JHARGRAM RAJ COLLEGE M.Sc. Semester-1 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:	$2\times2=4$
	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	s view as
	made by recent scientists. What are the limitations of syncytial theory regarding metazoa?	origin of 3+3+2
	b) Name one threatened invertebrate found in India with its distribution. Give an account o	f varieties
	of feeding habits in nematode according to habitat. State the adaptive features of fi	ree 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.	The state of the s	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 f	low across

the gills make the terms inspiration and expiration not entirely suitable."- Justify the statement. 5

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

2+3+(1+1+1)

	Each question carries EQUAL mark	
	Candidates are required to give their answers in their own words as far as practicable ZOO 102.1	
	(Histochemistry)	
,		×2=4
1.	a) Why paraffin is considered as an ideal embedding agent?b) Differentiate additive fixatives from non-additive one.	
	 c) What are amphoteric dyes? d) Mention the merits and demerits of the use of monoclonal and polyclonal antibodimmunohistochemistry. 	dy in
•	A Compatible Calleryings	2×4=8
2.	Answer any two questions from the following: a) Write down the working principle of benzidine reaction for MPO in blood smear. State is application.	211
	b) Write a note on the application of immunohistochemistry. What is Romanowsky effect? c) State the principle involved in Mallory's trichome staining method. Briefly write down	3+1 vn the 2+2
	protocol of it.	2+2
	d) What is fixation artifact? Why glutaraldehyde and osmium tetroxide are used as fixative re in electron microscopy?	1+3
3.	Answer any one question from the following:	1×8=8
٥.	a) Write notes on:	4+4
	 (i) Gomori's reaction for alkaline phosphatase (ii) Indirect immunohistochemistry b) (i) What is a vital dye? (ii) What is meant by bathochromy of a dye? (ii) Write do properties of a dye molecule. (iv) With example differentiate orthochromatic staining metachromatic staining. ZOO 101.2	g from
	(Animal physiology)	
4.	6 4 6 11	2×2=4
7	a) What is oxidative stress?	
	b) State the role of thermogenim.	
	c) What is Bohr's effect?	
	d) State two significances of T wave of ECG.	
5.	Answer any two questions from the following:	2×4=8
	a) Briefly describe the heat shock response in ectotherms to overcome temporary extreme h	eat. 4
	b) Define homeostasis. Discuss different components of a feedback mechanism or sys	tem with
	suitable example.	1+3
	c) Write a note on the origin and spread of excitation within the heart with diagram.	3+1
	d) Define haemopoiesis. How does it differ from haemostasis?	1+3
6.	Answer any one question from the following:	1×8=8
٥.	a) State the Frank-Starling Law of the heart. Discuss the regulatory mechanism	
	Baroreceptor reflex restores increased arterial pressure to its set point.	2+6

b) 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.

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

Paper-ZOO 103

Time- 2 hours

Use Separate Scripts for Each Group

Full Marks- 40

	Each question carries EQUAL mo	ırk
	Each question curries EQUITED	words as far as practicable
mandates are r	Each question carries EQOAD me equired to give their answers in their own	W. O. Cas 3

