the role of BRCA gene in breast cancer 2
13. Role of RB in retinoblastoma 3
14. Define Burkitt's lymphoma, Philadelphia chromosome etc.
15. Distinguish between proto-oncogene and tumor suppressor genes with suitable examples. 2
16. Illustrate how mutation in ras proto-oncogene can convert it into oncogene. 3

UNIT-7- CELL SIGNALLING:

1. With suitable illustration explain the intrinsic pathway of apoptosis. 4
2. Why RTKs are so called? 2
3. Classify plasma membrane receptors. 3
4. With suitable illustrations mention the extrinsic pathway of apoptosis. 5
5. Compare and contrast (any two): 2½+2½
   (a) Pro-apoptotic and anti-apoptotic gene
   (b) Apoptosis and necrosis.
6. With a suitable diagrammatic illustration explain signal transduction through the JAK-STAT pathway. Give example of two signalling molecules that elicit JAK-STAT pathway. 4+1
7. Compare and contrast on -Apoptosis and necrosis. 2½
8. State any two features of apoptotic cell. 2
9. State the process of signal transduction by RTK pathway. 4

UNIT-8: **Tools and Techniques in Cell Biology**

1. Write the purpose of using serum jn animal cell culture. 2
2. Define adherent and suspension cell cultures with example along with respective aims of the cultures. 2+2
3. What are the major challenges of animal cell culture? 2
4. Enlist the equipment's needed in animal cell culture. 2
5. What is primary cell culture? 2
6.

CC5

Introduction to Chordates: **Protochordata:**

- State the importance of endostyle in *Branchiostoma* sp. 2
- Describe the progressive and retrogressive changes in Ascidian Tadpole. 5
- What is tunicin? Where is it found? 2
- What is ciliary feeding? 2

- Compare and contrast the process of progressive and retrogressive metamorphosis. 5
- Describe the structure of endostyle in *Branchiostoma* with a suitable diagram. What is its function? 2+1+2
- State the characteristics of subphylum Urochordata. Discuss the significance of tadpole larva of Ascidia. 3+2
- Comment on the location and function of Hatschek's pit. 3
- What is retrogressive metamorphosis? 2
- State two important differences between primary and secondary gill bars of *Branchiostoma* sp. 2
- In what respect the metamorphosis of Ascidia differs from that of anuran amphibia? Narrate the steps of metamorphic changes in ascidian tadpole with suitable diagram. 4+(4+2)

Agnatha:

- Distinguish between cyclostomes and fishes. 4

Pisces:

- How you can distinguish fishes from other vertebrates? 2
- Physoclistous and Physostomous swim bladder in fish (SN). 5
- Describe the accessory respiratory organ found in *Clarias* sp. (with diagram). How does swim bladder act as an accessory respiratory organ in some fishes? Distinguish between anadromous and catadromous migration with example. (3+2)+2+3
- Define hemibranch and holobranch. 2
- State two functions of swim bladder. 2
- State two differences between Chondrichthyes and Osteichthyes. 2
- Define parental care. 2
- State the chordate features of *Branchiostoma*. 2
- Define anadromous migration. Give one example. 2
- Describe with diagram the ARO of *Anabas* sp. 5
- Differentiate between physostomous and physoclistous swim bladder. Provide examples. What is rete mirabilis? 4+1
- Describe the accessory respiratory organ of *Clarias* sp. with suitable diagram. 4
- Describe the structure of physoclistous swim bladder in fish. How does swim bladder act as an accessory respiratory organ in some fishes? (2+3)

CC6

Unit-1-Tissues:

1. Why blood is calleda connective tissue? 2
2. Describe the histological structure of striated muscle with diagram. 4
3. Classify and describe different epithelial tissues. 5
4. Mention the location and function of transitional epithelium. 2
5. Write two important differences between collagen fibre and elastic fibre. 2
6. Write any four characteristic features of cardiac muscle. 2
7. What is meant by sensory epithelium? — Give example. 2

8. What are the different types of epithelial tissues? Mention specific location of each type. 2½+2½
9. (a) Distinguish between striated and non-striated muscle.
   (b) Write the special features of cardiac muscle. 3+2
10. Red and white muscle fibre. 2
11. Classify epithelial tissue according to shape of the cells with example. 5
12.

Unit-2-Bone and Cartilage:
Unit-3-Nervous System:
Unit-4-Muscular system:
Unit-5-Reproductive System:

Unit-6-Endocrine System:

1. State the role of colloid in thyroid. 2
2. Write the full form of hCG and state any two of its function. 2
3. What is meant by atretic follicle? 2
4. Histology of adrenal cortex with labelled diagram. 5
5. Describe the mechanism of any steroid hormone's action with diagram. Classify hormones according to chemical nature. Give examples of each group. Mention the functions of oxytocin. 4+4+2
6. State, in brief, the role of pancreatic hormones on carbohydrate metabolism. Mention the location and role of parafollicular cells. Name the principal groups of nuclei of hypothalamus which control anterior pituitary. 5+3+2
7. Mention the location and function of Parafollicular cells. 2
8. State two functions of thyroid hormone. 2
9. Why cAMP is known as second messenger? 2
10. State the changes in gonadotropins during ovulatory phase of menstrual cycle. 2
11. Name the different zones of adrenal cortex and the hormones secreted from each zone. 2
12. What is meant by neuroendocrine gland? Give an example from vertebrate. 2
13. Name the cell types and mention one key function of each cell type present in endocrine pancreas. 2+3
14. Name any two placental hormones and state their functions. 2+1½+1½
15. Classify hormones according to their chemical nature with examples. 2½+2½
16. Describe the signal transduction pathway for any steroid hormone. 5
17. Mention the site of secretion and one important function of each of the following: 5
    (a) Calcitonin
    (b) Prolactin
    (c) Oxytocin
    (d) Gonadotropin releasing hormone
    (e) Epinephrine.

18. Name different cell types of endocrine pancreas. State the process of iodine uptake and storage in thyroid gland with a schematic diagram. 5
19. Endocrine pancreas. Mention the hormones secreted from each type. 2½+2½
20. Describe the histological structure of anterior pituitary gland and mention the names of hormones released by each cell type. 3+2
21. Give a brief account of signal transduction pathway of any one non-steroidal hormone. 5
22. Mention the names of different placental hormones and state their functions. 2+3
23. Distinguish between (any two) : (a) Steroid and non-steroid hormone. 2½

24. Compare the three cortical zones of adrenal gland with reference to structural and functional aspects. 5

CC7

CC7 QUESTION BANK

CABOHYDRATES

1. State the biochemical significance of a — 1. 6-glucosidase. 2
2. Describe the process of neoglucogenesis starting from pyruvate mentioning the names of required enzymes. 6
3. Sucrose is a non-reducing disaccharide"- Justify. 2
4. Isomerism of monosaccharides. 5
5. What is mutarotation? 2
6. Briefly describe non-oxidative phase of pentose phosphate pathway (without structure). Why it is termed as hexose monophosphate shunt? 5+2
7. State the roles of the following enzymes in carbohydrate metabolism:
   (i) Citrate synthase
   (ii) Phosphofructokinase 1
   (ii) 2+2+2
8. State two biological importance of monosaccharides. 2
9. Mention the function of carbomoyl phosphate synthatase with significance. 2
10. How many molecules of GTP is produced in one round of TCA cycle? 2
11. Describe biological importance of Glycogen, Starch and Cellulose. 2+2+1
12. State the function of hexokinase and phosphofructokinase. 2
13. State the functions of the following enzymes: (a) Transketolase (b) Aldolase (c) Pyruvate kinase (d) Palmitoyl thio-esterase (e) Citrate synthase. 2X5
14. Write short Note -Pentose phosphate pathway (structure not required) 5

Lipids:

1. Comment on the role of **fatty acid synthase** during de novo synthesis of fatty acids. 4

PROTEIN

1. Amino acids exist as zwitterion-Explain. 2
2. Mention the difference between oxidative and non-oxidative deamination. 2
3. Name different bonds found in the tertiary structure of protein (4 types). 2
4. Differentiate between fibrous and globular protein. 2
5. Define ketogenic amino acids with example.
6. (l) Define trans-deamination.
7. Define primary structure of protein.
8. Write a short note -Transamination 5
9. Write a short note on de-amination. 5
10. Briefly describe the urea cycle and mention its biological significance. 4+1
11. Define with example essential and non-essential amino acids. 2+2
12. Describe oxidative deamination with example. 3

Nucleic Acids:

2. Explain briefly the purine salvage pathway. 5
3. Nucleoside and nucleotide. 2
4. Differentiate between purines and pyrimidines. 2
5. Describe the purine salvage pathway briefly. 4

Enzymes

State the significance of Lineweaver-Burk plot. 2
What are isozymes? 2
Michaelis-Menten equation. (SN)
What is Km? What happens when 2+(2+2)

(i) [S]<<Km
(ii) [S]>> Km

Explain with an example E.C. number of an enzyme. 2
Define co-enzyme. Give an example. 2
Give example of a competitive enzyme inhibitor and the reaction that it inhibits. 2
What is meant by 'ACTIVE SITE' of an enzyme? 2
Define Km with significance. 2
What is uncompetitive inhibition? Explain the effect of this kind of inhibition on V_{max} and K_m with MM graph. (Michaelis-Menten Graph). 1+2+2
Elucidate the role of temperature on enzyme activity. 2
Differentiate between competitive and non-competitive enzyme inhibition. 3
What happens when [S] = Km and [S] < Km? What is isoelectric pH? (2+2)+1
What are cofactors? 1
What happens when [S] = Km and [S] < Km?
In the context of enzyme kinetics, the Michaelis-Menten equation describes the rate of enzymatic reactions by relating the reaction rate vvv to the substrate concentration [S][S][S], the maximum reaction rate VmaxV_{\text{max}}Vmax, and the Michaelis constant KmK_mKm. The equation is given by:
v=Vmax[S]Km+[S]v = \frac{V_{\text{max}} [S]}{K_m + [S]}v=Km+[S]Vmax[S]

When [S]=Km[S] = K_m[S]=Km

- **Condition:** The substrate concentration is equal to the Michaelis constant ([S]=Km[S] = K_m[S]=Km).
- **Effect on Rate:** At this point, the rate of the reaction vvv is exactly half of the maximum rate VmaxV_{\text{max}}Vmax. Mathematically:

v=Vmax[S]Km+[S]=VmaxKmKm+Km=VmaxKm2Km=Vmax2v = \frac{V_{\text{max}} [S]}{K_m + [S]} = \frac{V_{\text{max}} K_m}{K_m + K_m} = \frac{V_{\text{max}} K_m}{2 K_m} = \frac{V_{\text{max}}}{2}v=Km+[S]Vmax[S]=Km+KmVmaxKm=2Km VmaxKm=2Vmax

This implies that the enzyme is working at half of its maximum capacity. The substrate concentration at which this occurs is indicative of the enzyme's affinity for the substrate; a lower KmK_mKm indicates higher affinity.

When [S]<Km[S] < K_m[S]<Km

- **Condition:** The substrate concentration is less than the Michaelis constant ([S]<Km[S] < K_m[S]<Km).
- **Effect on Rate:** The reaction rate vvv is less than half of the maximum rate VmaxV_{\text{max}}Vmax. In this scenario, the Michaelis-Menten equation

approximates to a linear relationship because [S][S][S] is much smaller compared to KmK_mKm. The equation simplifies to:

v=Vmax[S]Km+[S]≈Vmax[S]Kmv = \frac{V_{\text{max}} [S]}{K_m + [S]} \approx \frac{V_{\text{max}} [S]}{K_m}v=Km+[S]Vmax[S]≈KmVmax[S]

This linear relationship indicates that the enzyme is not saturated with substrate, and the rate of reaction is directly proportional to the substrate concentration.

Summary

- **[S]=Km[S] = K_m[S]=Km:** The reaction rate vvv is Vmax/2V_{\text{max}}/2Vmax /2, meaning the enzyme is operating at half its maximum capacity.
- **[S]<Km[S] < K_m[S]<Km:** The reaction rate vvv is less than Vmax/2V_{\text{max}}/2Vmax/2 and is approximately proportional to [S][S][S], indicating that the enzyme activity is more dependent on substrate concentration in this range.

CC8

CC8 questions

Integumentary System:

- Give an account of the histological organization of mammalian skin with a labelled diagram (2021). 3+2
- Name three epidermal derivatives in mammals (2022). 3
- How does the skin of amphibians help them in respiration and water absorption (2022)? 5
- Write short notes on - Poison glands in Amphibians (2022). 5
- Distinguish between - Salt gland and Sweat gland (2022) $2^1/_2$
-

Digestive System:

- Define Hypsodont and Lophodont dentition. Write a note on diastema with its significance (2021). 3+2
- Comment on the fermentation process in Ruminant Stomach (2021). 5
- Distinguish between Thecodont and Acrodont dentition with suitable examples (2021). 5
- Comment on the role of anaerobic bacterial function in ruminant stomach of *Bos*. Define four types of dentitions in mammals with labelled diagram and example (2022). 4+(4+2)
- What do you mean by tadpoles tooth (2022)? 2
- Distinguish between - Molar and Pre molar. (2022) $2^1/_2$
-

Respiratory System:

- Draw and describe the structure of a holobranch of a bony fish (2021). 4+1
- What is branchiostegal membrane? Where is it found? (2022) 2
- Describe the structure of Teleost gill with diagram. Describe the process of respiration in Teleost (2022). (4+2)+4

- Distinguish between (any two) : 2½×
  (a) Hemibranch and Holobranch (2021)
- Draw and describe different air sacs in *Columba* sp. (2021). 5
- Distinguish between - Air sac and Air capillary (2022) $2^1/_2$
-

Circulatory System:

- Draw and describe the modification of aortic arches in mammals (2021). 2+3
- Distinguish between 'Ductus Arteriosus' and Ductus Caroticus' (2022). 2
- Distinguish between "Conus arteriosus' and 'Bulbus arteriosus'(2022). 2
- Distinguish between a single circuit heart and a double circuit heart with suitable examples (2022). 2
- Distinguish between (any two) : 2½
  (a) Foramen magnum and Foramen Monro (2021)
- Mention the structural peculiarities of a typical reptilian heart (2021). 2+3
- Draw and describe the modifications of aortic arches in reptiles. Distinguish between heart of fish and heart of Amphibia (2022). 4+3

Urinogenital System:

- What is mesonephros? State the differences between Wolffian and Mullerian duct (2021). 3+2
- What do you mean by opisthonephric kidney (2022)? 2
- Describe the structural peculiarities of Pronephros and Metanephros kidneys with proper diagrams. Define Wolffian duct and Mullerian duct (2022). (3+3)+2+2

Nervous system and sense organs:

- Distinguish between Pallium and Neopallium (2022). 2
- What is gyri and sulci (2022)? 2
- Name the V and IX cranial nerve and comment of their distribution in fishes (2021). 2+3
- Distinguish between (any two) : 2½
  (a) Corpus callosum and Corpus striatum (2021).
- Comment on the functional modifications of cerebellum in Vertebrates (2021). 5
- Give a comparative account of cerebrum and cerebellum of Reptiles and Mammals with diagams. Comment on 4 cranial nerves and their distribution in Amniotes (2022). 6+4
- Write short notes on - Function of Mammalian ear in balancing and hearing (2022) 5
- Write short notes on - Olfactory receptors in fish (2022). 5
-

Skeletal system:

- What is craniostylie jaw suspension? Where is it found (2022)? 2
- Write a brief note on autostylic jaw suspension (2021). 5
- Name the bones of pelvic girdle in Pigeon (2022). 3

CC9

Unit-1: Physiology of Digestion

1. Mention the role of bile in digestion of food substances. Write the mechanism of fat absorption in the intestine. 2½+2½
2. Discuss briefly the digestion of protein in stomach. Mention the function of Oxyntic/Chief cells and parietal cells of stomach. 3+1+1
3.

