

JHARGRAM RAJ COLLEGE
M.Sc. Semester-I Examination, 2023
ZOOLOGY
Paper-ZOO 101

Time- 2 hours

Use Separate Scripts for Each Group

Full Marks- 40

Each question carries EQUAL mark
Candidates are required to give their answers in their own words as far as practicable

ZOO 101.1

(Non chordate Biology)

1. Answer any two questions from the following: 2×2=4
- a) What is anhydrobiosis?
 - b) What is mastax?
 - c) What do you mean by amictic and mictic females in rotifera?
 - d) What do you mean by teleplanic and demersal larvae?
2. Answer any two questions from the following: 2×4=8
- a) Comment on the utility of ascus in bryozoan feeding. 4
 - b) Distinguish between phylactolaemata and gymnolaemata. 4
 - c) Discuss the ecological role of Foraminifera. 4
 - d) Classify insect larva after Antonio Berlese classification (1913) with examples. 4
3. Answer any one question from the following: 1×8=8
- a) Discuss Haeckel's view on origin of metazoa. Add a note about the modification of this view as made by recent scientists. What are the limitations of syncytial theory regarding origin of metazoa? 3+3+2
 - b) Name one threatened invertebrate found in India with its distribution. Give an account of varieties of feeding habits in nematode according to habitat. State the adaptive features of free living nematode with respect to its life style with necessary diagram. 2+2+4

ZOO 101.2

(Chordate biology)

4. Answer any two questions from the following: 2×2=4
- a) State two unique features of hominidae that differ from other primates.
 - b) What is the significance of Luci in human evolution?
 - c) How bats estimate the Azimuthal angle of a prey?
 - d) Write a note on metanephros.
5. Answer any two questions from the following: 2×4=8
- a) Compare the salient features of endostyle of a cephalochordate and an urochordate with necessary diagram. 4
 - b) Do freshwater fishes drink water? Justify your answer with proper explanations. 4
 - c) Write a note on the osmoregulation in marine fishes. 4
 - d) Draw a labelled diagram of inner ear. 4
6. Answer any one question from the following: 1×8=8
- a) Give an account of origin of chordate with special reference to neoteny. Add a note on Barrington's view in this regard. 4+4
 - b) (i) Draw a diagram to illustrate the counter-current across a gill filament. 3
(ii) "The operation of a double pumping mechanism and the consequent continuous flow across the gills make the terms inspiration and expiration not entirely suitable."- Justify the statement. 5

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JHARGRAM RAJ COLLEGE
M.Sc. Semester-I Examination, 2023
ZOOLOGY
Paper-ZOO 102

Time- 2 hours

Use Separate Scripts for Each Group

Full Marks- 40

Each question carries EQUAL mark
Candidates are required to give their answers in their own words as far as practicable

ZOO 102.1
(Histochemistry)

1. Answer any two questions from the following: 2×2=4
- Why paraffin is considered as an ideal embedding agent?
 - Differentiate additive fixatives from non-additive one.
 - What are amphoteric dyes?
 - Mention the merits and demerits of the use of monoclonal and polyclonal antibody in immunohistochemistry.
2. Answer any two questions from the following: 2×4=8
- Write down the working principle of benzidine reaction for MPO in blood smear. State its one application. 3+1
 - Write a note on the application of immunohistochemistry. What is Romanowsky effect? 3+1
 - State the principle involved in Mallory's trichome staining method. Briefly write down the protocol of it. 2+2
 - What is fixation artifact? Why glutaraldehyde and osmium tetroxide are used as fixative reagents in electron microscopy? 1+3
3. Answer any one question from the following: 1×8=8
- Write notes on: 4+4
 - Gomori's reaction for alkaline phosphatase
 - Indirect immunohistochemistry
 - (i) What is a vital dye? (ii) What is meant by bathochromy of a dye? (ii) Write down the properties of a dye molecule. (iv) With example differentiate orthochromatic staining from metachromatic staining. 1¹/₂+1¹/₂+2¹/₂+2¹/₂

ZOO 101.2
(Animal physiology)