	Candidates are required to give their district	
	ZOO 103.1	
	(Immunology)	2×2=4
		2.2 4
1		
	the conjext of vaccinc.	
	c	
	d) What is TAP? Mention its role in antigen processing and process	2×4=8
-	Answer any two questions from the following:	2+2
2	Why are they halled so:	2+2
	and the accompanies of MHI DELIES and their types.	4
	and the state of complement activity.	4
		4
	d) Write down the principle and application of Kirk.	10_0
	the following:	1×8=8
3.	Answer <u>any one</u> question from the following: a) With suitable diagram describe the molecular mechanism of T-cell selection. Briefly des	cribe the role of
	a) With suitable diagram describe the inforced and install mediated immunity	5+3
	CD4+ T-cell in cell mediated immunity. b) What is immunoproteasome? How does it differ from constitutive proteasome? Illustrate	e its function in
	b) What is immunoproteasonie? How does it differ a series and accountation	2+2+4
	antigen processing and presentation.	
	ZOO 103.2	
	(Methods in biology)	02-4
	Answer any two questions from the following:	2×2=4
4.	. THE I SHOW THE PROPERTY OF T	
	- t t t to the officiancy HOW (II) VOII III Casule IV:	
	b) What is a phytoextraction efficiency: How do you mount is	
	c) What is chromosome walking?	
	d) What are cationic exchangers?	
	. c. d. fallowing	2×4=8
5.	Answer any two questions from the following:	4
	the shocked causes of hand proadelling in cinomatography.	4
	t to the Dt Dt R and TWO SIED N I - I CIV.	2+2
	b) Compare between one step Kt-r CK and two step to be	ategories of CPA
	State the difference between in situ and ex situ bioremediation. Wention the various	2+2
	used in cryopreservation with examples.	
		1×8=8
6	Answer any one question from the following:	
0.	Comment on different types of particles used in stationary phase of the Ec. Empter	n how molecular
	weight of protein can be determined by gel permeation chromatography?	4+4
	f Liefilton system in hioremediation blocks. How seem	nentation velocity
	is related with sedimentation coefficient? State the advantages of BAC and YAC have	, over plasmids as
		3+2+3
	cloning vector.	

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

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

ZOO 104.1 (Cell Biology)

1.	Answer <u>any two</u> questions from the following: 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: 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. b) What do you mean by ERAD? Describe the mechanism that ensures misfolded proteins will not proceed forward. c) How does the signal transduction by RTKs get terminated? Name two lignads that act via RTK pathway. d) Mention the steps involved in protein translocation across the mitochondrial membrane. State the role of mitochondrial Hsp 70. 3+1
3.	Answer <u>any one</u> question from the following: $1 \times 8 = 8$

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 <u>any two</u> questions from the following:

 $2 \times 2 = 4$

- 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.

[Turn over]

5. Answer any two questions from the following:

Ge

a) A geneticist isolates two bacteriophage r mutants (r₁₃ and r₂) that cause rapid lysis. He carries out the following experimental crosses and counts the number of plaques listed here:

enotype of parental phage	Progeny	Number of plaques
h*r ₁₃ - × h*r ₁₃ +	h+r ₁₃ +	1
	h*r ₁₃ +	104
	h ⁺ r ₁₃ -	110
	h ⁻ r ₁₃ -	2
	Total	216
h+r2- × h-r2+	h ⁺ r ₂ +	6
	h ⁻ r ₂ +	86
	h ⁺ r ₂ -	81
	h ⁻ r ₂ -	7
	Total	180

Calculate the recombination frequencies between r_2 and h & between r_{13} and h. Draw all possible linkage maps for these 3 genes.

b) Explain why many oncogenic viruses contain genes whose products interact with tumor-suppressor proteins.

4

c) Describe the process of transformation in Bacillus subtilis.

d) In a large randomly mating population, the frequencies of I^A, I^B and i alleles are 0.7, 0.2 and 0.1 respectively. Calculate the expected frequencies for each blood type.

6. Answer any one question from the following:

 $1 \times 8 = 8$

a) [i] Abortive transduction are relatively stable merozygotes which can be used for complementation test. 6 mutants are tested in all pairwise combinations, yielding the result shown in the table (+ = complementation, 0 = non complementation). Construct the complementation map with the data

1	2	3	4	5	6	
0	+	0	+	+	+	1
	0	0	+	+	+	2
		0	+	+	+	3
		A PART OF THE PARTY OF THE PART	0	0	+	4
				0	0	5
					0	6

- [ii] Graphically represent the relationship between gene frequency and genotype frequency for a locus with two alleles.
- b) [i] Design an experiment to distinguish between the three parasexual processes in bacteria. 4
 [ii] A cross is made between two *E.coli* strains: HFr arg+ bio+ leu+ × F- arg- bio- leu-.

