

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5973

Unique Paper Code : 2232521201

Name of the Paper : Cell and Development Biology of Animals

Name of the Course : B.Sc. (P) Life Sciences

Semester : II

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Draw well labelled diagrams wherever required.

Attempt *four* questions in all, including

Question No. 1 which is compulsory.

All parts of a question to be attempted together.

1. (a) Define the following terms (any *four*) :

4

(i) Capacitation

(ii) Tight junctions

(iii) Gastrulation

(iv) Fate maps

(v) Epigenesis.

P.T.O.

- (b) Differentiate between (any *three*) : 6
- (i) Meiosis and Mitosis
 - (ii) Spermatist and Ovist
 - (iii) Gastrula and Neurula
 - (iv) Autocrine and Paracrine signaling.
- (c) Name the germ layers from which the following are derived : 5
- (i) Lung
 - (ii) Brain
 - (iii) Pancreas
 - (iv) Liver
 - (v) Kidney.
2. (a) Describe the process of spermatogenesis in mammals with the help of well labelled diagrams. 10
- (b) Add a note on morphogenetic movements. 5
3. (a) Describe the major morphological and physiological changes during metamorphosis in amphibians. Give a detailed account of hormonal regulation of metamorphosis in amphibian. 10
- (b) Briefly describe cortical reaction and its role in blocking polyspermy. 5

4. (a) What is the importance of checkpoints in cell cycle ? Give an account of the role of various Cdk-Cyclins during cell cycle regulation. 10
- (b) Explain how Prophase I is different from Prophase II. What do you understand by reductional division ? 5
5. (a) Describe Gastrulation in chick. What is the importance of primitive streak and Hensen's node ? 10
- (b) Describe the different types of tissues and their roles in the body. 5
6. Write short notes on any *three* of the following : 5,5,5
- (a) Planes and pattern of cleavage
- (b) Extra embryonic membrane in birds
- (c) Types of Egg
- (d) Von-Baer Laws.

This question paper contains 4 printed pages]

Roll No.

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S. No. of Question Paper : 5294

Unique Paper Code : 3184001001

Name of the Paper : Concepts in Biotechnology

Name of the Course : B.Sc. (Hons.) Biomedical Science

Semester : II/IV

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all.

Question No. 1 is compulsory.

Give illustrations and examples wherever required.

Subparts of the questions should be attempted together.

1. (a) Define the following (any five) : 5×2=10

(i) Palindromic sequences

(ii) Blotting

(iii) Ori C

(iv) Adapters

(v) Probe

(vi) Tracking dye.

P.T.O.

(b) State True or False and justify (any four) : 4×2=8

- (i) Ethanol precipitation is preferred over isopropanol precipitation in the process of plasmid DNA isolation.
- (ii) In agarose gel electrophoresis, DNA fragments move towards the cathode.
- (iii) Restriction enzymes often work as exonucleases.
- (iv) cDNA libraries represent the expressed part of an organism's genome.
- (v) Vectors always contain a promoter sequence to initiate gene expression

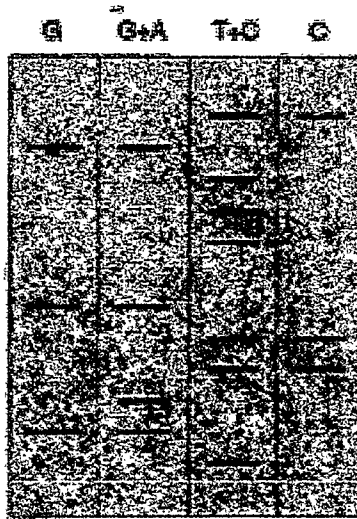
2. (a) Differentiate between the following (any three) : 3×3=9

- (i) Western and Southern hybridization
- (ii) Genomic DNA library and cDNA library
- (iii) Native and SDS-PAGE
- (iv) Colony and plaque hybridization.

(b) Write short notes on (any three) : 3×3=9

- (i) Restriction Enzymes
- (ii) Agarose gel electrophoresis
- (iii) Multiplex PCR
- (iv) Blue/white screening.

3. (a) The autoradiogram obtained after sequencing of a template strand is shown below. Elaborate in detail the method that has been used for sequencing. Also give the sequence of the template strand explaining how you obtained it. 9



- (b) Explain how gene cloning techniques are being applied for the production of recombinant pharmaceuticals, with a suitable example. 9
4. (a) Detail the structure and function of an expression vector. List the challenges encountered while using *E. coli* as the host for recombinant protein synthesis. 6
- (b) Plasmid pRIT453 was cut with *Sma*I, *Hind*III, and *Eco*RI. From the data given below, determine the restriction map : 6

<i>Eco</i> RI	7.7	1.6		
<i>Hind</i> III	7.4	1.9		
<i>Eco</i> RI + <i>Hind</i> III	4.5	1.9	1.6	1.3

- (c) What does "GMOs" stand for ? Give *two* examples. Discuss the biosafety concerns related to their use. 6
5. (a) What is Gene therapy ? Give a detailed account of the first successful gene therapy. Discuss the ethical concerns associated with it. 9
- (b) Explain in detail the technique of DNA profiling with the help of a diagram. 9
6. (a) Compare and contrast the features of agarose gel electrophoresis with that of polyacrylamide gel electrophoresis. 9
- (b) Give a brief account of different vectors used for cloning of a DNA fragment. 9

9101

Unique Paper Code : 2234001205
 Name of the Paper : Economic Zoology, GE-3
 Name of the Course : B.Sc. (H) Zoology, June/July 2025
 Semester : II (NEP-UGCF) / IV
 Duration : 2 Hours
 Maximum Marks: 60

Instruction for the candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all.
3. **Question No.1** is compulsory.
4. Draw well labelled diagrams wherever required.

SET-B

Q1. (a) Define any **four** of the following terms: (4x1=4)

- (i) Nacre
- (ii) Supersedure
- (iii) Mountage
- (iv) Integrated aquaculture
- (v) Parasitoid

(b) Match the items in column A with the items in column B (5)

<u>Column A</u>	<u>Column B</u>
(i) <i>Ichthyophthirius multifiliis</i>	Honeybee
(ii) <i>Bombyx mori</i>	Sugarcane pest
(iii) <i>Pyrilla perpusilla</i>	Fish parasite
(iv) <i>Apis mellifera</i>	Mulberry tree
(v) <i>Morus alba</i>	Silk moth

(c) Distinguish between any **three** of the following: (3x2=6)

- (i) Bee bread and Royal jelly
- (ii) Mulberry and Non-mulberry sericulture
- (iii) Indigenous and Modern methods of honey extraction
- (iv) Spat and Cultch

Q2. (a) What are the different types of physical and biological control strategies that are used for the management of insect pests? (8)

(b) How are pearls cultured on a commercial scale? (7)

Q3. (a) Describe the symptoms of some common fish diseases. How can these diseases be controlled or treated? (8)

(b) What are the various products of the apiculture industry? Discuss their uses for both honeybees and humans. (7)

Q4. How are mulberry silkworms reared for the production of silk? Which silk is often referred to as the 'Ahimsa silk' and why? Briefly describe the silkworm associated with ahimsa silk. (8 +2+5)

Q5. Provide a detailed account on the maintenance of aquariums. Add a short note on the importance and scope of aquaculture. (10)

(b) Explain the structure of composite fish culture with suitable examples. (5)

Q6. Write short notes on any **three** of the following: (5+5+5)

- (a) Edible oyster culture
- (b) *Leptocorisa acuta*
- (c) Composite fish culture
- (d) Langstroth beehive

Hotson

Society

Parsons

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5454

Unique Paper Code : 2234002004

Name of the Paper : Exploring Animal World

Name of the Course : Zoology : Generic Elective for Honours

Semester : II

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. 1 is compulsory and attempt *three* questions remaining.

Substantiate your answer with diagrams wherever necessary.

1. (a) Define the following (any *four*) :

4×1=4

(i) Nacre

(ii) Monocondylic

(iii) Osculum

(iv) Moulting

(v) Perching

P.T.O.

(b) Differentiate between the following (any *four*) : $4 \times 2 = 8$

(i) Platyhelminths and Nemathehelminths

(ii) Schizocoelomate and Enterocoelomate

(iii) Cilia and Flagella

(iv) Catadromous and Anadromous

(v) Polyp and Medusa.

(c) Give the location and its function in an organism (any *three*) : $3 \times 1 = 3$

(i) Nematocysts

(ii) Spiracle

(iii) Choanocytes

(iv) Symsacrum.

2. (a) Explain water vascular system in starfish with a diagram. 9,6

(b) Write the general characters of arthropods.

3. (a) What is compound eye ? Explain vision in arthropods. 9,6

(b) Briefly explain the pearl formation.

