WEST BENGAL STATE UNIVERSITY

B.Sc. Honours Part-II Examination, 2022

ZOOLOGY

PAPER: ZOOA-IV

Time Allotted: 4 Hours   Full Marks: 100

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

GROUP-A

[Marks-50]

1.   Answer any *five* questions from the following: $2 \times 5 = 10$

 (a) What is particulate theory of inheritance?

 (b) Mention two differences between TEM and SEM.

 (c) What are UTR and ORF?

 (d) What is Chargaff's rule?

 (e) Name one transposable element in bacteria and one in human.

 (f) What are auxotrophic and loss-of-function mutations?

 (g) What is polyadenylation of mRNA?

 (h) Briefly mention role of p53 gene in cell cycle regulation.

2.   Answer any *one* question from the following: $6 \times 1 = 6$

 (a) (i) State the genetic basis of Cri-du-chat and Turner's syndrome in human and mention their symptoms.   3

 (ii) A hemophilic man marries an albino woman and produce one boy and one girl. Will these offspring be normal? Justify your answer.   3

 (b) (i) In grasshopper rosy body color is caused by a recessive mutation; the wild type body color is green. If the gene for body color is on the X chromosome, what kind of progeny would be obtained in F1 generation from a mating between a homozygous rosy female and a hemizygous wild-type male? (In grasshopper, females are XX and males are XO).   3

 (ii) Site one example of each of the following: 1+1+1

 Sex-influenced inheritance in human, sex-linked inheritance in human and sex-lethal inheritance in *Drosophila* sp.

3. Answer any *one* question from the following: 10×1 = 10

(a) Singed bristles (sn), crossveinless wings (cv) and vermilion eye color (v) are due to recessive mutant alleles of three X-linked genes in *Drosophila melanogaster*. When a female heterozygous for each of the three genes was testcrossed with a singed, crossveinless, vermilion male, the following progeny were obtained: 2+5+3

Class	Phenotype	No. of Progeny
1.	Singed, crossveinless, vermilion	3
2.	Crossveinless, vermilion	392
3.	Vermilion	34
4.	Crossveinless	61
5.	Singed, crossveinless	32
6.	Singed, vermilion	65
7.	Singed	410
8.	Wild-type	3
	Total	1000

(i) What is the correct order of these genes on the X chromosome?

(ii) What are the genetic map distance between sn and cv, sn and v, and cv and v?

(iii) What is the co-efficient of coincidence for interference between given genes?

(b) (i) The F1 from a cross of AB/AB × ab/ab is testcrossed resulting in the following phenotypic ratios: 6+2+2

AB   308
Ab   190
ab   292
aB   210

What is the frequency of recombination between gene a and b?

(ii) Why observed double cross over (DCO) classes are usually less in number than expected?

(iii) What is linkage disequilibrium?

4. Answer any *two* questions from the following: 7×2 = 14

(a) (i) Explain why resolving power of light microscope is limited within 0.2 μm. 2+5

(ii) What are the contributions of Golgi complex and ER in maturation and secretion of protein outside cell? Discuss with diagram.

(b) (i) What are the major differences between rho-dependent and rho-independent processes of transcriptional termination in prokaryotes? 3+2+2

(ii) State the role of sigma factors in the process of transcriptional inhibition in bacteria.

(iii) What is the function of peptidyl transferase?

(c) (i) How does a mRNA mature from a pre-mRNA in eukaryotes? Describe with diagram. 6+1

(ii) What is coupled transcription-translation process?

(d) (i) State the components that constitute MPF.   2+4+1

    (ii) Explain the molecular mechanism involved in metaphase checkpoint of eukaryotic mitotic cell cycle with diagrammatic illustration.

    (iii) Distinguish between extrinsic and intrinsic membrane proteins.

5.   Answer any ***one*** question from the following: 10×1 = 10

  (a) Write short notes on any ***two*** of the following: 5×2

    (i) Dideoxy chain termination

    (ii) cDNA library

    (iii) Restriction endonucleases and its application

    (iv) Cloning method.

  (b) (i) What are artificial chromosomes?   2+2+2+2+2

    (ii) What is reverse transcription PCR?

    (iii) Name one plasmid vector and one GM crop.

    (iv) What are SNPs?

    (v) Give one example of biotechnology used in health and medicine industry.

GROUP-B

[Marks-50]

6.   Answer any ***five*** questions from the following: 2×5 = 10

  (a) State the basic structure of steroid.

  (b) Write the name of any enzyme stating its E.C. number.

  (c) What is hn RNA?

  (d) What is a phosphodiester bond and where is it found?

  (e) Distinguish between fat and oil.

  (f) Name any two electron transport inhibitors mentioning their site of action.

  (g) Name two unusual bases present in tRNA.

  (h) Why are amino acids amphoteric in nature?

7.   Answer any ***two*** questions from the following: 7×2 = 14

  (a) Name two amino acids which can act as precursors of neoglucogenesis. Name two sites of a mammalian body in which the process takes place. Mention three important bypass reactions of neoglucogenesis.   2+2+3

  (b) Define K_m. What is expected to happen when   7

    (i) [S] is much less than K_m?

    (ii) [S] is much greater than K_m?

    (iii) [S] is equal to K_m?

  (c) Distinguish between   3+2+2

    (i) Competitive and non-competitive inhibition of enzyme activity

    (ii) Euchromatin and heterochromatin

    (iii) D-glucose and L-glucose.

(d) Explain why and how ETC (Electron Transport Chain) and oxidative phosphorylation is termed as a coupled process. Mention the significance of ETC.

4+3

8. Answer any *one* question from the following:

10×1 = 10

(a) Describe the process of HMP shunt pathway with a flow diagram. Explain the energetics of glycolytic pathway. What is Lineweaver Burk plot?

6+2+2

(b) What is the role of carnitine in the mitochondrial β-oxidation of fatty acids? In what way does saturated and unsaturated fatty acids differ? Why is Kreb's cycle called amphibolic cycle?

5+3+2

9. Answer any *one* question from the following:

6×1 = 6

(a) What do you mean by secondary structure of a protein? What are the two main types of secondary structure in protein? How do they differ? Mention the different bonds involved in formation of higher order structure of protein.

1+1+2+2

(b) Explain retardation factor (R_f) in connection with chromatography. Distinguish between velocity gradient and density gradient ultracentrifugation. How native PAGE is different from SDS-PAGE?

2+2+2

10. Answer any *one* question from the following:

10×1 = 10

(a) Describe the principle and methodology of Western blotting. Explain Bragg's Law. Write the application of X-ray crystallography.

(2+3)+2+3

(b) Draw and describe the structure of Watson-Crick Model of B-DNA organization. How B-DNA differ from Z-DNA? Name the three distinct segments of a mature or processed eukaryotic m-RNA molecule.

6+2+2

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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