4. Answer any two questions from the following: 2×2=4
- What is oxidative stress?
 - State the role of thermogenin.
 - What is Bohr's effect?
 - State two significances of T wave of ECG.
5. Answer any two questions from the following: 2×4=8
- Briefly describe the heat shock response in ectotherms to overcome temporary extreme heat. 4
 - Define homeostasis. Discuss different components of a feedback mechanism or system with suitable example. 1+3
 - Write a note on the origin and spread of excitation within the heart with diagram. 3+1
 - Define haemopoiesis. How does it differ from haemostasis? 1+3
6. Answer any one question from the following: 1×8=8
- State the Frank-Starling Law of the heart. Discuss the regulatory mechanism by which Baroreceptor reflex restores increased arterial pressure to its set point. 2+6
 - What is 'diving response'? Write down the steps of prothrombin activator formation through intrinsic pathway. What are ROS scavengers? Cite one example and its mechanism of action. 2+3+(1+1+1)

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JHARGRAM RAJ COLLEGE
M.Sc. Semester-I Examination, 2023
ZOOLOGY
Paper-ZOO 104

Time- 2 hours

Use Separate Scripts for Each Group

Full Marks- 40

Each question carries EQUAL mark
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ZOO 104.1
(Cell Biology)

1. Answer any two questions from the following: 2×2=4
- a) Write the distribution of phospholipids in the outer and inner leaflet of plasma membrane.
 - b) What are GAGs?
 - c) State the role of dolichol phosphate present on ER membrane.
 - d) What is "Signal Recognition Particle"?
2. Answer any two questions from the following: 2×4=8
- a) What is MTOC? State the role of γ -TuRC during nucleation of microtubules. "Kinesin-1 is a processive motor and uses ATP to move along a microtubule"- explain. 1+1+2
 - b) What do you mean by ERAD? Describe the mechanism that ensures misfolded proteins will not proceed forward. 1+3
 - c) How does the signal transduction by RTKs get terminated? Name two ligands that act via RTK pathway. 3+1
 - d) Mention the steps involved in protein translocation across the mitochondrial membrane. State the role of mitochondrial Hsp 70. 3+1
3. Answer any one question from the following: 1×8=8
- a) What is ATPase pump? What are different kinds of ATPase pump? What is the significance of this pump? 1+6+1
 - b) Schematically represent the activation of integrin molecule with suitable diagram. How does synthetic RGD peptide inhibit inappropriate blood clot formation? Distinguish between hemidesmosome and focal adhesion. 4+2+2

ZOO 104.2
(Cytogenetics)

4. Answer any two questions from the following: 2×2=4
- a) What is cis-trans position effect?.
 - b) State two conditions to satisfy a population in Hardy Weinberg equilibrium.
 - c) How can bacterial genes be mapped by interrupted mating experiments?
 - d) State the roles of gag, pol, env, src.

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JHARGRAM RAJ COLLEGE
M.Sc. Semester II Examination, 2023
ZOOLOGY
Paper- ZOO 201

Time- 2 hour

Use separate scripts for each unit

Full Marks- 40

*The figures in the right-hand margin indicate marks
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Unit I: ZOO 201.1
(Biosystematics)

1. Answer **any two** questions from the following: 2×2=4
 - a) What is polytypic species? 2
 - b) What is phenon? 2
 - c) How are fatty acid profiles used to infer phylogenetic relationship? 2
 - d) Write two limitations of biological species concept. 2

2. Answer **any two** questions from the following: 2×4=8
 - a) How you can differentiate the concept of taxon from category in taxonomy? 4
 - b) What are holotype, lectotype and neotype? 4
 - c) Among the rules of biological classification, elaborate the concept of priority and reversibility. 4
 - d) Discuss the role of RNA in micromolecular systematics. 4

3. Answer **any one** question from the following: 1×8=8
 - a) What is the 'species problem' and how does it relate to microtaxonomy? Is classification a theory? 5+3
 - b) Provide a brief overview of the stages of taxonomy and explain the tasks typically performed by a taxonomist. 5+3

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Unit II: ZOO 201.2
(Ecological Principles)