4. (a) Describe the flight adaptations in Aves. 9,6

(b) Write the key for identification of poisonous and non-poisonous snakes.

5. Write short notes on the following (any *three*) :

5,5,5 . .

- (a) Adaptations in amphibians for the terrestrial life
- (b) Parasitic adaptations in Platyhelminthes
- (c) Metamersim in Annelids
- (d) General characters of Mammals.

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5809

Unique Paper Code : 2232011202

Name of the Paper : DSC : Fundamentals of Biomolecules

Name of the Course : B.Sc. (Hons.) Zoology

Semester : II (NEP-UGCF)

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt four questions in all.

Q. No. 1 is compulsory.

1. (a) Define the following (any four) :

4×1=4

(i) Enantiomer

(ii) Mutarotation

(iii) Plasmalogens

(iv) Holoenzyme

(v) Amphipathy

(b) Distinguish between (any four) :

4×2=8

(i) Reducing and Non-reducing sugar

(ii) O-glycosidic linkage and N-glycosidic linkage

P.T.O.

- (iii) Syn and anti-conformations
- (iv) Essential and Non-essential amino acids
- (v) Saturated and Unsaturated fatty acids.
- (c) Draw the chemical structures (any *three*) : 3×1=3
 - (i) Lactose
 - (ii) Hyaluronic acid
 - (iii) Adenine
 - (iv) Cholesterol
 - (v) Leucine.
- 2. (a) Describe Watson and Crick model of double helical structure of DNA using a well-labelled diagram. 10
(b) Describe *two* previous studies that formed the basis of double helical structure of DNA proposed by Watson and Crick. 5
- 3. (a) Derive the Michaelis-Menten equation of enzyme kinetics. 9
(b) What are bi-substrate reactions ? Give their types with example. 6
- 4. (a) What are structural lipids ? What are different types of structural lipids ? 9
(b) A structural biologist is analyzing the polysaccharide starch, which is composed of amylose and amylopectin.
 - (i) Draw the structure of amylose and amylopectin and explain how they differ from each other. 3

- (ii) How do the differences in the glycosidic linkages between glucose units in starch and cellulose affect their functions in living organisms ? 3
5. (a) What are the various levels of organization of protein structures ? Describe in detail. 10
- (b) Describe the forces responsible for maintaining the tertiary structure of proteins. 5
6. Write short notes on the following (any *three*) : 3×5=15
- (a) Structural polysaccharides
 - (b) Enzyme inhibition
 - (c) Structure of *t*-RNA
 - (d) Ramachandran plot
 - (e) Classification of amino acids.

This question paper contains 4 printed pages].

Roll No.

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S. No. of Question Paper : 5829

Unique Paper Code : 2232011203

Name of the Paper : Human Physiology-Control and Coordination
Systems/Discipline Specific Core-6

Name of the Course : B.Sc. (H) Zoology

Semester : II (NEP-UGCF)

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

~~Attempt four~~ questions in all.

Question No. 1 is compulsory

Draw well labelled diagram wherever necessary.

1. (a) Define the following (any four) :

4

- (i) Enteric plexuses
- (ii) Second messenger
- (iii) Andrology
- (iv) Aponeurosis
- (v) Spermiation.

P.T.O.

(b) Differentiate between the following :

4

(i) IPSP and EPSP

(ii) Sertoli and Leydig cells.

(c) Fill in the blanks :

2

(i) cells of pancreatic islet secrete insulin.

(ii) A is a bundle of axon located in the central nervous system.

(d) Expand the following abbreviation :

2

(i) PNS

(ii) ACh

(iii) GAGs

(iv) TBG

(e) Give the location and function of the following :

3

(i) Acrosome

(ii) Chromaffin cells

(iii) Cremaster muscle

2. (a) Discuss the events involved in excitation-contraction coupling cycle. 8
- (b) Give an account on microscopic organization of skeletal muscle. 7
3. (a) Discuss the concept of summation of graded potential. How does generation of action potentials take place using different types of voltage gated channels ? 9
- (b) Compare graded potential with action potential in neuron. 6
4. (a) Describe the process of spermatogenesis and differentiate it with oogenesis. 8
- (b) Write a note on hormonal control of testicular function. 7
5. (a) Describe the mechanism of action of peptide hormone with a suitable example. 7
- (b) Name the various hormones secreted by anterior pituitary with their functions. How is the hormonal secretion regulated ? 8

6. Write short notes on any *three* :

3×5=15

- (a) Implantation
- (b) Rigor mortis
- (c) Blood-testis barrier
- (d) Structure of neuron
- (e) Motor unit.

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5448

Unique Paper Code : 2234001201

Name of the Paper : GE : Lifestyle Disorders

Name of the Course : GE Zoology

Semester : II (NEP-UGCF)

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt four questions in all.

Question No. 1 is compulsory.

All questions carry equal marks.

1. (a) Define the following (any five) :

5×1=5

- (i) Hypoglycemia
- (ii) Metastasis
- (iii) Gestational diabetes
- (iv) PCOD
- (v) Meditation
- (vi) Blood pressure.

P.T.O.

(b) Differentiate between the following (any *three*) :

3×2=6

- (i) NSCLC and SCLC
- (ii) PUFA and MUFA
- (iii) Benign and Malignant tumour
- (iv) Electrocardiograph and echocardiograph

(c) Expand the terms (any *four*) :

4×1=4

- (i) NPHCE
- (ii) CAD
- (iii) KFT
- (iv) BMI
- (v) MRI.

2. (a) What role do proper diet and exercise have in our overall well-being ?

Write a short note on the health problems associated with improper diet and lack of physical exercise. 9

(b) What do you understand by the term 'alcohol abuse' ? Give a detailed account on its ill effects on human health. 6

3. (a) Enumerate the differences between Type I and Type II Diabetes. 6

(b) How is blood glucose regulated in our body ? Describe the complications of paediatric and adolescent diabetes. 9

4. Give an account of the causes, effects and control of cardiovascular diseases. 15
5. (a) Describe the symptoms of mouth cancer and enumerate the lifestyle choices that have been associated with mouth cancer. What are the therapeutic approaches that are used for treating mouth cancer ? 10
- (b) What are risk factors of Hypertension ? What are the medications used to control Hypertension ? 5
6. Write short notes on (any *three*) : 3×5=15
- (i) Yoga and its role in health
 - (ii) Diagnostic techniques for cancer
 - (iii) Sleep disorder and its health effect
 - (iv) Management of hypertension.

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5789

Unique Paper Code : 2232011201

Name of the Paper : Non-chordata : Coelomates

Name of the Course : B.Sc. (H) Zoology-UGCF

Semester : II

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any four questions in all.

Question No. 1 is compulsory.

Attempt various parts of question at one place only.

Draw well labelled diagrams wherever necessary.

1. (i) Define the following (any three) : 3
 - (a) Eusociality
 - (b) Cephalization
 - (c) Evisceration
 - (d) Adaptive gills.
- (ii) Differentiate between the following (any three) : 6
 - (b) Atoky and Epitoky
 - (b) Monopectinate and Bipectinate gills

P.T.O.

(c) Apposition and Superposition image

(d) Enterocoelomates and Schizocoelomates

(iii) Name an organism in which the following structures are present. Write one function of each (any three) : 3

(a) Radula

(b) Aristotle's lantern

(c) Dermal papillae

(d) Book lungs.

(iv) Give the generic name of the following and classify up to classes (any three) : 3

(a) King crab

(b) Sea mica

(c) Brittle star

(d) Peacock worm.

2. (a) Describe the different organs of excretion present in oligochaetes. Draw well labelled diagrams. 8

(b) Write the theories of metamerism in annelida. 7

3. (a) Give an account of social life in honeybees. 6

(b) Describe how insects have evolved various respiratory structures and adapted themselves to thrive in diverse environments. 9

4. Describe the phenomenon of torsion in gastropods. Write its significance and supporting theories. 15
5. (a) Explain the ambulacral system in asteroids with the help of a well labelled diagram. 10
(b) Briefly discuss the pulmonary respiration in molluscs. 5
6. Write short notes on the following (any *three*) : 15
 - (a) Evolutionary significance of *Peripatus*
 - (b) Pearl formation in bivalves
 - (c) Trochophore larva
 - (d) Metamorphosis in insects.

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5679

Unique Paper Code : 2232012403

Name of the Paper : DSC : Animal Behaviour

Name of the Course : B.Sc. (H) Zoology

Semester : IV (NEP-UGCF)

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any four questions in all including Question No. 1

which is compulsory.

1. (a) Define any four of the following terms :

4×1=4

- (i) Ethogram
- (ii) Inclusive Fitness
- (iii) Mnemotaxis
- (iv) Latent Learning
- (v) Polyphenism
- (vi) Alloparental behavior.