UNIT-2- Physiology of Respiration:

- Distinguish between IRV and ERV. 2
- Define Root effect. 2
- Describe the mechanism of CO, transport in blood as bi-carbonate ions and in combination with haemoglobin. Mention Haldane effect. What are the effects of carbon-monoxide poisoning (any two)? 6+2+2
- Explain the process of mammalian expiration and inspiration with diagram. Discuss the major factors affecting vital capacity. Define anatomical dead space. (4+2)+2+2
- S. N on – O_2 dissociation curve. 5
- Name two respiratory pigments and where do you find them. Explain 'Chloride Shift'. (½+½+½+½)+3
- Describe the structure of haemoglobin with a diagram. Write one point of difference between 'R form' and 'T form' of haemoglobin. (2+1)+2
- Describe briefly the significance of oxygen dissociation curve with diagram. 3+2
- Write short notes on (a) Carbon monoxide poisoning. 5

UNIT-3: Physiology of Circulation:

1. Discuss the process of erythropoiesis. 5
2. Name any two blood clotting factor. 2
3. S. N on - ABO blood group. 5
4. Describe the structure of haemoglobin with a diagram. Write one point of difference between 'R form' and 'T form' of haemoglobin. (2+1)+2
5. Describe the mechanism of blood clotting with a flowchart. 5
6. Briefly describe the genetic and biochemical basis of ABO blood group system in Human. 3+2
7. What is haematopoiesis? Describe the stages involved in formation of neutrophil. 2+3

UNIT-4-Physiology of heart:

8. Define stroke volume. 2
9. What is pace-maker of human heart? 2
10. What is cardiac output? State the factors that regulate cardiac output. Explain 'Iso-volumetric contraction period'. 1+2+2
11. S. N on - Cardiac Cycle. 5
12. Mention the characteristic features of coronary circulation. What is called "The pacemaker of heart" and why? 2+1+2
13.

UNIT-5- Thermoregulation & Osmoregulation:

1. What is osmoregulation? Describe the methods of osmoregulation in marine fishes. 1+4
2. Discuss the role of brown fat and counter-current heat exchanger system in thermoregulation of polar bear. 2½+2½

3. What is a counter current multiplier system? State the role of vasa recta in counter current mechanism. 2+3
4. What is brown fat? 2
5. Describe the method of osmoregulation in catadromous fish. 4
6. Write two significances of osmoregulation. 2
7. Distinguish between homeotherm and poikilotherm with example. 3
8. Describe the process of temperature regulation in camel. 5
9. Counter-current mechanism. (S N) 5
10. What is osmoconformer? 2
11. Write S. N. on –(a) Chloride cells, (b) Rectal gland and (c) salt gland 3X3=9
12. Comment on the neuro-endocrine regulation in osmoregulation. 4

UNIT-6- Renal Physiology:

1. What is ultrafiltration? Name the factors that regulate glomerular ultrafiltration. 3+2
2. Write short notes on - JGA. 2½
3. Distinguish between Cortical and Juxta-medullary nephron. 2
4. Mention the role of ADH in urine formation. 3
5. Add a note on the role of hypothalamus in controlling ADH production. 2

CC10

Paper : CC-10 (Immunology)

Unit-4-Immunoglobulins:

1. Define antigen presenting cell. Give examples. 1+1
2. What is the difference between antigenicity and immunogenicity? 2
3. Briefly explain 'agglutination' and 'precipitation' reactions. 3
4. Briefly describe principle and method of sandwich ELISA. Enumerate the different applications of ELISA. 3+2
5. Distinguish between monoclonal and polyclonal antibody. Describe the process of monoclonal antibody production. 1+4
6. Write down the principle of RIA. Write a short note on competitive ELISA. 2+3
7. Distinguish between Primary and Secondary Antigen-Antibody interaction. 2
8. What is the basic difference between RIA & ELISA? 2
9. S.N. on -- Affinity and avidity of antibody. 5
10.

1. Mention the primary lymphoid organs and state their functions in immunology. State the location and function of thymus. 3+2
2. Distinguish between CD4+ and CD8+ cells. 2+3
3. Differentiate between Humoral immunity and cell-mediated immunity. (1+1)+3
4. What do you mean by isotype and allotype? 3
5. Describe the structure of an immunoglobulin monomer with an appropriate labelled diagram. 3½+1½

6. What is hypersensitivity reaction? How does Type I hypersensitivity reaction differ from Type II hypersensitivity reaction? 2+3
7. What are cytokines? Mention the source and major functions of IL-2 and TNF-α. 1+(2+2)
10. What is adjuvant? Explain the chemical composition of any two adjuvants. Explain the role of adjuvants in vaccine. 1+2+2
11. Describe the structure of a T Cell receptor with suitable labelled diagram. 3½+1½
12. What is MHC? Distinguish between class I and class II MHC molecules. 1+4
15. Write short notes on (any two): 2½×2
(a) Macrophage
(b) Acquired immunity
(c) ITAM
(d) Alternate complement pathway.

What is opsonization?
How many polypeptide chains make up MHC-I class molecule.
What is hypervariable region of immunoglobulin? Mate its significance.
What is GALT and CALT?
Mention the biological functions of complements
State two function of eosinophils
Define lymphokines.
What are NK Cells?
Vaccines:
What is a vaccine? Distinguish between active and passive immunization. 2+3
Differentiate between live attenuated vaccine and subunit vaccine. Give examples. 2+2
What do you mean by passive immunization?

CC11

Unit-1-Introduction to Ecology:

1. What is synecology? 2
2. What is 'Autecology'? 2
3. Define Ecological Efficiency. 2
4. How does temperature act as limiting factor in animals? 3

Unit-2- Population:

1. What do you mean by the term 'biotic potential'? 2
2. What is species richness? 2
3. Define survivorship curves. 2
4. What do you mean by 'potential natality'? 2
5. What is 'ecological pyramid'? Energy flow pyramid is always true pyramid. — Explain. 2+3
6. Elucidate the phases of S-shaped population growth form citing an animal population model. 5
7. Draw a Y-shaped energy flow model and describe its components to show flow of energy in ecosystem. 5
8. What is population dispersal? 2

9. Distinguish between r-selected and K-selected species. What is species evenness? 3+2
10. Distinguish between 'dependent' and 'Density Independent' factors of population regulation. 3
11. Write importance of detritus food chain. What do you mean by 'Eltonian Pyramid'? 2½+2½
12. Distinguish between the following: 2x2
    a) Density dependent and Density independent growth regulation.
    b) Dispersal and Dispersion.
13.
    a) A record of survey in 2018 reveals that a *Tylototriton* sp. population was composed of 800 individuals. 35 new were born and 10 were died during that year. Calculate the population growth rate for that year.
    b) Why logistic growth model in a population more realistic?
    c) Draw the population growth curve of prey population when there is no predator. 4+3+3
14. (a) Ina laboratory condition two different species of *Paramoecium* are grown in the same medium. It was found that one of species dies in the presence of other in the medium.
    (i) Identify the species of *Paramoecium* grown in the medium.
    (ii) What could be the probable cause for such finding?
    (b) Describe the Y-shaped model of energy flow.
    (c) What do you mean by fecundity? 4+4+2
15. (a) A bacterial colony becomes double in 2 hours. Find the reproductive rate of the bacteria. [Given : log, 2 = 0.3010) 3
16. What do you mean by modular population? 2
17. What are age pyramids? Draw the age pyramids and comment on the basis of the given data :

Age group	Populations		
	I	II	III
Pre-reproductive →	900	900	300
Reproductive →	600	800	800
Post-reproductive →	300	300	400

1+6

Unit-3- Community:

1. What do you mean by 'ecesis'? 2
2. What is ecological equivalent? Give one example. 1+1
3. What is edge effect? 2
4. What do you mean by closed community? 2
5. Give two features of k-selected species. 1+1
6. What is protocooperation? 2
7. Write full form of NPP and GPP. 1+1
8. What do you mean by Climax Community? 2
9. What is Lotka—Volterra competition model? What are the three basic assumptions of the Lotka—Volterra model? 3+2

10. Define community. Explain vertical stratification of a community with example. What is Population dispersion? 2+2+1
11. Explain the richness and abundance components of Shanon—Weiner species diversity index. 2.5+2.5
12. (h) Write short notes on the following (any two): $2^1/_2$
    (i) Competitive co-existence
    (ii) Gause's principle
    (iii) Mutualism
    (iv) Ecotype.
13. How does major community differ from minor community? 2
14. What is Niche overlap? 1
15. The human survivorship curve is highly convex. — Explain. What is Carrying capacity? 3+2
16. What is biotic potential? Distinguish between specific mortality and ecological mortality. 2+3
17. Differentiate Primary and Secondary succession. How succession categorize on the basis of nutritional and energy contents? 2+3
18. What is Allen's rule? 2
19. What is ecological efficiency? 2
20. What do you mean by life table? 2
    c) Distinguish between- Ecotone and Edge effect. 2
21. Write short notes on: each $2^1/_2$ X 3
    (a) Lotka-Volterra equation for competition
    (b) Competitive coexistence
    (c) Vertical stratification.
22. Which of the following community is richer and more diverse? Justify your answer.

	Sp A	Sp B	Sp C
Community I	50	50	50
Community II	99	1	0

3

Unit-4- Ecosystem:

1. Define solar flux and solar constant. 1+1
2. What do you mean by 'turnover rate' in ecosystem? 2
3. Write the primary role of decomposers in ecology. 2
4. What do you mean by functional food web in ecosystem? 2
5. Name two nitrogen fixing bacteria. 1+1
6. What is meant by 'Primary Productivity' of an Ecosystem?
7. What is meant by Ecophene and Ecotype? Compare the role of Grager and Decomposer in an Ecosystem. 2+3
8. Define photoautotroph and chemoautotroph. Elaborate how light and water regulate net primary production in an ecosystem. 2+3
9. Mention the significance of life tables. Explain 'Inverted Pyramid'. 2+3
10. Distinguish between the following: 2x2
    a) DFC and GFC (Detritus food chain and Grazing food chain)

b) Nitrification and Denitrification

Unit-5- Applied Ecology:

1. What do you mean by biodiversity hotspots? 2
2. Define keystone species with example. 1+1
3. Mention the names and locations of any two tiger reserves in West Bengal. 1+1
4. What do you mean by 'Agenda 21'? 2
5. Write definition of 'Sanctuary' and 'National Park'. 1+1
6. What is a flagship species? Cite example. 1+1
7. Define ex-situ conservation with suitable example. 1+1
8. Explain why are India considered as one of the megadiversity countries. State the importance of megadiversity countries. 3+2
9. Write short notes on- Red data book
10. What is Umbrella Species? 1
11. Define in-situ conservation with suitable example. (1+1)
12. Comment on Biosphere Reserve. 2
13. What do you mean by 'Biodiversity Hotspot'? 2
14. What do you mean by Vulnerable and Endangered species? Give example of each. Name one 'Vavilov centre of plant origin' in India. 1+1+1+1+1
15. Compare between 'Flagship' and 'Keystone' species. What is 'Red data book'? Name one 'Bird Sanctuary' in India. 2+2+1
16. What is corridor in ecosystem? Write the advantages and problems of Ecosystem corridor. 1+2+2
17. Why India is a mega-diversity country? 2
18. What is 'Flagship species'? Give one example. 1+1
19. Name two hotspots of India. 2
20. Why is beaver a keystone species? 2
21. Name one mammal and one bird belonging to schedule IV. 1+1
22. Write short notes on: Importance of biodiversity $2^1/_2$
23. Which one is better ex situ or in situ conservation? Justify your answer. 4
24. List the threats to olive ridley turtle. 3
25. What are the aims / objectives of Wildlife Protection Act? 5

CC12

CC-12- (Principle of Genetics)

UNIT-1-(CCF)-Chromosome:

- Explain the higher order chromatin packaging with suitable diagram. 4

Structural Organization of Chromosomes

2 Marks (Remember & Understand)

1. Define a chromosome.
2. What are histones, and what role do they play in chromosome structure?
3. Differentiate between euchromatin and heterochromatin.
4. Name the major components of a nucleosome.
5. What is the significance of the centromere in a chromosome?

3 Marks (Apply & Analyze)

1. Explain the structure of the nucleosome and its role in chromosomal packaging.
2. Describe how chromatin is condensed into a metaphase chromosome.
3. Compare the structure and function of euchromatin and heterochromatin.
4. Discuss the importance of telomeres in maintaining chromosomal stability.
5. Analyze the role of scaffold proteins in the organization of metaphase chromosomes.

5 Marks (Evaluate & Create)

1. Evaluate the hierarchical organization of chromosomal structure, from DNA to metaphase chromosome, with a diagram.
2. Compare the structural and functional differences between prokaryotic and eukaryotic chromosomes.
3. Analyze the role of chromosomal organization in regulating gene expression and maintaining genomic integrity.
4. Design a labeled diagram to represent the structure of a typical eukaryotic chromosome and explain each component.
5. Critically evaluate the significance of chromosomal organization in evolutionary biology.

Polytene, Lampbrush, and Satellite Chromosomes

2 Marks (Remember & Understand)

1. What are polytene chromosomes?
2. Name the species in which lampbrush chromosomes are commonly found.
3. Define satellite DNA and its significance.

3 Marks (Apply & Analyze)

1. Explain the significance of polytene chromosomes in genetic studies.
2. Discuss the structural characteristics of lampbrush chromosomes.
3. Differentiate between primary and secondary constrictions in satellite chromosomes.

5 Marks (Evaluate & Create)

1. Compare the functional roles of polytene and lampbrush chromosomes.
2. Analyze the structural adaptations of satellite chromosomes and their role in chromosomal stability.
3. Illustrate and label the structural features of a polytene chromosome.

Human Karyotyping

2 Marks (Remember & Understand)

- Define karyotyping.
- What is the normal karyotype of a human male and female?
- Name two genetic disorders that can be identified through karyotyping.

3 Marks (Apply & Analyze)

- Explain the procedure of human karyotyping.
- Discuss the clinical importance of karyotyping in prenatal diagnosis.
- Differentiate between G-banding and C-banding techniques in karyotyping.

5 Marks (Evaluate & Create)

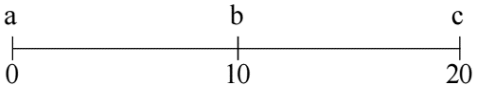
- Evaluate the role of karyotyping in identifying chromosomal abnormalities.
- Analyze the implications of karyotypic changes in Down syndrome and Turner syndrome.
- Create a hypothetical scenario where karyotyping helps diagnose a genetic disorder and explain the findings.