4. Answer any two questions from the following: 2×2=4
- a) Distinguish between semelparity and iteroparity. 2
 - b) What do you mean by edge area ratio? 2
 - c) What are bioenergetic and interaction food web? 1+1
 - d) Distinguish between fundamental and realized niche. 2

5. Answer any two questions from the following: 2×4=8
- a) 'Stability of ecosystem is achieved through redundancy'- justify the statement. What is Gaia hypothesis? 2+2
 - b) What is fecundity schedule? How will you calculate Net reproductive rate and how can you predict the type of growth of population from Net reproductive rate? 1+3
 - c) Complete the population surviving and rate of mortality in the following table:

Age (years) [X]	Observed number (alive) [n _x]	Population surviving at start [l _x]	Number of dying within age interval x and x+1	Rate of mortality [q _x]
0	115	1	?	0.78
1	?	0.217	6	0.24
2	19	0.165	7	?
3	12	?	10	0.83
4	2	0.017	1	0.50
5	1	0.009	1	1

- d) How Hamilton's rule justifies altruistic behaviour? 4
6. Answer any one question: 1×8=8
- a) Explain niche width along its two components. What do you mean by ecological guild? Why limnetic zone is considered as the most productive and diverse one? Differentiate lentic and lotic ecosystem. 2+2+2+2
 - b) Name three main types of Bet-Hedging strategy with one example each. What is kin selection? 6+2

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JHARGRAM RAJ COLLEGE
M.Sc. Semester II Examination, 2023
ZOOLOGY
Paper- ZOO 202

Time- 2 hours

Use separate scripts for each unit

Full Marks- 40

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Unit I: ZOO 202.1

(Biophysics)

1. Answer any two questions from the following: 2×2=4
 - a) Differentiate between laminar flow and turbulent flow. 2
 - b) What do you mean by limit of resolution (γ)? 2
 - c) Compare between carbonic acid bicarbonate buffer system and phosphate buffer system. 2
 - d) What is Reynold number? 2

2. Answer any two questions from the following: 2×4=8
 - a) Discuss any two cardio-dynamic factors that influence blood pressure. 2+2
 - b) State and explain Tyndall effect. Mention two biological applications of it. 2+2
 - c) Briefly mention the application of electro dialysis in the production of purified water. 4
 - d) Give a brief comparative account between working principles of light microscope and TEM. 4

3. Answer any one question from the following: 1×8=8
 - a) What are the implications of change in 'free energy' on the spontaneity of biochemical reactions? Discuss the adaptive features of elasmobranchs in hypertonic sea water. 3+5
 - b) Define fluorophore with example. Write down the working principle of fluorescence microscopy. Distinguish between direct and indirect immunofluorescence. 2+4+2

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JHARGRAM RAJ COLLEGE
M.Sc. Semester II Examination, 2023
ZOOLOGY
Paper- ZOO 203

Time- 2 hour

Use separate scripts for each unit

Full Marks- 40

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Unit I: ZOO 203.1

(Molecular Biology)

1. Answer **any two** questions from the following: 2×2=4
 - a) Name the mechanisms by which RNA-Pol proof-reads. 1+1
 - b) Name an antibiotic that blocks DNA replication and how? 1+1
 - c) What is translational coupling? 2
 - d) What are riboswitches? State its role in trp operon. 1+1
2. Answer **any two** questions from the following: 2×4=8
 - a) Briefly describe the mechanism by which RNA Pol overcome histone barriers in its way during transcription elongation phase. 4
 - b) What is ribosome recycling? How do different factors facilitate this event in prokaryotic cells? 1+3
 - c) State the functions of DNA polymerase 'Palm Domain'. What do you mean by polymerase switching? 2¹/₂+1¹/₂
 - d) Write a short note on the formation of Preinitiation Complex by RNA polymerase II and GTF? 4
3. Answer **any one** question from the following: 1×8=8
 - a) Describe with diagram the miRNA mediated post transcriptional regulation of gene expression. Why 7-methylguanosine (7-mG) Cap is formed in eukaryotic RNA transcripts? 6+2
 - b) Explain how does the concentration of tryptophan in cell regulates tryptophan biosynthesis. Why tetrameric form of repressor is advantageous over dimeric form in Lac operon regulation? 6+2