 Interrupted mating studies show that arg+ enters the recipient last, and so arg+ recombinants are selected on a medium containing bio and leu only. These recombinants are tested for the presence of bio+ and leu+. The following numbers of individual are found for each genotype:

arg+ bio+ leu+ 320 arg+ bio- leu+ 0 arg+ bio+ leu- 8 arg+ bio- leu- 48

What is the gene order? What are the map distances in recombination percentage?

2+2

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

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

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 <u>any two</u> 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 pri	ority and
	reversibility.	4
	d) Discuss the role of RNA in micromolecular systematics.	4
3.	Answer <u>any one</u> question from the following:	1×8=8
	a) What is the 'species problem' and how does it relate to microtaxor	nomy? 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

Unit II: ZOO 201.2

(Ecological Principles)

4.	Answer any two questions from the following:	2×2=4
	a) Distinguish between semeloparity and eteroparity.	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:

 $2\times4=8$

a) 'Stability of ecosystem is achieved through redundancy'- justify the statement. What is Gaia hypothesis?

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)	Observed number	Population surviving	Number of dying within age	Rate of
[X]	(alive) [n _x]	at start [l _x]	interval x and x+1	mortality [qx]
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?

6. Answer any one question:

 $1 \times 8 = 8$

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?

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

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: ZOO 202.1

(Biophysics)

1.	Aı	nswer <u>any two</u> 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	r system. 2
	d)	What is Reynold number?	2
2.	Ar	nswer <u>any two</u> 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 electrodialysis in the production of purified w	vater. 4
	d)	Give a brief comparative account between working principles of light micro	oscope and
		TEM.	4
3.	An	nswer <u>any one</u> question from the following:	1×8=8
	a)	What are the implications of change in 'free energy' on the spontaneity of b	oiochemica
		reactions? Discuss the adaptive features of elasmobranchs in hypertonic sea wat	ter. 3+5
	b)	Define fluorophore with example. Write down the working principle of fl	uorescence
		microscopy. Distinguish between direct and indirect immunofluorescence.	2+4+2
		ITUI	RN OVER

Unit II: ZOO 202.2

(Biochemistry)

4.	An	aswer any two questions from the following:	2×2=4
		Define coenzyme with suitable example.	1+1
	b)	State the role of thyroperoxidase and arginase.	1+1
	c)	'Water is a polar molecule that can both accept and donate hydrogen bond' - justif	fy. 2
	d)	State the role of biotin in pyruvate carboxylase reaction.	2
5.	An	nswer <u>any two</u> questions from the following:	2×4=8
	a)	Write short notes on (i) Ion exchange chromatography (ii) Gel filtration chromatog	raphy
			2+2
	b)	How NADH plays pivotal role in regulation of citric acid cycle?	4
	c)	Write a short note on the coupling of ETC with ATP synthesis.	4
	d)	Schematically represent the process by which long chain higher fatty acids (>0	C16) are
		being synthesized in adipose tissues.	3+1
6.	An	nswer <u>any one</u> question from the following:	1×8=8
	a)	What do you mean by heptad repeats in fibrous proteins? What are polyproline	helices?
		Write a short note on the catabolism of amino groups in vertebrate liver.	2+2+4
	b)	Briefly discuss the control of the Pentose Phosphate Pathway. What is Heinz body	y? What
		are the flux control points in the glycolytic pathway?	4+1+3