P.T.O.

(b) Distinguish between any *three* of the following : 3×2=6

- (i) Orthokinesis and Klinokinesis
- (ii) Hormone and Pheromone
- (iii) Intersexual and Intrasexual selection
- (iv) Eusocial and Subsocial species
- (v) Habituation and Sensitization

(c) Match the following scientists with their contributions : 5×1=5

Column A

Column B

- | | |
|----------------------|---|
| (i) Konrad Lorenz | Communication in bees through waggle dance |
| (ii) Oskar Heinroth | Theories of parental investment and reciprocal altruism |
| (iii) W.D. Hamilton | Innate behaviour patterns |
| (iv) Karl von Frisch | Studied imprinting in birds |
| (v) Robert Trivers | Theory of inclusive fitness and Kin selection |

2. (a) Explain associative learning. Add a note on Skinner's experiment to describe operant conditioning. 8

(b) Classify and explain the orientation behaviour with the help of suitable examples. 7

3. (a) Describe various types of dances performed by forager honeybees. With the help of diagram explain the distance and direction component of waggle dance. 8
- (b) What is stimulus filtering ? With suitable example explain its biological significance. 7
4. What is altruism in animal behaviour ? Explain its different types with examples. Why do some animals exhibit altruistic behaviour despite potential risks to their own survival ? 15
5. Explain the concept of male rivalry in animals. Describe *three* distinct ways in which males compete for mates and briefly discuss the advantages gained by the winning male. 15
6. Write short notes on any *three* of the following : 3×5=15
- (a) Innate behaviour
 - (b) Courtship behavior
 - (c) Imprinting
 - (d) Code breaker
 - (e) Artificial intelligence.

Sr. No. of Question Paper : 5957 ~~2234~~ **Roll No.....**
Unique Paper Code : - 2234 000007
Name of the Paper : GE 11: Animal Cell Biotechnology
Name of the Course : B.Sc. /B.Com. /B.A.
Semester : Semester IV, (NEP-UGCF)
Duration : 2 Hours **Maximum Marks: 60**

Instruction for Candidates

1. Write your Roll No. on the top immediately on the receipt of this question paper.
2. Attempt **four questions** in all, including Question No 1 which is compulsory.
3. Illustrate your answers with appropriate diagrams whenever necessary.

1. (a) Define the following : (5)

- i. Shuttle Vectors
- ii. Transgenesis
- iii. Biological containment
- iv. cDNA library
- v. Insertional inactivation

(b). Differentiate between **any three** of the following: (2X3)

- i. Continuous and Fed batch Fermentation
- ii. Dolly and Polly
- iii. Calcium chloride and Electroporation method of transformation
- iv. Gel filtration and Ion exchange chromatography

(c). Expand the following: (4)

- i. CFU
- ii. VNTR
- iii. MCS
- iv. SCID

- 2 (a) Describe important features of cloning vector. Explain any two types of cloning vectors used in recombinant technology. (10)
- (b) Write an account of DNA modification enzymes used in genetic manipulation. (5)
- 3 (a) Describe the strategy used to produce recombinant human insulin. (8)
- (b) Describe the principle of affinity chromatography. (7)
- 4 (a) Describe the procedure for creating and screening Genomic DNA Library. (8)
- (b) With suitable explain gene therapy and its types. (7)
- 5 Define transgenic animals. Describe any one method of their production. Add a note on their potential applications in human welfare. (15)
- 6 Write short notes on **Any Three** of the following:
- i. Recombinant DNA technology
 - ii. Downstream processing
 - iii. Somatic Cell Nuclear transfer
 - iv. Recombinant vaccines (5,5,5)

3. (a) Classify receptors based on their functions and give examples. (6)
- (b) With the help of labelled diagrams, illustrate the evolution of aortic arches in vertebrates. (9)
4. (a) Discuss the evolution of vertebrate kidney with the help of labelled diagrams. (12)
- (b) What is the name, nature and innervations of VII cranial nerve in mammals? (3)
5. (a) Explain the structure and function of mammalian ear with the help of suitable diagrams. (9)
- (b) Describe the structure of the gills in cartilaginous and bony fishes. (6)
6. Write short notes on **any three** of the following : (3×5=15)
- (i) Fate of first two visceral arches
- (ii) Swim bladder
- (iii) Scales in fishes
- (iv) Male genital ducts

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5540

J

Unique Paper Code : 2232012401

Name of the Paper : DSC – Comparative Anatomy of Vertebrates

Name of the Course : B.Sc. (H) Zoology NEP-UGCF

Semester : IV

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt four questions in all.
3. Question No. 1 is compulsory.
4. Draw well labelled diagrams wherever necessary.

1. (a) Define the following (**any four**) : (4)

(i) Corpus callosum

(ii) Neurocranium

(iii) Craniostyly

(iv) Iter

(v) Carapace

(vi) Holobranch

(b) Differentiate between the following **(any two)** :
(4)

(i) Amphicoelous and heterocoelous centrum

(ii) Uteri duplex and uteri simplex

(iii) Horns and antlers

(iv) Ductus caroticus and ductus arteriosus

(c) Give exact location and function of the following
(any four) : (4)

(i) Fovea centralis

(ii) Spiracle

(iii) Aqueduct of Sylvius

(iv) Jacobson's organ

(v) Helicotrema

(vi) Foramen of panizzae

(d) State whether following statements are True/False
(any three) : (3)

(i) Mammalian skulls have a single temporal fossa.

(ii) The neurocranium of chondrichthyes is well ossified.

(iii) Cerebrospinal fluid is secreted by choroid plexus.

(iv) Post ganglionic fibres of parasympathetic nervous system are adrenergic.

(v) All mammals have seven cervical vertebrae.

2. (a) Briefly discuss the comparative account of stomach in amniotes. (6)

(b) What are the different hard derivatives of epidermis of skin in vertebrates? (9)

This question paper contains 4 printed pages]

Roll No.

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S. No. of Question Paper : 5294

Unique Paper Code : 3184001001

Name of the Paper : Concepts in Biotechnology

Name of the Course : B.Sc. (Hons.) Biomedical Science

Semester : II/IV

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all.

Question No. 1 is compulsory.

Give illustrations and examples wherever required.

Subparts of the questions should be attempted together.

1. (a) Define the following (any *five*) : 5×2=10

(i) Palindromic sequences

(ii) Blotting

(iii) Ori C

(iv) Adapters

(v) Probe

(vi) Tracking dye.

P.T.O.

(b) State True or False and justify (any four) : 4×2=8

- (i) Ethanol precipitation is preferred over isopropanol precipitation in the process of plasmid DNA isolation.
- (ii) In agarose gel electrophoresis, DNA fragments move towards the cathode.
- (iii) Restriction enzymes often work as exonucleases.
- (iv) cDNA libraries represent the expressed part of an organism's genome.
- (v) Vectors always contain a promoter sequence to initiate gene expression

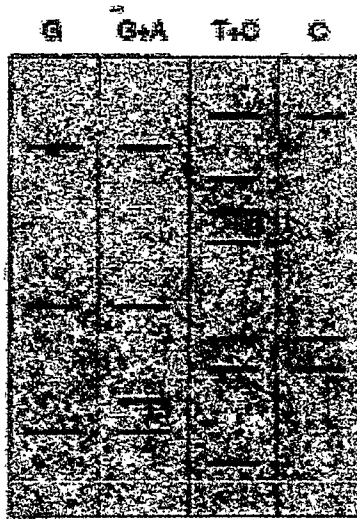
2. (a) Differentiate between the following (any three) : 3×3=9

- (i) Western and Southern hybridization
- (ii) Genomic DNA library and cDNA library
- (iii) Native and SDS-PAGE
- (iv) Colony and plaque hybridization.

(b) Write short notes on (any three) : 3×3=9

- (i) Restriction Enzymes
- (ii) Agarose gel electrophoresis
- (iii) Multiplex PCR
- (iv) Blue/white screening.