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Unit II: ZOO 203.2
(Parasitology)

4. Answer **any two** questions from the following : 2×2=4
- a) What do you mean by Antigenic Variation? 2
 - b) What is PKDL? 2
 - c) Define Phoresis with example. 1+1
 - d) Define transovarial and transstadial transmission. Give examples. 1+1
5. Answer **any two** questions from the following: 2×4=8
- a) Elucidate the response of human immune system against erythrocytic stage of *Plasmodium falciparum* infection. . 4
 - b) How does parasitic infection manipulate host cell communication to suppress host immune response? 4
 - c) What is the Inflammatory (Acute) Phase of pathogenesis during *Wuchereria bancrofti* infection? 4
 - d) Describe the structure of trematode cuticle with suitable diagram. 4
6. Answer **any one** question from the following: 1×8=8
- a) Describe the life cycle of *Paragonimus westermani* with a suitable illustration. What is zoonosis? 6+2
 - b) Describe the molecular biology of immune evasion strategies employed by *Plasmodium falciparum* in human. 8

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JHARGRAM RAJ COLLEGE
M.Sc. Semester II Examination, 2023
ZOOLOGY
Paper C-ZOO 204

Time- 2 hour

Use separate scripts for each unit

Full Marks- 40

The figures in the right hand margin indicate marks
Candidates are required to give their answers in their own words as far as practicable

Unit I: C-ZOO 204.1
(Wildlife & Eco Management)

1. Answer any two questions: 2×2=4
- a) Define bioaccumulation. 2
- b) What is invasive species? Give example. 1+1
- c) Why India is called a mega diverse country? 2
- d) What is Red data book? 2
2. Answer any two questions: 2×4=8
- a) Distinguish between in situ and ex situ conservation with examples. 4
- b) What are habitat destruction and habitat fragmentation? 2+2
- c) Define wildlife crime. What is illegal trade in wildlife? 2+2
- d) Why corridor conservation is important for forest management? State the problems of corridor conservation. 2+2
3. Answer any one question: 1×8=8
- a) Write down the threats of Olive Ridley Turtle. State the conservation strategies of musk deer. 5+3
- b) What is IUCN? Give example of one vulnerable reptile and a critically endangered Indian bird. What is Radio collar? State its use. What is telemetry? 1+2+1+2+2

Unit II: C-ZOO 204.2
(Aquaculture)

4. Answer any two questions: 2×2=4
- a) What are the environmental factors affecting the fish growth? 2
- b) Differentiate between penaeid and non-penaeid group of prawns. 2
- c) What do you mean by exotic fish? Give an example. 1+1
- d) Differentiate between aquaculture and fishery. 2
5. Answer any two questions: 2×4=8
- a) Write the chemical composition of pearl. How pearl is formed naturally? 2+2
- b) Give the name of one viral and one bacterial disease of fish. Write the symptoms of these diseases. 1+1+1+1
- c) Give an account of the problems and prospects of pisciculture in west Bengal. 4
- d) Write the merit and demerit of cage culture. 4
6. Answer any one question: 1×8=8
- a) What is induced breeding? How it is applied on major carps? What are the advantages of induced breeding. 2+4+2
- b) What is integrated farming? Discuss about fish culture cum piggery. Write the importance of integrated fish farming. 2+4+2

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JHARGRAM RAJ COLLEGE
M.Sc. Semester-III Examination, 2023
ZOOLOGY
Paper-ZOO 301

Time- 2 hours

Use Separate Scripts for Each Group

Full Marks- 40

Each question carries EQUAL mark
Candidates are required to give their answers in their own words as far as practicable

ZOO 301.1
(Entomology)

1. Answer any two questions from the following: 2×2=4
 - a) State two important features of order Hymenoptera.
 - b) Mention the significance of filter chamber.
 - c) What is tentorium?
 - d) What is peritrophic membrane?