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

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: ZOO 203.1

(Molecular Biology)

		swer <u>any two</u> questions from the following:	2×2-4
1.	Ans	swer <u>any two</u> questions from the following.	1+1
	a)	Name the mechanisms by which RNA-Pol proof-reads.	1+1
	b)	Name an antibiotic that blocks DNA replication and how?	
	c)	What is translational coupling?	2
	d)	What are riboswitches? State its role in trp operon.	1+1
2.	An	swer <u>any two</u> questions from the following:	2×4=8
	a)	Briefly describe the mechanism by which RNA Pol overcome histone bar	riers in its
	,	way during transcription elongation phase.	4
	b)	What is ribosome recycling? How do different factors facilitate this	s event in
	-,	prokaryotic cells?	1+3
	c)	State the functions of DNA polymerase 'Palm Domain'. What do you	n mean by
	c)	polymerase switching?	21/2+11/2
	1	Write a short note on the formation of Preinitiation Complex by RNA po	lymerase II
	d)		4
		and GTF?	
3.		nswer any one question from the following:	1×8=8
	a)	Describe with diagram the miRNA mediated post transcriptional regulat	ion of gene
		expression. Why 7-methylguanosine (7-mG) Cap is formed in eukar	yotic 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 dim	
		Lac operon regulation?	6+2

Unit II: ZOO 203.2

(Parasitology)

4.	Ar	nswer <u>any two</u> questions from the following:	2×2=4
	a)	What do you mean by Antigenic Variation?	2
	b)		2
	c)	Define Phoresis with example.	1+1
	d)	11.1. Cina ayammlag	1+1
	u)	Define transovarial and transocación transcribente de la companya	
5.	Ar	nswer <u>any two</u> questions from the following:	2×4=8
	a)		stage of
		Plasmodium falciparum infection.	4
	b)	How does parasitic infection manipulate host cell communication to supp	ress host
	,	immune response?	4
	c)		bancrofti
		infection?	4
	d)		4
	-,		
6.	An	nswer <u>any one</u> question from the following:	1×8=8
	a)	Describe the life cycle of Paragonimus westermani with a suitable illustration	ion. What
		is zoonosis?	6+2
	b)	Describe the molecular biology of immune evasion strategies emp	loyed by
		Plasmodium falciparum in human.	8

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: a) Define bioaccumulation. b) What is invasive species? Give example. c) Why India is called a mega diverse country? d) What is Red data book?	2×2=4 2 1+1 2 2
2.	 Answer any two questions: a) Distinguish between in situ and ex situ conservation with examples. b) What are habitat destruction and habitat fragmentation? c) Define wildlife crime. What is illegal trade in wildlife? d) Why corridor conservation is important for forest management? State the problem corridor conservation. 	2×4=8 4 2+2 2+2 as of 2+2
3.	Answer any one question: a) Write down the threats of Olive Ridley Turtle. State the conservation strategies of	1×8=8 f musk deer. 5+3
	b) What is IUCN? Give example of one vulnerable reptile and a critically endanged bird. What is Radio collar? State its use. What is telemetry?	gered Indian 2+1+2+2
	Unit II: C-ZOO 204.2 (Aquaculture)	
4.	Answer any two questions: a) What are the environmental factors affecting the fish growth? b) Differentiate between penaeid and non-penaeid group of prawns. c) What do you mean by exotic fish? Give an example. d) Differentiate between aquaculture and fishery.	2×2=4 2 2 1+1 2
5.	 Answer any two questions: a) Write the chemical composition of pearl. How pearl is formed naturally? b) Give the name of one viral and one bacterial disease of fish. Write the sympt diseases. c) Give an account of the problems and prospects of pisciculture in west Bengal. d) Write the merit and demerit of cage culture. 	2×4=8 2+2 oms of these 1+1+1+1 4 4
6.	 Answer any one question: a) What is induced breeding? How it is applied on major carps? What are the advantage induced breeding. b) What is integrated farming? Discuss about fish culture cum piggery. Write the integrated fish farming. 	2+4+2