3. (a) The autoradiogram obtained after sequencing of a template strand is shown below. Elaborate in detail the method that has been used for sequencing. Also give the sequence of the template strand explaining how you obtained it. 9



- (b) Explain how gene cloning techniques are being applied for the production of recombinant pharmaceuticals, with a suitable example. 9
4. (a) Detail the structure and function of an expression vector. List the challenges encountered while using *E. coli* as the host for recombinant protein synthesis. 6
- (b) Plasmid pRIT453 was cut with *Sma*I, *Hind*III, and *Eco*RI. From the data given below, determine the restriction map : 6

<i>Eco</i> RI	7.7	1.6		
<i>Hind</i> III	7.4	1.9		
<i>Eco</i> RI + <i>Hind</i> III	4.5	1.9	1.6	1.3

- (c) What does "GMOs" stand for ? Give *two* examples. Discuss the biosafety concerns related to their use. 6
5. (a) What is Gene therapy ? Give a detailed account of the first successful gene therapy. Discuss the ethical concerns associated with it. 9
- (b) Explain in detail the technique of DNA profiling with the help of a diagram. 9
6. (a) Compare and contrast the features of agarose gel electrophoresis with that of polyacrylamide gel electrophoresis. 9
- (b) Give a brief account of different vectors used for cloning of a DNA fragment. 9

- (b) Describe the various types of cleavage patterns in animal embryos based on the amount and distribution of yolk. Support your answer with suitable examples. (6)
5. (a) Describe the extra-embryonic membranes in a chick embryo and explain their formation and function. (8)
- (b) Define gastrulation. Illustrate and describe the various morphogenetic movements involved in gastrulation, with specific examples from amphibian embryonic development. (7)
6. Write short notes on **any three** of the following : (3×5=15)
- (a) French Flag Model
- (b) Blocks to polyspermy
- (c) Embryonic stem cells
- (d) Teratogens
- (e) Ageing

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5600

J

Unique Paper Code : 2232012402

Name of the Paper : DSC – Developmental Biology

Name of the Course : **B.Sc. (H) Zoology-UGCF**

Semester : IV – NEP

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
 2. Attempt any **four** questions including Question No. 1 which is compulsory.
 3. Draw well-labelled diagrams wherever necessary.
-
1. (a) Define the following : (4)
 - (i) Primary Organizer
 - (ii) Delamination

5600

2

(iii) Spermateliosis

(iv) Gray crescent

(b) Distinguish between the following (**any two**) :
(2×2=4)

(i) Autonomous and conditional specification

(ii) Hensen's Node and Nieuwkoop Center

(iii) Yolk Sac and Yolk Plug

(c) Match the following : (2)

(i) J.F. Gudematsch a. Phocomelia

(ii) Thalidomide b. Salamander regeneration

(iii) Spallanzani c. Epigenesis

(iv) Caspar Friedrich Wolff d. Amphibian metamorphosis

(d) Expand the following abbreviations : (3)

(i) AGE

(ii) DLHP

(iii) PTTH

(e) Name the germ layer from which each of the following is derived : (2)

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3

(i) Notochord

(ii) Lungs

(iii) Adrenal Cortex

(iv) Lens

2. (a) Describe the process of metamorphosis in amphibians. Explain the role of hormones in regulating this transformation. (8)

(b) What is a fate map? Describe the different techniques used to construct fate maps. Draw a well-labelled fate map of the blastula stage of a frog. (7)

3. (a) Define regeneration. Explain the process of epimorphic regeneration with a suitable example, highlighting the key stages involved. (8)

(b) Discuss the process by which the spermatid transforms into spermatozoa. (7)

4. (a) Define placenta and describe its different types based on morphological and histological criteria with suitable examples. (9)

P.T.O.

- (ii) Paleoendemics and Neoendemics
- (iii) Sciophytes and Heliophytes
- (iv) Natural selection and artificial selection
4. (a) Describe the various types of ecological pyramids?
(5)
- (b) Explain the Y-shaped energy flow model in an ecosystem.
(5)
- (c) Discuss the history of life on earth briefly with appropriate examples.
(5)
5. (a) Define the term Phytogeography. Name the different botanical provinces of India. Give elaborate accounts of any two.
(8)
- (b) What is speciation? Explain the different modes through which speciation occurs.
(7)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5871

J

Unique Paper Code : 2162512401

Name of the Paper : Ecology and Evolution

Name of the Course : **B.Sc. Life Science**

Semester : IV

Duration : 3 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Attempt four questions in all, including question number 1, which is compulsory.
3. All questions carry equal marks.
4. All parts of a question must be answered together.
5. Draw diagrams wherever required.

5871

2

1. (a) Define the following (any five): (1x5=5)

- (i) Ecotone
- (ii) Biome
- (iii) Homology
- (iv) Climax community
- (v) Soil texture
- (vi) Phylogeny

(b) State True/ False for the following statements (any five). (1x5=5)

- (i) The diversification of life on Earth over long periods of time is an example of microevolution.
- (ii) Sister taxa along with their common ancestor forms a clade in the phylogenetic tree.
- (iii) The zone of eluviation is the part of a soil profile where materials like clay particles, humus and salts accumulate from other layers.
- (iv) Competition and predation influence population growth irrespective of population density.

5871

3

(v) Regeneration of forest after land slide is an example of secondary succession.

(c) Match the following: (1x5=5)

- | | |
|--------------------|-----------------|
| (i) Ginkgo biloba | A. Fossil |
| (ii) Orchids | B. Symbiosis |
| (iii) Lichens | C. Phylloclade |
| (iv) Stromatolites | D. Paleoendemic |
| (v) Opuntia | E. Commensal |

2. With the help of well labelled diagrams, explain any three of the following: (5x3=15)

- (i) Soil Profile
- (ii) Survivorship curves
- (iii) Hydrosere
- (iv) Nitrogen cycle

3. Differentiate between the following (any three): (5x3=15)

- (i) Biological species concept and Phylogenetic species concept

P.T.O.

9101

Unique Paper Code : 2234001205
 Name of the Paper : Economic Zoology, GE-3
 Name of the Course : B.Sc. (H) Zoology, June/July 2025
 Semester : II (NEP-UGCF) / IV
 Duration : 2 Hours
 Maximum Marks: 60

Instruction for the candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all.
3. **Question No.1** is compulsory.
4. Draw well labelled diagrams wherever required.

SET-B

Q1. (a) Define any **four** of the following terms: (4x1=4)

- (i) Nacre
- (ii) Supersedure
- (iii) Mountage
- (iv) Integrated aquaculture
- (v) Parasitoid

(b) Match the items in column A with the items in column B (5)

<u>Column A</u>	<u>Column B</u>
(i) <i>Ichthyophthirius multifiliis</i>	Honeybee
(ii) <i>Bombyx mori</i>	Sugarcane pest
(iii) <i>Pyrilla perpusilla</i>	Fish parasite
(iv) <i>Apis mellifera</i>	Mulberry tree
(v) <i>Morus alba</i>	Silk moth

(c) Distinguish between any **three** of the following: (3x2=6)

- (i) Bee bread and Royal jelly
- (ii) Mulberry and Non-mulberry sericulture
- (iii) Indigenous and Modern methods of honey extraction
- (iv) Spat and Cultch

Q2. (a) What are the different types of physical and biological control strategies that are used for the management of insect pests? (8)

(b) How are pearls cultured on a commercial scale? (7)

Q3. (a) Describe the symptoms of some common fish diseases. How can these diseases be controlled or treated? (8)

(b) What are the various products of the apiculture industry? Discuss their uses for both honeybees and humans. (7)

Q4. How are mulberry silkworms reared for the production of silk? Which silk is often referred to as the 'Ahimsa silk' and why? Briefly describe the silkworm associated with ahimsa silk. (8 +2+5)

Q5. Provide a detailed account on the maintenance of aquariums. Add a short note on the importance and scope of aquaculture. (10)

(b) Explain the structure of composite fish culture with suitable examples. (5)

Q6. Write short notes on any **three** of the following: (5+5+5)

- (a) Edible oyster culture
- (b) *Leptocorisa acuta*
- (c) Composite fish culture
- (d) Langstroth beehive

Hotson

Society

Parsons

4. (a) Describe the general characteristics of Class Amphibia. Highlight their adaptations to terrestrial life. (7)
- (b) Distinguish between poisonous and non-poisonous snake based on morphological features. (8)
5. (a) Write the general characteristics of Class Aves, mentioning features that distinguish birds from other vertebrates. (7)
- (b) Compare and contrast the three major subclasses of mammalia (Prototheria, Metatheria and Eutheria). (8)
6. Write short notes on any **three** of the following : (5×3=15)
- (i) Water Vascular System in Echinoderms
 - (ii) Pearls Formation
 - (iii) Parasitic adaptation in Nematelminthes
 - (iv) Metamerism in Annelida

(200)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5174

J

Unique Paper Code : 2234002004

Name of the Paper : GE-8 : Exploring Animal World

Name of the Course : **B.Sc/B.A/B.Com**

Semester : IV/VI

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions including Question no. 1 which is compulsory.
3. Draw diagrams wherever necessary.

P.T.O.