Unit-1: Mendelian Genetics and its Extension:

1. Define Multiple alleles and Pseudoallele. [2021] 1.5+1.5
2. When a gene is said to be epistatic? What is the difference between epistasis and dominance? [2020] 2
3. What is Incomplete Dominance and Codominance? Give examples of both. [2020] 2+2
4. What is criss-cross pattern of inheritance? [2020] 2
5. ABO blood grouping is an example of multiple alleles but MN blood grouping is not. — Why? [2020] 2
6. What is isoallele? Give example. [2020] 2
7. Which is called a pleiotropic gene? Give example. [2020] 2
8. What are pseudoalleles? Give example. 2
9. Penetrance and Expressivity (S. N.) 3
10. Epistasia (S. N.) 3

Unit-2-Linkage, Crossing Over and Linkage Mapping:

1. (a) What is the probability of producing haemophilic and normal offsprings if a carrier haemophilic female marries with a normal male? Explain with proper genetic cross. (b) Distinguish between sex linked traits and sex influenced traits. 3+2
2. The following is a linkage map for three recessive genes located in the same chromosome measured in percentage recombination frequencies :



If the coefficient of coincidence (CC) is 0.6 in this case, determine the frequencies of phenotypes expected among 1000 offsprings of a cross abc/ABC × abc/abc. 5

3. A *Drosophila* female heterozygous for the sex-linked recessive traits a, b and c were crossed to a male which was phenotypically a b c. The cross yielded following progeny phenotypes :

+ b c –	450
a + + –	450
a b c –	32
+ + + –	38
a + c –	11
+ b + –	9

(a) Find out the genotype of the female parent.
(b) Determine correct gene order.
(c) Construct a linkage map of a, b, c.
(d) Which progeny phenotypes are missing? Explain their absence. 2+2+4+(1+1)

4. Differentiate between Complete and Incomplete linkage. 2
Interference and coincidence S. N.) 3
Haemophilia. (S. N.) 3
4. Explain the pattern of sex linkage in *Drosophila* with special reference to white Eye locus. 5
5. Write down the characteristic features, one each of 'Haemophilia A', 'Haemophilia B' and 'Haemophila C'. What is Holandric gene? 3+2

Unit-3-Mutations:

- What are the direct and indirect effects of ionizing radiation? 2
- What is tandem duplication? 2
- Give one example each for nullisomy and trisomy in human. 2
- Tautomerism 2
- Non-disjunction of chromosome 21 in human 3
- Differentiate 'Euploidy' and 'Aneuploidy'. 2
- Distinguish between spontaneous mutation and induced mutation. Name some common chemical mutagens which are used to induce mutation. What are the direct and indirect effects of non-ionizing radiation on mutations? 1+1+3
- Distinguish between Autopolyploidy and Allopolyploidy. 2
- What are Base analogs? Give two examples. 2
- What are nutritional mutant? Give example. 2
- What is Attached X-method? How it is used in Drosophila to detect sex linked visible mutation? 2+3
- What is Prototroph and Auxotroph? Describe the steps of detection of biochemical mutation in *Neurospora* through suitable diagram. 2+3
- Frame Shift Mutation 2
- Distinguish between Meiotic-I and Meiotic-II non-disjunction. Diagrammatically explain the formation of trisomy 21 from either meiosis-I or meiosis-II non-disjunction. 2+3
- "Inversions are often called Crossover Suppressors." — Explain. 2
- Robertsonian Translocation. 2
- Bar Eye mutation in Drosophila sp. is an ideal example of chromosomal duplication. — Explain. 5

Unit-4- Sex Determination:

Role of 'XIC' in dosage compensation in human females. 3

1. As per the theory of genic balance given by Calvin Bridges, mention the expected sex of the
2. individuals with chromosome constitution as given below: (i) 3X: 3A, (ii) 2X: 3A, (iii) 3X: 2A, (iv) 1X: 2A. Justify your answer. 4
3. State the role of Numerator and Denominator elements during sex determination in Drosophila. 5
4. Comment on the role of MSL Protein in Dosage compensation of Drosophila with suitable illustration. 5
5. What is Testicular feminization? How a mosaic XX/XO human can be formed? 2+3
6.

Unit-5-Extra-chromosomal Inheritance:

1. How is extra-chromosomal inheritance manifested in shell spiralling of snail? 5
2. Write short notes on-Dextral and Sinistral coiling. 2½
3. What is Kappa Particles? Explain the phenomenon of inheritance of Kappa particles in *Paramoecium*. 1+4
4. Write down the salient features of kappa particles in *Paramoecium* sp. 2
5. Explain the transmission of kappa particles during short duration and long duration conjugation in *Paramoecium* sp. with suitable diagrams. 4

Unit-6-Genetic Fine Structure:

- What do you mean by cis-trans test? 2

- Why Benzer selected rll locus for complementation study? 2
- Explain 'complementation' in the light of Benzer's rlI locus experiment. 4
- Why Benzer selected rII locus for complementation text? (b) Discuss briefly the experiment of Benzer to differentiate between complementation and Recombination. 1+4
- What is the characteristic feature of r mutant of T4 bacteriophage used in Benzer's experiment? 2
- What is complementation test and why it is used? 2
- What is Cistron? Explain the phenomenon of complementation with special reference to Benzer's rII locus. 1+4

Unit-7-Transposable Genetic Elements:

- What are LINEs and SINEs? 2
- Alu elements 3
- IS element 3
- Transposable genetic element functions on Enhancer.— Justify 3

UNIT-8-(CCF)-Quantitative Genetics:

Concept of Quantitative Traits

2 Marks (Remember & Understand)

1. Define quantitative traits with examples.
2. Differentiate between qualitative and quantitative traits.
3. Give an example of a quantitative trait in plants and explain its significance.

3 Marks (Apply & Analyze)

1. Explain how kernel color in wheat demonstrates quantitative inheritance.
2. Analyze the factors contributing to ear length variation in corn.
3. Compare the inheritance patterns of qualitative and quantitative traits.

5 Marks (Evaluate & Create)

1. Evaluate the importance of studying quantitative traits in plant breeding.
2. Analyze how environmental factors influence the expression of quantitative traits with examples.
3. Create a diagrammatic representation of the inheritance of kernel color in wheat and explain the phenotypic ratio.

Polygenic Inheritance

2 Marks (Remember & Understand)

1. Define polygenic inheritance.
2. Name two examples of polygenic traits in humans.
3. How is polygenic inheritance different from monogenic inheritance?

3 Marks (Apply & Analyze)

1. Explain the concept of polygenic inheritance using human skin color as an example.
2. Discuss the role of multiple alleles in determining polygenic traits.
3. Analyze the significance of additive and non-additive gene effects in polygenic inheritance.

5 Marks (Evaluate & Create)

1. Evaluate the contribution of polygenic inheritance in shaping population diversity.
2. Analyze the role of polygenic traits in agricultural productivity and crop improvement.

3. Design a hypothetical experiment to study polygenic inheritance in corn ear length.

Heritability – Concept and Types

2 Marks (Remember & Understand)

1. What is heritability?
2. Differentiate between broad sense and narrow sense heritability.
3. Give an example of a trait with high heritability.

3 Marks (Apply & Analyze)

1. Explain the significance of broad sense heritability in plant and animal breeding.
2. Discuss how narrow sense heritability influences the response to selection.
3. Analyze the relationship between heritability and environmental variance.

5 Marks (Evaluate & Create)

1. Evaluate the importance of heritability in predicting the outcome of breeding programs.
2. Analyze the methods used to estimate heritability and discuss their limitations.
3. Design an experiment to calculate the narrow sense heritability of a quantitative trait in a crop species.

CC13

Unint-1-Early Embryonic Development

a. Gametogenesis: Spermatogenesis, Oogenesis (sea urchin & mammal)

- Define spermiogenesis. 2
- Mention the role of Sertoli cells in spermatogenesis. 2
- Give an account of growth phase of oogenesis. 5
- Briefly describe about spermiogenesis process with suitable diagram. 3+2

b. Types of eggs, Egg membranes

- Mention the types of egg on the basis of distribution of yolk. 2
- What is primary egg membrane? What is yolk plug? 2+1
- Distinguish between: Macrolecithal and mesolecithal egg. 2½

c. Fertilization in sea urchin and mammal

- Write a note on prevention of polyspermy during fertilization of sea urchin. 5
- Amphimixis (SN). 2.5
- What is acrosome reaction? Briefly describe the cortical granule reaction. 1+4
- What is sperm capacitation? Mention major molecular changes occur in mammalian sperm capacitation. 1+4

d. Planes and patterns of cleavage

- Describe various planes of cleavage with suitable diagram and example. 5
- Differentiate between meroblastic and holoblastic cleavage. 2

e. Types of Blastula [frog and chick]

f. Fate map in chick embryo, fate mapping using vital dye and radioactive technique