XXXXXXXXX

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

6+2

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

		are required to give their answers in their own words as far as practicable	
		ZOO 301.1	
1.	A	(Entomology) Answer any two questions from the following:	
	a	State two important features of order Hymenoptera.	$2\times2=4$
	b	Mention the significance of filter chamber.	
	c)	What is tentorium?	
	d)		
	۵,	what is peritrophic memorane?	
2.		nswer any two questions from the following:	21 0
	a)	Give a brief account on saltatorial & rantorial type of insect leg with suitable	$2 \times 4 = 8$
	b)	Name two families of order coleoptera where light production is found. State the significant production in insects	2+2
		Broduction in miscels.	1.0
	c)	Mention the function of crystalline cone. Give a comparative account on the image for	1+3
		and the modulinal miscus.	
	d)	Write a short note on retrocerebral complex in insects.	1+3
		in misocis.	4
3.	Ar	nswer any one question from the following:	0.10
	a)	What is GEP? 'Insects control or supress populations of many known and it	8×1=8
		orampies. State tile liatile () (lamage and control strategies of Di	-explain
		January, a potent post of cashewilli	
	b)	What is sclerotization? Give a brief account on the structural organization of in-	1+3+2+2
		with suitable diagram.	
		ZOO 301.2	2+6
,		(Ecotoxicology)	
4.	An	swer any two questions from the following:	2×2=4
	a)	What is static renewal test?	2^2-4
	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.	An	swer any two questions from the following:	
	a)	State the role of GSU in detay: Fact:	$2\times4=8$
	b)	State the role of GSH in detoxification of xenobiotics with an example.	
	-,	Compare among additive effect, synergistic effect, potentiation and antagonistic effect carenvironmental pollutants.	used by
	,	What are the differences between acute and chronic toxicity? What are the major reexposure in toxicology?	outes of
	d)	Distinguish I Confrom I D. Will all Classics	2+2
		Distinguish LC ₅₀ from LD ₅₀ . What is Chelation therapy? How is bioremediation carried o	ut?
6.		swer any one question from the following:	1+2+1
	a)	Define Hormesis Give a schemetic	$8 \times 1 = 8$
		Define Hormesis. Give a schematic representation of CYP450 monoxiginase systematic properties.	tem for
	b)	Comment on any two types of agents as	2+4+2
		Comment on any two types of agents causing exogenous DNA damage along wit mechanism of action? How does ROS damages DNA?	th their

mechanism of action? How does ROS damages DNA?

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

Each question carries EQUAL mark

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

ZOO 302.1 (Molecular Evolution)

1. Answer any two questions from the following:

 $2\times2=4$

- a) Distinguish between paralogy and orthology?
- b) What is heterozygous superiority?
- c) Write the evolutionary significance of pseudogene.
- d) What is polytomy? What is its significance?
- 2. Answer any two questions from the following:

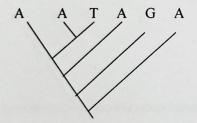
 $2 \times 4 = 8$

- a) Derive the allele frequency change (Δq) in a population after one generation of selection against recessive allele(a).
- b) 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.
- c) Is there any evidence that genome size ever decreases in evolution? Justify your answer.

 Distinguish between fitness and inclusive fitness.

 2+2
- d) Calculate the length of the following tree with Fitch algorithm.

4



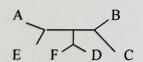
3. Answer any one question from the following:

 $8 \times 1 = 8$

a) With the help of majority rule consensus method, find the consensus tree from the following trees:

8





b) i] 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 ii] What features distinguish a cladogram from phylogram? How many rooted trees are possible with four taxa or operational taxonomic units (OTUs)?

[Turn over]

4. Answer any two questions from the following:

 $2\times2=4$

- a) What kind of kinase activity observed in sensor protein of 'Two Component Signal System" in bacteria?
- b) Define selective media with example.
- c) What is synchronous growth?
- d) MacConkey agar is both selective and differential culture media Explain.
- 5. Answer any two questions from the following:

 $2\times4=8$

- a) A bacterial cell culture has a generation time of 25 minutes. How many generations will it take to reach 3200 cells. Explain serovar with example.
- b) You are given two DNA sequences S1 and S2 of length N1 and N2 from two different bacteria X and Y.