5174

2

1. (a) Define any **five** terms : (5×1=5)

- (i) Polymorphism
- (ii) Proglottids
- (iii) Notochord
- (iv) Urochordata
- (v) Coelom
- (vi) Amoeboid Movement
- (vii) Catadromous

(b) Differentiate between any **three** pairs of terms : (3×2=6)

- (i) Radial Symmetry vs. Bilateral Symmetry
- (ii) Triploblastic vs. Diploblastic Organisms
- (iii) Chordates and Non-chordates
- (iv) Direct Development vs. Indirect Development
- (v) Cephalization vs. Metamerism

5174

3

(c) Match the following. (4×1=4)

Column A **Column B**

- (i) Nephridia (a) Attachment in Tapeworm
- (ii) Book gills (b) Stinging cells in Hydra
- (iii) Scolex (c) Excretion in Annelids
- (iv) Nematocysts (d) Respiration in Horseshoe crab

2. (a) Describe the types of body symmetry found in animals with suitable examples. (7)

(b) Discuss the various types of locomotory organelles found in protozoans with suitable examples. How do these structures aid in movement? (8)

3. (a) List and explain the general characteristics of Phylum Arthropoda. (7)

(b) Explain the canal system in phylum porifera and describe the different types with the help of well label diagram. (8)

P.T.O.

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5918

Unique Paper Code : 2232522401

Name of the Paper : DSC : Fundamentals of Human Physiology

Name of the Course : B.Sc. (Prog.) Life Sciences

Semester : IV (NEP-UGCF)

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any four questions in all, including

Question No. 1 which is compulsory.

All questions carry equal marks.

Draw well labelled diagram wherever necessary.

1. (a) Define the following (any three) : 3

(i) Summation

(iii) Peristalsis

(iii) Chloride Shift

(iv) Spermiation

(b) Differentiate between the following (any three) : 6

(i) Voltage gated and Ligand gated ion channels

(ii) External respiration and Internal respiration

P.T.O.

- (iii) Action Potential and Graded potential
- (iv) Electrical and Chemical Synapse
- (c) Give the location and function of the following (any *three*) : 3
 - (i) G cells
 - (ii) Juxtaglomerular apparatus
 - (iii) Nissls granules
 - (iv) Myomesin
- (d) Expand the following abbreviations (any *three*) : 3
 - (i) IGF
 - (ii) ACE
 - (iii) FEV
 - (iv) EPSP
- 2. (a) Explain the process of origin and propagation of cardiac action potentials. 8
- (b) Diagrammatically explain the sliding filament mechanism of muscle contraction. 7
- 3. (a) Discuss the roles of enzymes involved in the digestion of carbohydrates in the alimentary canal. Also add a note on absorption of carbohydrates. 10
- (b) Explain the role of bile salts in the emulsification of fats. 5

4. (a) Describe the oxygen-hemoglobin dissociation curve. How do various factors affect it ? 8
- (b) Write a short note on the structure and function of Adrenal gland. 7
5. (a) Explain the process of formation of diluted urine. 8
- (b) Elaborate on the Menstrual cycle and discuss its hormonal control. 7
6. Write short notes on any *three* : 3×5=15
- (a) Spermatogenesis
- (b) Structure and function of pituitary gland
- (c) Resting membrane potential
- (d) Pulmonary ventilation.

4888

4

- (b) Giardiasis
- (c) Leprosy
- (d) Non-specific immune response

(200)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4888 J

Unique Paper Code : 2234002005

Name of the Paper : GE: Microbiota: Importance
in Health & Disease

Name of the Course : **B.Sc. (H) Zoology (NEP)**

Semester : IV

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **FOUR** questions in all.
3. Question No. 1 is compulsory.

1. (a) Define the following terms : (1×6 = 6)

(i) Adaptive immunity

P.T.O.

- (ii) Endospore
- (iii) Septicaemia
- (iv) Bioterrorism
- (v) Viroids
- (vi) Probiotics

(b) Distinguish between : (2×3=6)

- (i) Pathogenicity and Virulence
- (ii) Resident flora and Transient flora
- (iii) Probiotics and Prebiotics

(c) Fill in the blanks : (1×3=3)

- (i) _____ are heat stable proteins.
- (ii) Microorganisms living in extreme conditions are called as _____.
- (iii) Moisture content, pH and acidity, nutrient content, Biological structures, redox potential for microbial growth are called as _____ factors.

- 2. (a) Give a detailed account of the various bacterial diseases of the skin. (12)
- (b) Write a short note on Candidiasis. (3)
- 3. Describe in detail the specific immune response against microbial infection. (15)
- 4. Give a brief description of the microbe that causes Cholera. Give a detailed account the symptoms, test, diagnosis, and preventive measures for the disease. (15)
- 5. Give a detailed account of the following diseases. (7.5×2=15)
 - (a) Polio
 - (b) Trypanosomiasis
- 6. Write short note on **any three** : (5×3=15)
 - (a) Gut microbiota

This question paper contains 4 printed pages]

Roll No.

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S. No. of Question Paper : 8063

Unique Paper Code : 2233012008

Name of the Paper : DSE-8, Parasitology

Name of the Course : B.Sc. (H) Zoology (NEP)

Semester : IV, (DSE-8)

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any *five* questions in all, including

Question No. 1, which is compulsory.

1. (i) Explain the following terms :

5×2=10.

(a) Incubation period

(b) Facultative parasite

(c) Schizogony

(d) Strobila

(e) Apolysis.

P.T.O.

- (ii) Match the following terms in the column A with the organism in column B : 5

'A'

'B'

- | | |
|-------------------------|-------------------------------|
| (a) Organ of Berlese | (i) Flea |
| (b) Promotal Comb | (ii) <i>Plasmodium vivax</i> |
| (c) Sporozoite | (iii) <i>Cimexlectularius</i> |
| (d) Oncosphere | (iv) <i>Schistosoma</i> spp |
| (e) Gynaecophoric canal | (v) <i>Taenia solium</i> |

- (iii) Differentiate between any *five* of the following terms : 5×2=10

- (a) Primary host and Secondary host
- (b) Parasite and Host
- (c) Gravid and Mature proglottid
- (d) Epidemic and Endemic disease
- (e) Monogenetic and Digenetic life history
- (f) Head louse and Body louse.

(iv) Write the vector of the following :

5

(1) Cholera

(2) Malaria

(3) Leishmaniasis

(4) Elephantiasis

(5) Plague.

2. What is digenetic life cycle ? Explain it with reference to life history of *Fasciolopsis buski*. 15

3. Explain the life cycle, pathogenicity and control of *Trichinella spiralis*. 15

4. What are the clinical manifestations of *Wuchereria bancrofti* ? How is it transmitted, diagnosed and treated ? 15

5. Discuss in detail about the morphology, life-cycle and pathogenicity of *Trypanosoma gambiense*. 15

6. (i) With the help of a neat and labelled diagram write detailed note on the life cycle of *Xenopsylla cheopis*. 7

(ii) State the habit and habitat of *Xenopsylla cheopis*. Give the medical importance of this insect. 8

7. Write short notes on any *three* of the following :

3×5=15

- (a) *Ascariasis*
- (b) Life cycle of *Entamoeba histolytica*
- (c) Biology of *Pediculus humanus*
- (d) Vampire bat
- (e) Life cycle of *Ascaris lumbricoides*.

This question paper contains **3** printed pages]

Roll No.

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S. No. of Question Paper : **1321**

Unique Paper Code : **32237903**

Name of the Paper : **DSE-Animal Biotechnology**

Name of the Course : **B.Sc. (H) Zoology**

Semester : **VI (CBCS-LOCF)**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all.

Question No. 1 is compulsory.

All questions carry equal marks.

1. (a) Define the following terms :

5×1=5

(i) Nude mice

(ii) Phagemid

(iii) Probes

(iv) SCID

(v) Transgene.

(b) Differentiate between the following :

3×2=6

(i) Isochizomers and Neoschizomers

(ii) YAC and BAC

(iii) Sanger and Next Generation Sequencing.

P.T.O.

(c) Give the reasons for the following : 3×2=6

- (i) Use of competent cells in process of transformation.
- (ii) Fluorescent bands in Agarose gel electrophoresis.
- (iii) Blue colored colonies in blue and white screening.

(d) Expand the following : 5×1=5

- (i) HAT
- (ii) ddNTP
- (iii) RFLP
- (iv) ZNF
- (v) Amp^R.

(e) Write the contribution of the following scientists : 5×1=5

- (i) Alec Jeffreys
- (ii) Herbert Boyer
- (iii) Ian Wilmut
- (iv) He Jiankui
- (v) Neal Burnette.

2. (a) Explain the molecular diagnosis and treatment of any genetic disease.