- Fate map in chick embryo (SN). 2.5
- What do you mean by vital dye marking? Draw and describe the fate map of chick blastula. 1½+2½
- Fate map in chick embryo 2.5
-

g. Gastrulation in frog and chick

- Discuss the role of dorsal lip of blastopore during gastrulation of frog. 5
- Distinguish between: Invagination and epiboly 2½
- Mention the importance of primitive streak. 3
- Regression of primitive streak in chick. 3
- Describe the process of primitive streak formation in chick. 5

h. Embryonic induction and organizers in Xenopus (Spemann & Mangold's experiment)

- Explain the process of primary induction in light of Spemann and Mangold's experiment. 5
- State the major functions of organizer. What is evocator? 4+1
- What is Nieuwkoopcentre? 2

Unint-2-Late Embryonic Development:

a. Extra-embryonic membranes in Chick;

- What is sero-amniotic raphe? 2
- Functions of amnion and chorion of chick (SN). 2.5
- State the process of formation of allantois. Mention the function of amnion. 3+2

b. Implantation of embryo in humans,

- What are the differences between cytotrophoblast and syncytotrophoblast? 2

c. Placenta (Structure, types and functions of placenta)

- Mention different histological layers found in human placenta. 2
- Define decidua basalis, zonary placenta and cotyledenous placenta. 3
- Give an account of types of placenta in mammals depending on maternal and fetal tissues with examples. 5

Unit-3- Post Embryonic Development:

a. Development of brain in Chick. Molecular Induction in Brain and Eye development.

- State the role of noggin in embryogenesis. 2
- Draw and describe the neural tube formation in chick embryo. 2+3
- Give an illustrative account on the formation of compartments in vertebrate brain. 5
- Write down the inductive events that govern the development of brain in chick. 3
- What is neuralation? How it occurs in animals? 2+2

b. Development of Eye in Chick. Molecular Induction in Brain and Eye development.

- Write the process of optic cup and lens formation in chick embryo. Explain secondary induction with example. What is ingression? 6+2+2
- Briefly describe the process of optic cup formation in chick embryo and comment on induction for lens formation. 3+2
-

Unit-4-Implications of Developmental Biology:

a. *In vitro* fertilization (IVF),

- Distinguish between non-permeating and permeating CPAs.

- Mention the steps involved in embryo transfer. 3
- State the advantages and disadvantages of in vitro fertilization. 2
- Cryopreservation of spermatozoa (SN) 2.5
- What do you mean by in vitro fertilization? What is intra-cytoplasmic-sperm transfer? 2½+2½

c. Stem cell: Concept of potency, types, markers and applications of stem cell therapy in bone marrow transplantation and cartilage regeneration

- Define differentiation. 2
- Differentiate between totipotent and pluripotent embryonic stem cell. 2
- State the properties of stem cells. How stem cells help in bone marrow transplantation? Mention name of two stem cell markers. 4+4+2
- State the important properties of stem cells. What are embryonic stem cells? 3+2

CC14

Unit	Topic
1.	Origin of Life (Chemical basis), RNA world hypothesis **Questions:** 1. Briefly describe Urey and Miller's experiment and observations. What was the conclusion drawn from the experiment? 4+1 2. Explain the RNA world hypothesis 3 3. Why RNA is called first nucleic acid? 2 4. What is coacervate? State its significance. 3 5. State the hypothesis of 'Oparin-Haldane" to explain the pre-biotic condition of origin of life. 4 6. List the amino acids derived from Millers experiment. 2 7. Briefly describe the formation of different micro molecules on the primitive e earth surface. 4 8. Comment on spontaneous generation concept of origin of life. 3 9. What is cosmozoic theory of origin of life? 3 10. What was the structure of primitive earth? 4 11. Briefly describe the formation of different macro molecules on the primitive e earth surface. 4 12. What is juvenile water? 2 13. What do you mean by hot-dilute soup? Sate its significance. 2+1 14. State the reactions that took place to form amino acids during pre-biotic atmosphere. 5 15. State the composition of pre-biotic atmosphere. 2 16. State the sources of sugar, nitrogen base and phosphate to form nucleic acids in pre-biotic atmosphere. 4
2.	Historical review of Evolutionary concepts: Lamarkism, Darwinism and Neo Darwinism **Questions:** 1. Write briefly on the postulates of Neo-Darwinism. 5 2. Explain Lamarck's theory of evolution with suitable examples. Discuss its present status. 4+2 3. "Survival of the fittest" – explain wherein does the fitness of life. 4

	4. What is the justification of the statement made by Ernst Mayr that "Lamarck has a better claim to be designated as the founder of the theory of evolution"? 4 5. Explain very brief the main augments in support of evolution by natural selection, given by Charles Darwin. What is Neo- Darwinian synthesis? 4+2 6. Fundamentals of Lamarckian concept of evolution. 4 7. Discuss the modern concept of Lamarckian theory with necessary comments and evidences. 6 8. Discuss the basic process of synthetic theory of evolution. 4 9. Drawbacks of Darwinian concept of evolution. 3 10. Define Darwinian fitness? 2
3.	Geological time scale, Fossil: types and age determination by Carbon dating, Evolution of horse **Questions:** 1. What is geological time scale? What period is called the 'age of fishes' and why? 2+3 2. State the characteristic features of any two of the following : 2½+2½ (a) Eohippus (b) Merychippus (c) Pliohippus. 3. Write a short note on the different types of fossils. 5 4. Tabulate the period of Paleozoic Era in a chronological order with a special note on their faunal appearance. 5 5. What are the requisites in the application of the term 'Fossil'? 3 6. Tabulate the epochs of Tertiary periods mentioning the span. 2 7. What are the limitations of radiocarbon dating of a fossil? 3 8. Describe the techniques of fossil dating. 3 9. Tabulate the epochs of Coenozoic era mentioning the span. 2 10. Different modes of fossilization. 5 11. Write in brief the progressive structural changes in the evolution of horse and comment on their significance. 4+2 12. Narrate the importance of Eocene period. 2 13. Write a note on different types of fossils. 4 14. Write a note on significances of fossils. 4 15. Distinguish between transitional versus ancestral fossils. 2 16.
4.	Natural Selection: Modes with Examples **Questions:** 1. Explain the terms stabilizing and disruptive selection with examples. 5 2. Selection can be directional or stabilizing or disruptive – explain. 4
5.	**Species concept, Isolating mechanisms, modes of speciation; Speciation by chromosome rearrangement in *Drosophila*. Adaptive radiation/macroevolution (exemplified by Galapagos finches).** **Questions:** 1. Write briefly on any two of the following : $2½ \times 2^{1}/_{2}$ (a) Hybrid breakdown (b) Convergent evolution (c) Chromosome evolution in *Drosophila* 2. What is meant by Darwinian fitness? 2 3. Briefly narrate the process of species formation by chromosome rearrangements taking example from *Drosophila.* 3 4. What is biological species concept? Comment on its limitation. 2+3 5. Comment on founder effect. 3