2. Answer any two questions from the following: 2×4=8
 - a) Give a brief account on saltatorial & raptorial type of insect leg with suitable example. 2+2
 - b) Name two families of order coleoptera where light production is found. State the significance of light production in insects. 1+3
 - c) Mention the function of crystalline cone. Give a comparative account on the image formation in diurnal & nocturnal insects. 1+3
 - d) Write a short note on retrocerebral complex in insects. 4

3. Answer any one question from the following: 8×1=8
 - a) What is GEP? 'Insects control or suppress populations of many known or potential pests' –explain with suitable examples. State the nature of damage and control strategies of *Plocaederus ferrugineus*, a potent pest of cashewnut. 1+3+2+2
 - b) What is sclerotization? Give a brief account on the structural organization of insect integument with suitable diagram. 2+6

ZOO 301.2
(Ecotoxicology)

4. Answer any two questions from the following: 2×2=4
 - a) What is static renewal test?
 - b) Define MATC. How can it be estimated?
 - c) Write two causes of generation of metabolic toxin.
 - d) What is meant by 'Comet tail'??

5. Answer any two questions from the following: 2×4=8
 - a) State the role of GSH in detoxification of xenobiotics with an example. 4
 - b) Compare among additive effect, synergistic effect, potentiation and antagonistic effect caused by environmental pollutants. 4
 - c) What are the differences between acute and chronic toxicity? What are the major routes of exposure in toxicology? 2+2
 - d) Distinguish LC₅₀ from LD₅₀. What is Chelation therapy? How is bioremediation carried out? 1+2+1

6. Answer any one question from the following: 8×1=8
 - a) Define Hormesis. Give a schematic representation of CYP450 monooxygenase system for biotransformation of xenobiotics. Define toxicokinetics. 2+4+2
 - b) Comment on any two types of agents causing exogenous DNA damage along with their mechanism of action? How does ROS damages DNA? 6+2

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JHARGRAM RAJ COLLEGE
M.Sc. Semester-III Examination, 2023
ZOOLOGY
Paper-ZOO 302

Time- 2 hours

Use Separate Scripts for Each Group

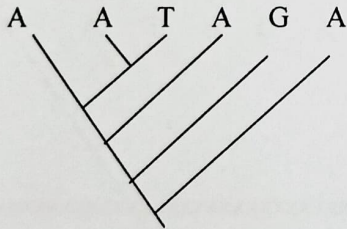
Full Marks- 40

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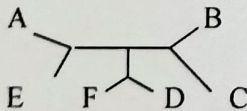
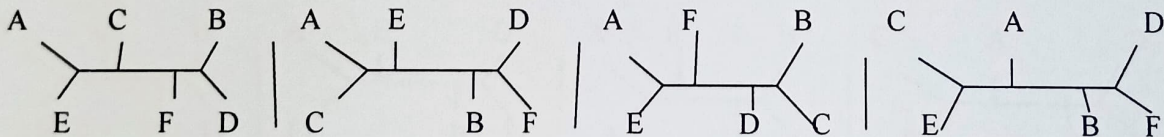
ZOO 302.1
(Molecular Evolution)

1. Answer any two questions from the following: 2×2=4
- Distinguish between paralogy and orthology?
 - What is heterozygous superiority?
 - Write the evolutionary significance of pseudogene.
 - What is polytomy? What is its significance?

2. Answer any two questions from the following: 2×4=8
- Derive the allele frequency change (Δq) in a population after one generation of selection against recessive allele(a). 4
 - The allele frequency of A is 0.7 in the donor population and 0.3 in the recipient population. A group of 20 individuals migrates and join the recipient population, which originally had 80 members. Calculate the allelic frequency in the conglomerate population. 4
 - Is there any evidence that genome size ever decreases in evolution? Justify your answer. Distinguish between fitness and inclusive fitness. 2+2
 - Calculate the length of the following tree with Fitch algorithm. 4



3. Answer any one question from the following: 8×1=8
- With the help of majority rule consensus method, find the consensus tree from the following trees: 8



- A study involving 100bp of human mtDNA shows 15 visible substitutions, among which 14 are transitions & 1 is transversion. Applying Jukes-Canton and Kimura two parameter models of evolution, calculate the actual number of substitutions in the DNA fragment. 4
 - What features distinguish a cladogram from phylogram? How many rooted trees are possible with four taxa or operational taxonomic units (OTUs)? 4