8

(b) What are the differences between in-vivo and ex-vivo gene therapy ? 4

3. (a) What is Ti plasmid ? Explain, how they can be used for production of herbicide resistant plants ? 6
- (b) Explain the mechanism for the production of Dolly. 6
4. (a) Explain the concept of Restriction and give a detailed note on different types of Restriction enzymes. 6
- (b) Discuss the principle and applications of DNA Fingerprinting. 6
5. (a) Discuss, how the gene editing techniques can be used for production of transgenic animals ? 6
- (b) Explain a mechanism for studying the Gene Expression Profiling in a patient with mutations for a particular disease. 6
6. Write short notes on the following (any *three*) : 3×4=12
- (i) Expression Vectors
- (ii) Western Blotting
- (iii) cDNA Libraries
- (iv) Recombinant Insulin.

This question paper contains **3** printed pages]

Roll No.

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S. No. of Question Paper : **1321**

Unique Paper Code : **32237903**

Name of the Paper : **DSE-Animal Biotechnology**

Name of the Course : **B.Sc. (H) Zoology**

Semester : **VI (CBCS-LOCF)**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all.

Question No. **1** is compulsory.

All questions carry equal marks.

1. (a) Define the following terms :

5×1=5

(i) Nude mice

(ii) Phagemid

(iii) Probes

(iv) SCID

(v) Transgene.

(b) Differentiate between the following :

3×2=6

(i) Isochizomers and Neoschizomers

(ii) YAC and BAC

(iii) Sanger and Next Generation Sequencing.

P.T.O.

(c) Give the reasons for the following : 3×2=6

- (i) Use of competent cells in process of transformation.
- (ii) Fluorescent bands in Agarose gel electrophoresis.
- (iii) Blue colored colonies in blue and white screening.

(d) Expand the following : 5×1=5

- (i) HAT
- (ii) ddNTP
- (iii) RFLP
- (iv) ZNF
- (v) Amp^R.

(e) Write the contribution of the following scientists : 5×1=5

- (i) Alec Jeffreys
- (ii) Herbert Boyer
- (iii) Ian Wilmut
- (iv) He Jiankui
- (v) Neal Burnette.

2. (a) Explain the molecular diagnosis and treatment of any genetic disease.

8

(b) What are the differences between in-vivo and ex-vivo gene therapy ? 4

3. (a) What is Ti plasmid ? Explain, how they can be used for production of herbicide resistant plants ? 6
- (b) Explain the mechanism for the production of Dolly. 6
4. (a) Explain the concept of Restriction and give a detailed note on different types of Restriction enzymes. 6
- (b) Discuss the principle and applications of DNA Fingerprinting. 6
5. (a) Discuss, how the gene editing techniques can be used for production of transgenic animals ? 6
- (b) Explain a mechanism for studying the Gene Expression Profiling in a patient with mutations for a particular disease. 6
6. Write short notes on the following (any *three*) : 3×4=12
- (i) Expression Vectors
- (ii) Western Blotting
- (iii) cDNA Libraries
- (iv) Recombinant Insulin.

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6. Write short notes on any three of the following:
(5×3=15)

- (a) ASO-dot blot assay
- (b) Phage based cloning vectors
- (c) Knock out mice
- (d) Animal cloning

(1000)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5520 J

Unique Paper Code : 2232013601

Name of the Paper : Animal Biotechnology

Name of the Course : B.Sc. (H) Zoology

Semester : VI NEP-UGCF

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Answer any **FOUR** questions including **Question No.1** which is compulsory.

1. (a) Define the following (any three): (3)

(i) Cosmid

(ii) Polylinker

P.T.O.

(iii) Plaque

(iv) Packaging cell line

(b) Differentiate between the following (**any four**):
(8)

(i) Expression vector and cloning vector

(ii) Knockout animal and Transgenic animal

(iii) TALEN and ZFN

(iv) Primer and Probe

(v) BACs and YACS

(c) Mention the contribution of the following scientists
to the field of biotechnology: (4)

(i) Herbert Boyer

(ii) Jennifer Doudna

(iii) Ian Wilmut

(iv) Werner Arber

2. (a) What are restriction enzymes? Describe their types
and their role in genetic engineering with suitable
examples. (8)

(b) Illustrate the colony hybridization method for
screening of Genomic library. (7)

3. (a) Describe CRISPR/Cas9 system as a targeted gene-
editing tool. (8)

(b) What is gene therapy? How can this technique be
employed to treat or prevent a disease? (7)

4. (a) Describe the DNA microinjection method for
production of transgenic animals. Add a note on
the application of these animals in pharmaceutical
industry. (8)

(b) Discuss various transformation techniques that can
be used for introducing foreign DNA into host
cells. (7)

5. (a) Explain the use of PCR-oligonucleotide ligation
assay in diagnosis of cystic fibrosis. (8)

(b) Describe the approach used for production of
Recombinant Insulin in bacterial system. (7)

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 5868

Unique Paper Code : 2232523601

Name of the Paper : Basics of Immunology

Name of the Course : B.Sc. Life Sciences (NEP)

Semester : VI

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt four questions including

Question No. 1 which is compulsory.

Draw well-labelled diagrams wherever necessary.

1. (a) Define the following (any four) :

4×1=4

(i) Granuloma

(ii) Hapten

(iii) Passive immunity

(iv) Anaphylaxis

(v) Autoimmunity

(vi) Opsonin.

P.T.O.

- (b) Differentiate between the following (any *two*) : 2×2=4
- (i) Cell-mediated and humoral immunity
 - (ii) T and B cell epitopes
 - (iii) T helper and T cytotoxic cell.
- (c) Give the immunological significance of the following (any *three*) : 3×1=3
- (i) Interferons
 - (ii) Calnexin
 - (iii) Lysozyme
 - (iv) NK cells.
- (d) Justify the following : 4×1=4
- (i) The secondary immune response is faster and stronger than the primary immune response.
 - (ii) IgM antibody is considered to be effective in agglutination and complement activation.
 - (iii) All antigens are not immunogens.
 - (iv) T cells are said to be self-MHC restricted.
2. (a) Define Immunogenicity. Discuss the various factors that influence the degree of immunogenicity. 7
- (b) Discuss the general structure and biological function of antibody molecules. 8

3. (a) Describe the various types of barriers involved in innate immune responses. 7
- (b) Briefly discuss the attributes of adaptive immunity. Differentiate between primary and secondary immune response. 8
4. (a) Differentiate between structure and function of Class I and Class II MHC molecules. 7
- (b) What is antigen processing and presentation. Illustrate the processing and presentation of exogenous antigens. 8
5. (a) Discuss the properties and functions of cytokines. 7
- (b) Describe types of hypersensitivities on the basis of Gell and Coomb's classification. 8
6. Write short notes on (any *three*) : 3×5=15
- (a) Clonal selection theory
- (b) Vaccines
- (c) Immunodeficiency with suitable examples
- (d) Alternate pathway of complement activation.

- (b) What do you understand by embryonic induction. Explain experiments of embryonic induction on amphibians in detail. (6)
5. (a) What are teratogens? Discuss the effects of teratogens on human embryonic development. (6)
- (b) What is polyspermy? Describe the mechanism of fast block and slow block to polyspermy, respectively? (6)
6. Write short notes on any **three** of the following : (3×4=12)
- (a) Fate maps
- (b) Models of ageing
- (c) In vitro fertilisation
- (d) Regeneration in Salamander limbs
- (e) Amniocentesis

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1315 J

Unique Paper Code : 32231601

Name of the Paper : Developmental Biology

Name of the Course : **B.Sc. (H) Zoology**

Semester : VI (CBCS-LOCF)

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
 2. Attempt **Five** questions in all. Question No. 1 is compulsory.
 3. Attempt **all** the parts of a question together.
1. (a) Define :
 - (i) Vitellogenesis
 - (ii) Window of implantation
 - (iii) Invagination
 - (iv) Decidua
 - (v) Nieuwkoop center

(5)

(b) Differentiate between the following (**any three**) :

- (i) Epigenesis and Preformation
- (ii) Epimorphosis and Morphallaxis
- (iii) Primary neurulation and Secondary neurulation
- (iv) Epitheliochorial and Haemochorial placenta
- (v) Radial cleavage and Spiral Cleavage (9)

(c) Expand the following :

- (i) ROS
- (ii) DES
- (iii) IVF
- (iv) ABC
- (v) JH (5)

(d) Name the germ layers from which each of the following is derived

- (i) Skin
- (ii) Blood
- (iii) Liver
- (iv) Spleen
- (v) Gut (5)

(e) State the major contributions of the following scientists (**any three**) :

- (i) W. Vogt
- (ii) J. F. Gudarnatsch
- (iii) William Roux
- (iv) Hiide Mangold (3)

2. Describe the formation of extra-embryonic membranes in birds. Draw well labelled diagrams. Add a note on significance of each type of extra embryonic membrane. (12)

3. (a) Define gastrulation. With the help of well labelled diagrams describe the formation of gastrula in amphibians. (6)

(b) What is primary organiser? Discuss the experiments that led to the discovery of induction. (5)

(c) Explain the following statement "Of all the tissues of early gastrula only one has its fate determined". (1)

4. (a) Describe the process of spermiogenesis with the help of suitable diagram. (6)

This question paper contains **3** printed pages]

Roll No.