S1= ATGCAGGCATGCCGG

S2= ATTGTTACGG

- Classify these two species based on GC content. Given that generally Gram-Positive bacteria contain high (≥60%) GC content.
- c) Define auxochrome and its function. With suitable "text diagram" describe the spread and pour plate culture technique.
- d) Discuss about the lytic and lysogenic cycle of viral reproduction.

4

6. Answer any one question from the following:

 $8 \times 1 = 8$

- a) Define limit of resolution and resolving power. Briefly describe the plasmid prolfiling procedure in bacterial taxonomy.

 3+5
- b) What is fermentation? Write short notes on (i) Batch fermentation (ii) Fed-Batch fermentation (iii) Continuous fermentation. 2+(2+2+2)

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

	Curatuates are required to give their unswers in their own words as far as practicable	
	ZOO 303B.1	
	(Biodiversity & Conservation Ecology)	
1.	Answer any two questions from the following:	$2\times2=4$
	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 contracterian and utillaterian perspective of ethics in wildlife mans	
	what do you mean by contracterian and utmaterian perspective of etines in whatie main	2+2
	b) Write a note on Arabari model.	4
	c) State the advantages and disadvantages of molecular marker technique for measuring	
	diversity.	g genetic 4
	d) What are the criteria for globally threatened species?	4
	G G	
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 d	estruction
	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 vulture restaurant?	at is radio
	collar?	4+2+2
	ZOO 303B.2	
	(Aquatic Ecology)	
4.	and 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:	
٥.	a) Explain lake effect snow fall with diagram.	$2\times4=8$
	b) Classify wetland with examples.	4
	c) Why the low tide zone of coastal appropriate has a restant his live is a Nil.	4
	c) Why the low tide zone of coastal ecosystem has greatest biodiversity? What are huma problems in coastal ecosystem?	
	d) What do you mean by effluent and preliminary treatment? State the artist of	2+2
	d) What do you mean by effluent and preliminary treatment? State the salient features biological treatment.	
	orong real meatment.	2+2
6	. Answer any one question from the following:	01 0
	a) Elaborate river continuum concept after Vannole et al. (1980). How is 'ox bow lake	8×1=8
	Discuss the functions of estuarine ecosystem	2.2.2
	b) Define amphiphyte & saproplankton with examples. State the role of periphyton in	2+3+3
	Distinguish between epibenthos and endobenthos. Point out any four major threats of S	ecosystem.

Distinguish between epibenthos and endobenthos. Point out any four major threats of Sundarbans.

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

Each question carries EQUAL mark

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

C ZOO 304.1 (Genetics)

1. Answer any two questions from the following:

 $2 \times 2 = 4$

- a) What is crisscross inheritance?
- b) What do you understand by coupling and repulsion?
- c) State the relationship between linkage and crossing over.
- d) Distinguish between euchromatin and heterochromatin.
- 2. Answer any two questions from the following:

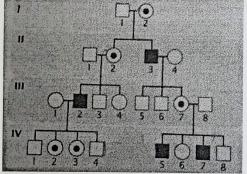
 $2 \times 4 = 8$

a) Briefly describe the three levels of DNA packaging in eukaryotic chromosomes.

... .

b) Pedigree pattern of a trait followed through four generations. Identify the nature of trait and justify your answer.

1+1+2



- c) In a testcross, 15 progeny exhibit new combinations of traits out of 123 progenies. Calculate the recombination frequency. What is primary and secondary nondisjunction?
- d) What are genetic markers? What is the difference between genetic mapping and physical mapping?
- 3. Answer any one question from the following:

 $8 \times 1 = 8$

a) 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

[TURN OVER]