	6. Distinguish with example sympatric and allopatric speciation. 5 7. Write a short note on ecological and ethological isolating mechanisms. 5 8. Define isolating mechanism. Briefly describe different types of prezygotic isolating mechanism with suitable example. 1+5 9. Adaptive radiation in Galapagos finches. 4 10. What is adaptive radiation? State the causes of adaptive radiation. Comment on the adaptive radiation that has occurred in Darwin's finches. 1+2+2 11. Distinguish between adaptive radiation and animal dispersal. 2 12. Explain Allopatric speciation. How does it differ from sympatric speciation? 4+2 13. What is parapatric speciation? 2 14. What is index fossil? 2 15. What is adaptive convergence? Give one example. 2
6.	Origin and Evolution of Man, Unique Hominid characteristics contrasted with primate characteristic **Questions:** 1. State the trend in changes of skull structures in hominid evolution. 5 2. What are the characteristic features of *Homo sapiens*? Trace the ancestry of man and discuss the traditional forms in human evolution. 2+4 3. Define MAN. List the significant traits which made human being a MAN. 2+2 4. Considering the significant biological changes involved in the evolution of man, give a generalised account of human ancestry. 6 5. State four primate characters. 2 6. Mention two important hominid characters that are unique to man. 2 7. Distinguish between Modern Man and Modern Apes 3
7.	**Population genetics:** Hardy-Weinberg Law; factors disrupting H-W equilibrium (Genetic Drift, Migration and Mutation and Selection in changing allele frequencies (only derivations required). Simple problems related to estimation of allelic and gene frequencies. **Questions:** **1.** What is Hardy-Weinberg Equilibrium? How does mutation influence Hardy-Weinberg equilibrium? 2+3 **2.**
8.	Extinction, back ground and mass extinctions, detailed example of K-T extinction **Questions:** 1. What is meant by mass extinction? With example explain causes of K-T extinction. 2+3 2. State the significance Cretaceous- Tertiary (K-T) boundary. 2 3.
9.	Phylogenetic trees, construction and interpretation of Phylogenetic tree using parsimony, convergent and divergent evolution. **Questions:** 1. What is adaptive radiation? State the causes of adaptive radiation. Comment on the adaptive radiation that has occurred in Darwin's finches. 1+2+2 2. Are adaptive radiation and dispersal of animals synonymous? Give reason to explain. 2 3. Explain the term "operational taxonomic unit (OTU). 2 4. State the reasons for adaptive radiation of metatherian mammals in Australian realm. 3 5. Explain how genetic diversity is related to phonetic diversity? 3 6. What are plsiomorphic and apomorphic characters? 2 7. Distinguish between cladogram and phenogram. 2 8. Discuss the principle and merits of Cladistics classification. 4 9.

ZOOA-DSE -A2. Biology of Insects

Unit-3-Physiology of Insects: Digestive system

1) What is peritrophic membrane? Where do you found and what are its function? If it is damaged or lost somehow - what will happen? (Bsc. 2020) 1+1+1.5+1.5

2.Name two digestive enzymes of insect. (B.Sc 2020) 2

3.What is Cryptonephridia? What are its significance?(B.sc 2020) 3+2

4. Mention the function of salivary gland and crop in insect during digestion.(B. sc. 2020) 2.5+2.5

5. What is filter chamber ? what are evolutionary significance of it? 2+3

6. What do you mean by intrinsic and extrinsic enzymes? 2+2

7. Role of PH in the digestion of insects.3

8. What is extra-oral or extra-intestinal or non-intestinal digestion? 3

9. Role of microbes in the digestion of insects. 4

Unit-3-Physiology of Insects: Respiratory system

1. How aquatic insect respire? - discuss citing with suitable example. Draw a labelled schematic diagram of insect spiracle. (3+2)

2. Describe briefly the tracheal system in terrestrial insects. 5

3. How does a terrestrial insect respire? 5

Unit-3-Physiology of Insects: Endocrine system - Metamorphosis

1. What are neurosecretary cell in insects? Mention the function of hormones secreted by corpora allelata and Prothoracic gland.(1+2+2)

2. State the function of Barsicon hormone.(2)

3. Briefly describe the endocrine regulation in metamorphosis of insects.(5)

Unit-3-Physiology of Insects: Nervous system

1.Draw a schematic structure of stomatogastric nervous system of an insect with proper labeling. what are its function.[4+1]

2. Define Protocerebrum, deuterocerebrum and tritocerebrum. 2+2+2

Unit-3-Physiology of Insects: Photoreceptor

1. Draw and ultra structure of insects compound eye and mention the function of rhabdome. [B.sc 2021] 4+1

2. Compare apposition and superposition image formation in insects. [B.sc 2020] 5

3. What are the types of omatidia found in insects. 2.5

4. Explain the mechanism of superposition image formation and mention the advantage of such images.

5. What is pseudocone and exocone ommatia ? Give examples. 2+2

6. State the function of Semper Cells. 2

Unit-4- Insect Society:

1. What do you mean by eusociality?how does it differ from pseudosociality? Discuss Colony Optimization theory in social insect.[1+1+3]

2. Write a short note on evolutionary significance of trophallaxis.[5]

3. Describe different castes of a termite colony and there function.[3+2]

Unit-5-Insect Plant Interaction:

1. How do you identify Adult female of *Scirpophaga incertulus*?
2.Give two examples of marker.
3. Describe briefly on host recognition and plant acceptance by phytophagous insects.
4. Explain theory of Co-evolution. 3
5. Life cycle, damage and control measures of Gandi bug or *Hispa armigera .(*3+1+1)

Unit-2: General Morphology of Insects: Thorax

1. What is tagmina and haltere?
2. What is stridulatory apparatus? What is its function?
3. What is saltatorial leg.[2020]
4. Write a short note on Raptorial and Natatorial legs. 2.5+2.5
5. Short note on wing venation? 5

Unit-2: General Morphology of Insects: Abdominal appendages

1. Mention briefly different parts of male and female genitalia in insects. [B.sc 2020] 2.5+2.5
2. Draw a comparative schematic diagram of genital structures for both male and female insects. Why genital structure are considered as taxonomic tool? [B.sc 2021] 3.5+1.5
3. Name pregenital abdominal appendages found in insects. discuss the functions of each of them. [M.sc 2006] 2+3
4. Describe briefly the structural organisation of female genitalia. [M.sc 2006] 5
5. Name post genital abdominal appendages found in insects mention the functions of each of them. 2+3

Unit-2: General Morphology of Insects: Head

1. Draw and ultra structure of insects compound eye and mention the function of rhabdome. [B.sc 2021] 4+1
2. Antenna structure are diverse in insects communities. How antenna structure could be useful in insect classification. 3+2
3. Compare apposition and superposition image formation in insects. [B.sc 2020] 5
4. Describe the structure of a typical antenna with examples. [M.sc 2006] 5
5. What are different type of antenna found in insects. 5
6. What are the types of omatidia found in insects. 2.5
7. Explain the mechanism of superposition image formation and mention the advantage of such images.
8. What is opisthognathous head. 2
9. Based on mouth parts structure how to use differentiate Lapidopteran, Dipteran and Orthopteran insects. 5
10. What is Johnston's organ?

DSE-A3

Unit	Topic
10.	**Introduction:** Organization of *E. coli* and *Drosophila* genome. **Questions:** ➢
11.	**Molecular Techniques in Gene manipulation: Questions:** Restriction endonucleases: ➢ Name one Restriction enzyme and Mention its site 2 ➢ Restriction endonucleases and their types. $2^1/_2$ ➢ What do you mean by 'blunt' and 'staggered' cut? Define Neo-schizomer and Isoschizomer with examples. 2+2+1 ➢ Advantages of use of linker over adaptor. $2^1/_2$ ➢ Type II restriction endonuclease. $2^1/_2$ Cloning Vectors & their features: ➢ What are phagemid? 2 ➢ What is expression vector? Cite an example. 1+1 ➢ What is BAC? 1 ➢ Describe the configuration of YAC with a sketch. 3 ➢ How plasmid differs from cosmid? Mention the advantages of using bacteriophages as vectors. 2+1 ➢ Describe the basic features of pBR322 vector. How does it differ from pUC vectors? 3+2 ➢ What is HAC (Human Artificial Chromosome)? What is shuttle vector? 2+3 Construction of Genomic libraries and cDNA libraries: ➢ What is chimera? Mention the advantages of cDNA library. (2+3) ➢ What is the difference between a genomic library and a cDNA library? Discuss the process of cDNA library formation with a neat diagram. 1+4 Transformation techniques: Agarose and Polyacrylamide Gel Electrophoresis, Southern, Northern and Western blotting ➢ Write short Notes on Western Blot. 2.5 ➢ What is the principle of gel electrophoresis? What is the significance of addition of SDS and beta-marcapto-ethanol/DTT in sample buffer of SDS PAGE? 2+1+2 ➢ State the differences between southern and northern blotting. Mention applications of Southern blot in forensic science. 3+2 ➢ Give the significance of Etbr und DNA marker in agarose gel-electrophoresis. 2 ➢ What is blocking? State its significance in Western blot. (2+3) ➢ S. N. on -PAGE. $2^1/_2$ ➢ Western Blot. $2^1/_2$ ➢ Polymerase chain reaction: ➢ Mention the source of Taq Pol and state one of its drawbacks. 2 ➢ What is allele specific PCR (AS-PCR) ? 2 ➢ State the applications of RAPD. 2

	➢ Mention the importance of Primer in PCR. 2 ➢ State the difference between conventional PCR and RT-PCR. What are the advantages of using real time PCR over conventional PCR? (3+2) ➢ Mention the principle of RT PCR. Write the advantages and disadvantages of RAPD. 2+3 ➢ What is the use of Allele specific PCR? Write the applications of DNA Fingerprinting. 2+3 ➢
12.	**Genetically Modified Organisms:** 17. Write short Notes on – (a) Knock-out mice preparation, (b) DNA microinjection 2.5 x2= 5 18. Mention the key steps associated with the cloning of animals by nuclear transplantation. 5 19. Comment of use of transgenic animal in pharmaceutical products. 2
13.	