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S. No. of Question Paper : **5550**

Unique Paper Code : **2232013603**

Name of the Paper : **DSC Evolutionary Biology**

Name of the Course : **B.Sc. (Hons.) Zoology**

Semester : **VI NEP-UGCF**

Duration : **2 Hours**

Maximum Marks : **60**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Draw well-labelled diagrams wherever necessary.

Attempt *four* questions in all.

Question No. **1** is compulsory.

1. All parts of this question are compulsory : 15

(a) Define the following : 4

(i) Kin Selection

(ii) Darwinian fitness

(iii) Stromatolites

(iv) Genetic load.

P.T.O.

- (b) Differentiate between the following : 6
- (i) Convergent and Divergent evolution
 - (ii) Allopatric and Sympatric speciation
 - (iii) Inversion and Polyploidy mutations.
- (c) Fill in the blanks with appropriate answers : 5
- (i) In large populations will be the primary micro evolutionary force responsible for changing allele frequencies, while will be prominent in smaller populations often leading to non-adaptive evolution.
 - (ii) Lynn Margulis is credited for the
 - (iii) is the largest extinction in the history of life on earth.
 - (iv) is also commonly referred to as dawn horse.
2. (a) Give a brief description of theory of biochemical origin of life on earth. How were the primary environmental conditions conducive to origin of life on earth ? 7+2
- (b) Comment on the causes and evolutionary consequences of K-T mass extinction. 6
3. (a) Discuss the different ways in which organic variations provide raw material for evolution ? 8

- (b) Describe the various prezygotic isolating mechanism with suitable examples. 7
4. (a) Discuss the salient features of natural selection. Detail their various types with suitable graphs and examples. 3+9
- (b) Elaborate the merits and demerits of biological species concept. 3
5. (a) Tabulate the trends in the evolutionary progression of horse phylogeny with reference to important fossil records. 8
- (b) Explain the various ways in which Genetic drift can operate on populations. 7
6. Write short notes on any *three* of the following : 5,5,5
- (a) *Australopithecus*
- (b) Neutral theory of molecular evolution
- (c) Geological time scale
- (d) Lamarckism
- (e) Adaptive resemblances.

3. (a) Describe various types of natural selection using suitable graphs & examples. (8)
(b) Explain the concept of the molecular clock with an example. (4)
4. (a) Define Hardy-Weinberg equilibrium? State its assumptions. (6)
(b) What are genetic variations? Explain the role of heritable variations in evolution? (6)
5. (a) Discuss the different modes of speciation. (6)
(b) Give a comparative account of various species concepts proposed in evolution. (6)
- 6 (a) Describe the causes and effects of mass extinctions specifying K-T extinction. (6)
(b) Describe various isolating mechanisms with examples. (6)
7. Write short notes (any three): (12)
 - (a) RNA world
 - (b) Human Evolution
 - (c) Adaptive radiation
 - (d) Genetic Drift

(100)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1316

J

Unique Paper Code : 32231602

Name of the Paper : Evolutionary Biology (DSC)

Name of the Course : B.Sc (H) Zoology, 2025
May/June (CBCS-LOCF)

Semester : VI, (DSC) Theory Examination

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Do not write anything on the question paper except your Roll Number.
3. Attempt **FIVE** questions in all. Question Number **ONE** is **COMPULSORY**.

1. (I) Define the following (any five): (5)
 - (a) Chemogeny
 - (b) Endo-symbiotic theory
 - (c) Index fossil

P.T.O.

- (d) Phylogenetic tree
- (e) Artificial selection
- (f) Ring species

(II) Differentiate between (any five) : (10)

- (a) Lamarckism and Darwinism
- (b) Microevolution and macroevolution
- (c) Continuous and Discontinuous variation
- (d) Founder's effect and bottleneck phenomenon
- (e) Homologous and Analogous Organ
- (f) Phyletic gradualism and punctuated equilibrium

(III) Justify the following statements (any two) :

(3)

- (a) RNA world hypothesis is crucial for understanding the origin of life.
- (b) Molecular clocks are essential for studying evolutionary timelines.
- (c) Adaptive radiation leads to biodiversity.

(IV) Contribution of scientists (any five) : (5)

- (a) Charles Darwin

- (b) Jean-Baptiste Lamarck
- (c) Lynn Margulis
- (d) Gregor Mendel
- (e) Alfred Russel Wallace
- (f) Stephen Jay Gould

(V) Fill in the blanks, (any four) : (4)

- (a) _____ was the first fossil in Horse phylogeny.
- (b) In Hardy-Weinberg equilibrium, $p+q =$ _____.
- (c) The K-T extinction event is associated with the extinction of _____.
- (d) The geographical barrier induces _____ speciation.
- (e) _____ is most closely related to humans among primates.

2. (a) Explain the process of fossil formation and the types of fossils with examples. (4)

(b) Discuss the geological time scale and its significance in evolutionary studies. (4)

5560

8

(i) Draw a scatter diagram on graph paper.

(ii) Compute the linear regression equation.

(iii) Predict the length of fish at 9th week.

(2 + 7+1= 10)

6. Write short note on any three

(i) Hypothesis testing

(ii) Confidence Intervals.

(iii) ANOVA

(iv) Applications of Biostatistics in Biological Sciences

(v) Skewness and Kurtosis (5 x 3 = 15)

(1000)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5560

J

Unique Paper Code : 2232013602

Name of the Paper : DSC - Methods in Biostatistics

Name of the Course : B.Sc. (Hons.) Zoology

Semester : VI NEP-UGCF

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Use of simple calculator is allowed.
3. Statistical tables should be provided.
4. Attempt **four** questions in all, including Question No.1 which is compulsory

P.T.O.

1. (a) State whether the following statement is true or false. (1 x 4=4)

(i) Increasing the sample size decreases standard error.

(ii) If $\beta_2 = 4.15$, the given distribution is platykurtic.

(iii) The confidence intervals at 95% significance level are narrower than set at 99% level.

(iv) F distributions are unimodal and skewed to right.

(b) Explain the following symbols (1×5=5)

(i) H_0

(ii) σ^2

(iii) N

(iv) α

(v) p

of 2 cm. Do these data provide sufficient evidence that the population mean of college students is 168 cm. Consider the height of students normally distributed. (Use $\alpha = 0.05$). (5)

5. (a) Define - (2)

(i) Correlation and

(ii) Regression

(b) Calculate the coefficient of correlation (r) when the coefficients of regression are $b_{xy} = 0.3$ and $b_{yx} = 2.7$ (3)

(c) The following data show growth, i.e. increase in length of body of a fish (*Labeo rohita*) in a pond, as a function of time;

Time (weeks) :	1	2	3	4	5	6	7	8
Length (cm) :	5	13	16	23	28	35	40	42

- (b) Immature mice were divided in two groups. One group was injected with 4IU FSH and the other group left as control. The Gonadosomatic index (GSI) was calculated in both the groups and tabulated as follows

Control	4IU
27	89
41	77
30	66
43	79
33	70

Test the hypothesis that FSH injection has significant effect on GSI of mice at 95% significance level. (7)

- (c) The mean height obtained for a sample of 200 college students is 170 cm with standard deviation

- (c) Write the contribution of following scientists in biostatistics (1 x 2=2)

(i) William Sealy Gosset

(ii) Siméon Poisson

- (d) Distinguish between the following: (2 x 2=4)

(i) Type I and Type II errors

(ii) Point estimation and Interval Estimation.

2. (a) Calculate the mean, variance, standard deviation (S.D.) and coefficient of variance (C.V.) from following data. (8)

Class interval	Frequency
1-3	6
4-6	19
7-9	20
10-12	5

- (b) Given below are mean heights and variances of male and female students in a college:

Mean height (cm): male – 170, female- 160
 Variance (cm) : male - 22, female – 12

Find out whether the heights of male or female students are more variable. (4)

- (c) It is known that 30 percent of lentil seeds in a container are infested with *Callosobruchus maculatus*, an insect pest. When 10 seeds are randomly selected from this population, what is the probability that it will contain exactly 4 insect infested seeds? (4)

3. (a) What are the properties of chi square distribution?