	: - C :F am	2+4+2
	 interference, if any. (i) Briefly describe the mechanism by which choice is made between alternative fe male developmental pathways in <i>Drosophila</i> following the interpretation of X: A rat 	male and
	(ii) Distinguish between replicon and replicator.	6+2
	C ZOO 304.2	
	(Basic and applied immunology)	
4.	Answer any two questions from the following:	$2\times2=4$
٠.	a) Define haematopoiesis.	
	b) Differentiate between innate and acquired immunity.	
	c) What do you mean by epitope?	
	d) Define hapten and immunogen.	
-	Answer any two questions from the following:	$2\times4=8$
5.	a) Write a short note on MHC.	4
		4
	DIA IDIICA	4
	(1) mon 1 DOD (11) Cretatoria T cell and Natural Killer (ell	2+2
	d) Differentiate between (1) TCR and BCR (11) Cytoloxic T cent and Natural Riner cent	
,	A server are question from the following:	$8 \times 1 = 8$
6.	1' describe the common structure of antibody	4+4
	i discontinuo and different types of vaccines	2+6
	b) What do you mean by vaccination? Add a note on different types of vaccines.	

Find out the correct linear order of genes. Calculate the map distance between the genes and the

2+4+2

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

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: ZOO 403B.1 (System Ecology)

1	. A	Answer <u>any two</u> questions:	2×2-
	a)	What is the difference between degraded and open forest?	2×2=4
	b)		
	c)		
	d)	Differentiate between conservation biology and ecological restoration.	
2.	Aı	nswer <u>any two</u> questions:	
	a)		2×4=8
	b)	'Economy and environment are joint system' – explain.	4
	c)	Experimentally show that I say	4
	d)	Experimentally show the role of key stone species in an ecosystem.	4
	u)	Explain evenness index.	4
3.	An	swer <u>any one</u> question:	×8=8
	a)	Elaborate the behavior of Lotka Voltera model in interspecific competition	8-6
		necessary diagram at zero isocline.	
		What are reintroduction and rehabilitation? State the difference between	8
		community and meta population. 'Ecotourism is more than travel to appre	meta
		nature' - explain.	ciate
		3+;	3+2

Unit II: ZOO 403B.2 (Human Ecology)

4.	Answer <u>any two</u> questions:	2×2=4
	a) What do you mean by biotic homogenization?	
	b) What are radioactive wastes?	
	c) Distinguish between SEA and CEA.	
	d) What is stone cancer?	
5.	Answer <u>any two</u> questions:	2×4=8
	a) What are the advantages of biopesticides over the others?	4
	b) State the conditions of thermal inversion.	4
	c) Discuss the major environmental problem in big cities with special reference water pollution.	e to air and
	d) What are the types of wastelands? Why watershed is important?	2+2
6. <i>A</i>	Answer <u>any one</u> question:	1×8=8
a) Discuss the major causes of climate change. Differentiate between point and r	ion
	point pollution. What are different types of carbon sequestration?	3+2+3
b)	Write notes on any two:	515
	i) Different types of agricultural solid waste	5+5
	ii) Cause and effect of landscape change	
	iii) Different steps of EIA	
	iv) Types of soil erosion	

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

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: ZOO 401.1 (Environmental Pollution & Management)

1.	Answer <u>any two</u> questions: 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.	2×2=4
	Answer <u>any two</u> questions: a) Comment on the effect of Arsenic pollution in our life. b) Comment on different approaches of managing bioinvasion in forests. c) What is algal bloom? What are the measures to control water pollution? d) Write a short note on photochemical smog.	2×4=8 4 2+2 1+3 4
	 Answer <u>any one</u> question: a) What are the indicative stress reactions of aquatic ecosystems that as bioindication? Discuss about the impact of acid rain on aquatic system. b) Enumerate the measures to reduce emission of air pollutants from fact automobiles, giving brief descriptions of various such measures. 	