DSE-B3 -Module Questions

Unit-1- Patterns of Behaviour:

2022:

- What is sign stimulus? 2
- Mention two differences between kinesis and taxis. 2
- What is habituation? How instinctive behaviour differs from learning behaviour? Give suitable examples. (b) What is classical conditioning? What are its significances? [2+(3+2)+(1+2)]
- S. N. on – Geotaxis. 5
- S. N. on – FAP 5

2021:

- What do you mean by operant conditioning? Give example. Distinguish between habituation and sensitization with suitable example. (2+1)+2
- What is the difference between 'motivation' and 'drive'? Explain 'taxis' and 'kinesis' with suitable examples. 2+3
- What is the difference between 'motivation' and 'drive'? Explain 'taxis' and 'kinesis' with suitable examples. 2+3
- What is imprinting? Elaborate the concept of sexual imprinting with example. 2+3
- What is thermotaxis? 2
- Comment on classical conditioning. 2
- What do you mean by imprinting? 2
- Distinguish between orthokinesis and klinokinesis. 2
- What is operant conditioning? Give example. State its significance. Distinguish between habituation and sensitization with suitable example. What do you mean by zeitgeber?
  (2+1+2)+3+2
- How sign stimulus plays specific role in FAP? Describe with suitable example. 3+2
- What do you mean by stereotyped behaviour? 2

Unit-2-Social and Sexual Behaviour

i. Social Organization:

- What do you mean by eusociality? 2
- What is nuptial flight? 2
- What is social organisation? Write characteristics of macropterous, brachypterous and apterous forms of termites. How new termite colony is established? 1+(2+2+2) +3
- Briefly describe caste system in a termite colony. 5
- State the characteristic features of eusocial insects. 2
- Write notes on two of the following: 5

(a) Significance of sterile castes in a termite colony.

- State the characteristic features of eusocial insects. 2

ii. Social Communication:

- Describe waggle dance in honey bee. 3
- Comment on function of 'queen pheromone' in honeybee colony. 3
- How pheromones control the social behaviour of honey bee? 4
- What is dance-language hypothesis? Explain the dance phenomenon and its significance with example. 2+4
- Comment on role of pheromones in communication of honey bees. 3

iii. Social behaviour:

- What do you mean by reciprocal altruism? Discuss with suitable example. 2+3
- Justify altruistic behaviour in haplo-diploid insects. 3
- What is selfishness? Give one example of selfishness in animal kingdom. Comment on its adaptive significance. 2+1+2
- Hamilton's rule (S. N.). $2^1/_2$
- What is "Hamilton's rule? 2
- Reciprocal altruism (S. N.). $2^1/_2$

iv. Sexual Behaviour:

- What do you mean by "sexual dimorphism? How does it control the mate choice in peacock? What is intrasexual selection? How it is exhibited in male-male competition? - Elaborate with relevant example. 2+3+2+3
- Define polygyny with example. 2
- Discuss with suitable example intrasexual and intersexual selection in the light of 'male-male competition' and 'female choice'. 2½+2½

v. Kinship theory:

- How the 'reproductive fitness' and inclusive fitness' get influenced by parent offspring conflict? 3
- What is kin selection? Wite down its adaptive significance. (2+3)

vi. Parental care in fishes:

- Brod pouching and viviparity can be considered as examples of parental care in fishes. - Elaborate with relevant examples. 3+3
- Draw and describe the nest building behaviour of any five fishes. 5

vii. Conflict within families:

- Sibling rivalry. (S. N.). $2^1/_2$
- What is parent offspring conflict? How the 'reproductive fitness' and inclusive fitness' get influenced by this? 2+3
- What is sibling rivalry? Give two examples. State its significance. 2+2+1

Unit-3-Chronobiology & Biological Rhythm:

1. Discuss with suitable diagram the role of Supra Chiasmatic Nucleus in maintenance of circadian rhythm. Give one example of circadian rhythm in human and an invertebrate animal. 3+2
2. Write short notes on: 2½
    a) Zeitgeber
    b) Entrainment
    c) Zugunruhe
    d) Adaptive significance of biological clock.
3. Comment on endocrine control of bird migration. Discuss the adaptive significance of bird migration. 3+2
4. What is phase shift in the study of biological rhythm? Define lunar periodicity. 2+2
5. Circadian rhythm is also regulated by external cues -explain with example. 3
6. What do you mean by the term amplitude in the study of circadian rhythm? Differentiate between photic and non-photic zeitgebers. 2+2
7. Discuss the role of melatonin in the maintenance of circadian rhythm. 4

2017
(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
8. Write notes on two of the following: 5x2
(b) Reciprocal altruism hypothesis.
(c) Role of male fish in parental care.

2018(b) Discuss parent-offspring conflict in relation to cost-benefit ratio. 4

8. Write notes on : 5x2
(a) Fixed Action Pattern (FAP)
(b) Active and passive avoidance learning.

DSE-B4

Unit-1-Introduction and Classification:

- Classify class Osteichthyes (upto subclass) mentioning two characteristics and one example of each taxon. 5
- State modifications of mouth structure of fishes depending on their feeding habitat at different water levels. How does relative length of gut (RLG) value indicate feeding habit of fishes? 3+2

Unit-2-

- Name the types of median fins found in fishes with their location on the body. What do you mean by homocercal and heterocercal caudal fin? 3+2
- Differentiate between cycloid and ctenoid scales. How scales are used to determine the age of a fish? 3+2

- Distinguish between physostomous and physoclistous types of swim-bladders. Write the role of swim-bladder as a hydrostatic organ. 3+2
- What is the function of electric organ in fishes? Write a short note on bioluminescence in fishes. 2+3

Unit-3-

- Distinguish between gill net and drag net. Name any two types of fishing craft used in West Bengal. 3+2
- State any three differences between inland and marine fisheries. How GIS technology has improved fishing yield? 3+2
- Briefly discuss the reasons behind depletion of fisheries resources in India. 5

Unit-4-

- Differentiate between intensive and semi-intensive system of fish culture. What are pen culture and cage culture? 3+2
- Write the method for selection and segregation of brood stock in an aquaculture farm. 5
- Elaborate the steps of hypophysation during induced breeding of carps (**details**). 5
- How water quality is important for preparation of aquarium? Name two fish preservation techniques. 3+2
- Write the name of causal organism, two symptoms and preventive measure of one bacterial and one viral disease of fish. 2½+2½
- What are the advantages of composite fish culture? State the importance of isinglass as fishery by-product. What is transgenic fish? 2+2+1
- What is isinglass? State its use.
- Composite fish culture is superior than monoculture- justify the statement. State the role of exotic carps in composite carps culture. 3+2
- Argulosis in fish. 3
- What is hapa? State difference between breeding hapa and hatching hapa. 2
- State criteria of exotic carps usually considered during introduction in India. 2
-

Unit-5-

- Transgenic fish Zebra fish is a god model organism in developmental and genetic research -justify. 5