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JHARGRAM RAJ COLLEGE
M.Sc. Semester-III Examination, 2023
ZOOLOGY
Paper-ZOO 303B
Ecology Special Paper

Time- 2 hours

Use Separate Scripts for Each Group

Full Marks- 40

Each question carries EQUAL mark

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

ZOO 303B.1

(Biodiversity & Conservation Ecology)

1. Answer any two questions from the following: 2×2=4
 - a) What do you mean by captive breeding?
 - b) State the objectives of CITES.
 - c) What do you mean by IBA?
 - d) State one advantage and one disadvantage of pugmark in census technique.

2. Answer any two questions from the following: 2×4=8
 - a) What do you mean by contractarian and utilitarian perspective of ethics in wildlife management? 2+2
 - b) Write a note on Arabari model. 4
 - c) State the advantages and disadvantages of molecular marker technique for measuring genetic diversity. 4
 - d) What are the criteria for globally threatened species? 4

3. Answer any one question from the following: 8×1=8
 - a) What is red data book? What is IUCN green status of species? State the role of habitat destruction as a major threat of biodiversity loss. 2+2+4
 - b) State the causes of decline of tiger population in India. What is vulture restaurant? What is radio collar? 4+2+2

ZOO 303B.2

(Aquatic Ecology)

4. Answer any two questions from the following: 2×2=4
 - a) What is virtual water?
 - b) What do you mean by 'rain forest of sea'?
 - c) Mention two strategies for conservation of coastal dunes.
 - d) What do you mean by hydrothermal vent and ICZM?

5. Answer any two questions from the following: 2×4=8
 - a) Explain lake effect snow fall with diagram. 4
 - b) Classify wetland with examples. 4
 - c) Why the low tide zone of coastal ecosystem has greatest biodiversity? What are human induced problems in coastal ecosystem? 2+2
 - d) What do you mean by effluent and preliminary treatment? State the salient features of aerobic biological treatment. 2+2

6. Answer any one question from the following: 8×1=8
 - a) Elaborate river continuum concept after Vannote et al. (1980). How is 'ox bow lake' formed? Discuss the functions of estuarine ecosystem. 2+3+3
 - b) Define amphiphyte & saproplankton with examples. State the role of periphyton in ecosystem. Distinguish between epibenthos and endobenthos. Point out any four major threats of Sundarbans. (1+1)+2+2+2

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JHARGRAM RAJ COLLEGE
M.Sc. Semester-III Examination, 2023
ZOOLOGY
Paper-C-ZOO 304
(CBCS)

Time- 2 hours

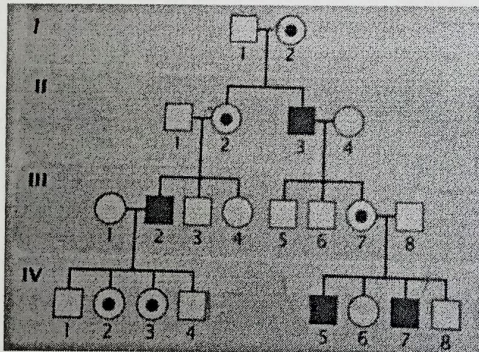
Use Separate Scripts for Each Group

Full Marks- 40

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C ZOO 304.1
(Genetics)

1. Answer any two questions from the following: 2×2=4
- What is crisscross inheritance?
 - What do you understand by coupling and repulsion?
 - State the relationship between linkage and crossing over.
 - Distinguish between euchromatin and heterochromatin.
2. Answer any two questions from the following: 2×4=8
- Briefly describe the three levels of DNA packaging in eukaryotic chromosomes. 4
 - Pedigree pattern of a trait followed through four generations. Identify the nature of trait and justify your answer. 1+1+2



- In a testcross, 15 progeny exhibit new combinations of traits out of 123 progenies. Calculate the recombination frequency. What is primary and secondary nondisjunction? 2+2
 - What are genetic markers? What is the difference between genetic mapping and physical mapping? 2+2
3. Answer any one question from the following: 8×1=8
- In a three point test cross of ABC/abc X abc/abc, following data are obtained:

Phenotypes	Number
ABC	230
abc	240
aBc	96
AbC	104
ABc	138
abC	142
aBC	12
Abc	8
Total:	970

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JHARGRAM RAJ COLLEGE
M.Sc. Semester IV Examination, 2023
ZOOLOGY
Paper- ZOO 403B
ECOLOGY SPECIAL PAPER

Time- 2 hour

Use separate scripts for each unit

Full Marks- 40

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**Unit I: ZOO 403B.1
(System Ecology)**

1. Answer **any two** questions: 2×2=4
 - a) What is the difference between degraded and open forest?
 - b) What do you mean by regulating service of ecosystem?
 - c) What is TIES?
 - d) Differentiate between conservation biology and ecological restoration.

2. Answer **any two** questions: 2×4=8
 - a) Explain thermocline with reference to stratification of lake. 4
 - b) 'Economy and environment are joint system' – explain. 4
 - c) Experimentally show the role of key stone species in an ecosystem. 4
 - d) Explain evenness index. 4

3. Answer **any one** question: 1×8=8
 - a) Elaborate the behavior of Lotka Voltera model in interspecific competition with necessary diagram at zero isocline. 8
 - b) What are reintroduction and rehabilitation? State the difference between meta community and meta population. 'Ecotourism is more than travel to appreciate nature' – explain. 3+3+2

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JHARGRAM RAJ COLLEGE
M.Sc. Semester IV Examination, 2023
ZOOLOGY
Paper- ZOO 401

Time- 2 hour

Full Marks- 40

Use separate scripts for each unit

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**Unit I: ZOO 401.1
(Environmental Pollution & Management)**

1. Answer ***any two*** questions: 2×2=4
 - a) How Peroxy Acetyl Nitrate is formed in the environment?
 - b) What do you mean by 'Co-invasion'?
 - c) What is ozone depletion?
 - d) Mention the causes of eutrophication.

2. Answer ***any two*** questions: 2×4=8
 - a) Comment on the effect of Arsenic pollution in our life. 4
 - b) Comment on different approaches of managing bioinvasion in forests. 2+2
 - c) What is algal bloom? What are the measures to control water pollution? 1+3
 - d) Write a short note on photochemical smog. 4

3. Answer ***any one*** question: 1×8=8
 - a) What are the indicative stress reactions of aquatic ecosystems that are used as bioindication? Discuss about the impact of acid rain on aquatic system. 4+4
 - b) Enumerate the measures to reduce emission of air pollutants from factories and automobiles, giving brief descriptions of various such measures. 8

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JHARGRAM RAJ COLLEGE
M.Sc. Semester IV Examination, 2023
ZOOLOGY
Paper- ZOO 402

Time- 2 hour

Use separate scripts for each unit

Full Marks- 40

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**Unit I: ZOO 402.1
(Developmental Biology)**

1. Answer any two questions: 2×2=4
 - a) Name the factors of sperm activation in sea urchin.
 - b) How T3 induces the acceleration of metamorphosis in *Xenopus*?
 - c) How 26S proteasome influence acrosomal exocytosis?
 - d) What is cortical rotation?

2. Answer any two questions: 2×4=8
 - a) 'Amphibian axis formation combines both autonomous and conditional specification' – explain the statement with suitable diagram. 4
 - b) State the role of IZUMO1 and SAS1B in fertilization of sea urchin. 4
 - c) Explain the role of the head organizer in maintenance of the polar body axis in *Hydra*. 4
 - d) What is AEC? How retinoic acid influence regeneration of salamander limbs? 1+3

3. Answer any one question: 1×8=8
 - a) What is Nieuwkoop center of an amphibian blastula? Define organizer with suitable example. Write down the functions of the organizer. 'The default fate of the ectoderm is to form neural tissue' – explain. 1+(2+2)+3
 - b) i) Briefly describe the events associated with ZP3 mediated acrosome reaction in mammalian sperm. 4
ii) 'Wnt signaling is the dominant encoder of axis formation in *Hydra*' – explain. 4