Unit II: ZOO 401.2 (Biostatistics)

4. Answer any two questions: $2 \times 2 = 4$ a) Differentiate ordinal from nominal variables with examples. b) What is the standardized normal distribution? c) Fill the blank: SE is the ____of the mean of ____means and complete the equation: $Z = \frac{(\bullet - \bullet)}{\sigma}$ (Where Z is the Z-score). d) If a model underestimates an observation, will the residual be positive or negative? What about if it overestimates the observation? 5. Answer *any two* questions: $2 \times 4 = 8$ a) What are the basic properties of Binomial distribution? State its expressions. 3+1b) What is the level of significance in hypothesis testing and how does it relate to the p-value? What is the standard deviation of the sample weights (in grams) for a group of laboratory mice: 20, 23, 21, 20, 26, 29, 24, 28, 19? c) Differentiate type I error with type II errors with examples. Suppose you have collected data regarding the number of common mormon butterfly sightings in a college campus with ten field visits. The data consists of the following observations: 10, 05, 20, 21, 19, 04, 13, 11, 30, 45. Represent this data in a box-and-whisker plot. d) According to historical records, the average number of hospitalizations for acute myocardial infarction (AMI) in a city per day is 4.4 individuals. Now can you calculate what is the probability of exactly one case of AMI-related hospitalization in the city on any given day? $1 \times 8 = 8$

6. Answer any one question:

a) Name two non-parametric test with their equivalent parametric tests. Under what circumstances can the chi-square test, t-test, ANOVA, and regression analysis be utilized? Law might eventually specify that new automobiles must average, for example, 15 km per litre (kmpl) of gasoline. Because it's impossible to test all new cars, compliance tests would be based on random samples from the entire production of each car model. Here is the sample data for a particular population of car: 12,16,13,14,13,17,15. Does the mean gas mileage for the population of cars drop below the legally required minimum of 15 kmpl?

2+2+4

b) Here is the height (in feet) and weight (in kg) data of 10 people. From the data calculate the covariance, correlation coefficient and r² value of the variables. Also calculate the F-value for the data. Comment on the result.

Height	5.9	5.6	6.1	50	155	1.0				2+2+2+2	
		5.0		5.8	5.5	5.9	5.7	6.0	5.8	5.6	
Weight	70	68	75	72	65	73	60		71	3.0	
					1	175	00	76	1/1	67	

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

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: ZOO 402.1 (Developmental Biology)

1.	A	answer <u>any two</u> 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.	Aı	nswer <u>any two</u> questions:	2×4=8
	a)	'Amphibian axis formation combines both autonomous and conditional specifi	
		- 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	
			4
	d)	What is AEC? How retinoic acid influence regeneration of salamander limbs?	1+3
		The second secon	173
	An	swer <u>any one</u> question:	1×8=8
	a)	What is Nieuwkoop center of an amphibian blastula? Define organizer with	1.9-8
		example. Write down the functions of the organizer. 'The default fate of the example.'	suitable
		1s to form neural tissue' – explain	
	b)		2+2)+3
		i) Briefly describe the events associated with ZP3 mediated acrosome read mammalian sperm.	tion in
		ii) 'Wnt signaling is the dominant encoder of axis formation in Hvdra" – explain	4
		is the dominant encoder of axis formation in Hydra" - explain	in 4

Unit II: ZOO 402.2 (Neuroendocrinology)

	4.	Answer <u>any two</u> questions:	2×2=4
		a) What is Synomone?	
		b) State the different types of Jak and STAT proteins.	
		c) What do you mean by neural pruning?	
		d) Mention two neuroendocrine abnormalities found in Parkinson's disese.	
	5. 4	Answer <u>any two</u> questions:	
			2×4=8
		a) Briefly explain the genetical aspect of type I diabetes.	4
		b) Write down the molecular mechanism of synaptic vesicle fusion.	4
		c) Explain the role of calcium-calmodulin dependent protein kinase in neurotran	nsmitter
		section. State the role of synaptotagmin and synaptobrevin.	2+2
	(d) Briefly describe the mechanism of action of NGF in neuronal differentiation.	4
ó.	Aı	nswer <u>any one</u> question:	1×8=8
	a)	i) Describe the role of App protein in Alzheimer's disease.	
		ii) How does AD contribute to the loss of synaptic homeostasis?	4+4
	b)	Discuss the functional differences between ionotropic and metabotropic re-	eceptor
		iefly describe the role of metabotropic receptor in synaptic communication.	4+4