Explain main differences between ' χ^2 test of Goodness of Fit' and ' χ^2 test of Independence'. (4)

- (b) In an experiment, a researcher classified 200 fishes according to the sex and the parasitic infection. The data was tabulated as mentioned below,

Sex	Infected	Uninfected
Males	65	45
Females	35	55

Apply appropriate statistical test to justify that parasitic infection is independent of the sex of fish (Take $\alpha = 0.05$). (7)

- (c) The mean length of 9 earthworms collected from a normal population was found to be 15.8 cm with variance 10.3. Find the 95% confidence intervals of mean. (4)

4. (a) Distinguish between one sample and two sample t - tests. (3)

This question paper contains 3 printed pages]

Roll No.

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S. No. of Question Paper : 8059

Unique Paper Code : 2233010017

Name of the Paper : DSE-Research Methodology

Name of the Course : B.Sc. (Hons.) Zoology

Semester : VI (NEP-UGCF)

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all, including Question Number 1,

which is compulsory.

1. (a) Define the following :

5

(i) Research

(ii) Trademark

(iii) Commercialization

(iv) References

(v) Abstract.

(b) Expand the following abbreviations :

5

(i) APA style

(ii) WIPO

(iii) CCSEA

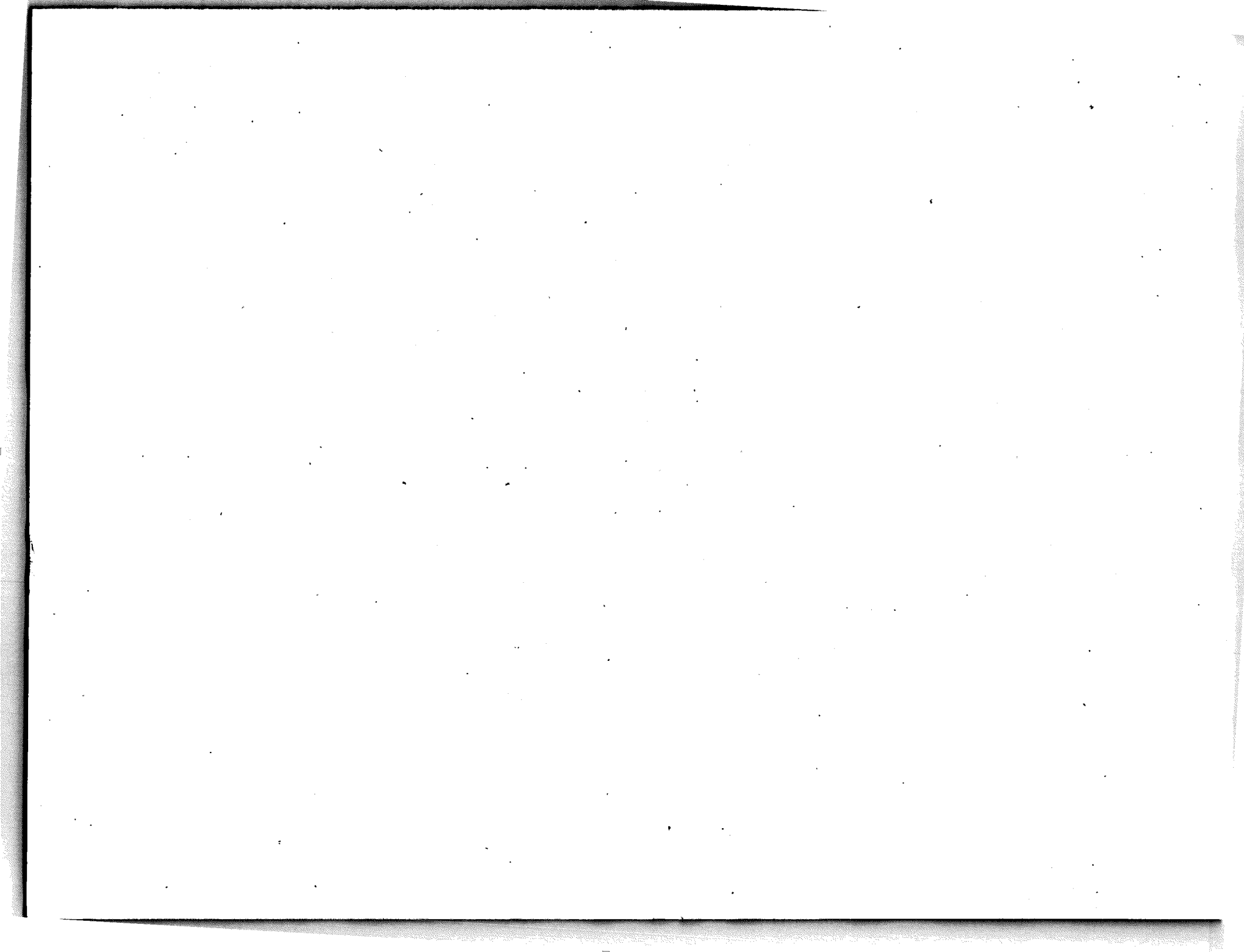
(iv) PCT

(v) DOI.

P.T.O.

- (c) Differentiate between the following : 15
- (i) Primary data and Secondary data
 - (ii) Research methods and Research methodology
 - (iii) Research paper and review article
 - (iv) Index & Appendix
 - (v) Systematic sampling and Stratified sampling.
- (d) True or false : 5
- (i) Paraphrasing means rewriting, what someone else has written in your own words.
 - (ii) Acknowledging the source with a reference and placing the words in quotation marks is required, if you use someone else's exact words.
 - (iii) Patents are valid for a lifetime.
 - (iv) Open-access journals allow free access to research papers.
 - (v) Research fellowships are awarded based on academic merit.
2. Describe the CCSEA guidelines for the care and handling of laboratory animals. 15
3. (a) What is intellectual property and why should we protect it ? 5
- (b) Write notes on copyrights and patent laws. 10

4. (a) Describe the various types of research. 12
(b) Write a note on oral presentation. 3
5. Describe the various probability sampling and non-probability sampling methods with suitable examples. 15
6. (a) Define the term plagiarism. Write a note on the various types of plagiarism. 8
(b) Define the term citation. Why is citing sources important in research ? 7
7. Write short notes on (any *three*) : 3×5=15
 - (a) Acknowledgement (Research paper/Review article)
 - (b) Research grants
 - (c) Benefits of using plagiarism detection tools
 - (d) Fellowships
 - (e) Data presentation using digital tools (any *two*).



This question paper contains **3** printed pages]

Roll No.

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S. No. of Question Paper : **107**

Unique Paper Code : **32237911**

Name of the Paper : **Wildlife Conservation and Management**

Name of the Course : **B.Sc. (H) Zoology**

Semester : **VI**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all, including question No. 1,

which is compulsory.

1. (a) Define the following :

1×4=4

(i) Habitat

(ii) Biotelemetry

(iii) Biotic potential

(iv) Ecotourism

(b) Distinguish between the following :

2×4=8

(i) Preservation and Conservation

(ii) GPS and GIS

(iii) Active remote sensors and Passive remote sensors

(iv) Endangered and Vulnerable species

P.T.O.

- (c) Expand the following : 1×4=4
- (i) IUCN
 - (ii) CITES
 - (iii) NBWL
 - (iv) UNEP
- (d) Fill in the blanks : 1×3=3
- (i) are infectious diseases that spread between animals and human beings.
 - (ii) Bovine tuberculosis is caused by
 - (iii) The colour of hair is due to pigment granules embedded in layer.
- (e) Briefly explain the following statements : 2×2=4
- (i) Non-native species should not be rehabilitated or release in the wild.
 - (ii) Prescribed fire can only be used at particular locations and time of the year for setting back succession.
- (f) Illustrate the following with the help of diagrams (no description required) : 2×2=4
- (i) Structure of a hair
 - (ii) Felid and Canid pugmarks
2. (a) Enumerate the underlying reasons for depletion of Indian Wildlife. 8
- (b) Describe the various methods of setting back succession. 4

3. Describe the Geographical Information System along with its components and working mechanism. Briefly discuss its advantages. 12
4. (a) What are the key physical parameters involved in the evaluation and management of wildlife ? Explain with the help of examples. 8
(b) Explain the positive and negative values of wildlife. 4
5. (a) When was project tiger initiated in India ? What are its objectives and outcomes ? Give any *two* examples of tiger reserves in India. 6
(b) Describe any *one* disease of wildlife emphasizing on its causative agent, reservoir, symptoms and control measures. 6
6. (a) What is a climax community ? Write the characteristics and theories of climax community. 6
(b) Describe various ethical perspectives for wildlife management and conservation. 6
7. Write short notes on any *three* of the following : 4×3=12
 - (i) Restoration of degraded habitats
 - (ii) Census method
 - (iii) Setting back succession
 - (iv) Conservation Ethics
 - (v) Remote sensing.