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14 (ZOO-1) 1014

**2021**

**( Held in 2022 )**

**ZOOLOGY**

Paper : ZOO -1014

Full Marks : 20+20=40

Time : Two hours

***The figures in the margin indicate full marks for the questions.***

**UNIT-1**

*Answer Q. No. 1 and any three from the rest.*

1. Define the following : 1×5=5
- (a) Polytypic species
  - (b) Taxonomic Category
  - (c) Allometric Variation
  - (d) Sibling species
  - (e) Gynandromorphs.

*Contd.*

2. Compare between allopatric and allochronic populations. Add a note on peripatric speciation with example. 2+3=5
3. What do you understand by a superspecies ?  
—Elaborate with an example. Highlight the difficulties in application of subspecies categories. 5
4. Explain the genetic variations within a population with suitable examples. 5
5. Discuss the application and interpretation of *any three* important rules of taxonomic nomenclature. Highlight the importance of the International Code of Nomenclature. 3+2=5

## UNIT-II

*Answer Q. No. 1 and any three from the rest.*

1. Write very short answers of the following questions : **(any five)** 1×5=5
  - (a) Define stratified random sampling.
  - (b) A random sample of size 100 has mean 15, population variance being 25. Find standard error.

- (c) What is Kruskal-Wallis test ?
- (d) Prove that the correlation coefficient is the geometric mean of regression coefficient.
- (e) What is null hypothesis ?
- (f) What is  $t$ -test ?

2. Define Quartile. What do you mean by lower, middle and upper quartile ? Determine Quartiles from the following distribution :

$$2+3=5$$

Weight ( $lbs$ )( $X$ )	:	15	16	17	18	19	20
No. of Children ( $f$ )	:	2	4	5	4	3	2

3. What do you mean by positive, negative and zero correlation ? Define coefficient of correlation between two variables with its formula and range of this coefficient.

$$3+2=5$$

4. Distinguish between parametric and non-parametric test. Explain the concept of ANOVA and techniques of calculating one-way ANOVA.

$$2+3=5$$

5. Calculate Standard deviation of the following distribution : 5

Weekly : 130 - 150 150 - 170 170 - 190 190 - 210 210 - 230  
wages

No. of : 8 26 59 43 12  
Persons



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14 (ZOO-1) 1024

**2021**  
**( Held in 2022 )**

**ZOOLOGY**

Paper : ZOO-1024

Full Marks : 20+20=40

Time : Two hours

***The figures in the margin indicate full marks for the questions.***

**UNIT-I**

***Q. No. 4 is comopulsory and answer any two questions from the rest :***

1. What are the different applications of sequence analysis ? Mention different types of sequence alignment methods. Obtain the optimal global alignment using dynamic programming method for the following two sequences using any scoring scheme of your choice

S1 = AATTCGCGTA and

S2 = TATCGCTACA

7

*Contd.*

2. As a Bioinformatician what would be your primary analytical strategies if you are provided with a gene sequence of an organism whose genome is yet to be annotated, how will you proceed forward via *in silico* analysis to annotate the gene. 7

3. What is molecular phylogeny? Define distance and character based methods of tree building. Construct a phylogenetic tree using any of the character based method for the following multiple sequence alignment. Consider orangutan as outgroup

Human	TTAGCTACT	
Chimpanzee	CTAGCTCCC	
Gorilla	CTGGCCACT	
Orangutan	CTGGACCCT	7

4. Answer **any three** questions from the following :  $2 \times 3 = 6$

(a) Define similarity, identity and homology in terms of protein sequence.

(b) List down *any two* biological sequence formats with suitable examples.

(c) Discuss about Protein Data Bank.

(d) Discuss the various structure based drug design approaches.

- (e) Based on sequence identity and query coverage how will you select the method of protein structure prediction ?
- (f) What are the differences between PAM and BLOSUM matrix ?

## UNIT-II

*Q. No. 1 and Q. No. 2 are compulsory and any three from the rest.*

1. (a) Which subclass of antibody is generally used as primary and secondary antibodies in ELISA ? 1
- (b) If the half life of 100g of radioactive isotope is 8 years, how many (g) will remain in 32 years ? 1
2. Write down the different methods of probe labelling. 3
3. What is serial block-face and focused ion beam electron microscopy ? Write in brief about the fixation and staining technique for Electron microscopy. 1+4=5

4. Which format of chromatography is useful for extraction of volatile lipids from a mixture of carbohydrates and non-volatile lipids mixture? Write down the principle and application of HPLC. 1+4=5
  
  5. Write a comparative note on Southern and Northern blotting. 5
  
  6. Write the principle and procedure of RIA. Add a note on its applications. 1+3+1=5
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14 (ZOO-1) 1034

**2021**

**( Held in 2022 )**

**ZOOLOGY**

Paper : ZOO-1034

Full Marks : 20+20=40

Time : Two hours

***The figures in the margin indicate full marks for the questions.***

**UNIT-I**

Question Nos. 1 and 2 are **compulsory**.  
Answer **any three** questions from the rest.

1. Choose the correct answer :  $1 \times 2 = 2$
- (a) Which compound were formed during the origin of life ?
- (i) Urea, amino acid
- (ii) Urea, nucleic acid

Contd.

(iii) Proteins, nucleic acid

(iv) Proteins, amino acid

(b) What did Stanley Miller synthesize in their evolution experiment ?

(i) Virus

(ii) Protein

(iii) Cell

(iv) Amino acid

2. Write short notes on **any two** from the following questions :  $1\frac{1}{2} \times 2 = 3$

(a) Pre-biotic molecules

(b) Prokaryotes

(c) Kimura hypothesis.

3. Describe the changes in hereditary instructions in relation to evolution. 5

4. Describe the bottleneck effect of genetic drift with example. 5

5. Describe the isolation mechanism of evolution and their role in speciation. 5

6. Describe the theory of Neo-Darwinism with examples. 5

7. Describe the principle of origin of new genes and proteins. 5

## UNIT-II

*Question Nos. 1 and 2 are compulsory.  
Answer **any three** questions from the rest.*

1. Choose the correct answer :  $1 \times 2 = 2$

(a) A biological rhythm is best defined as —

- (i) Heart beat of an animal
- (ii) The growth of a plant or animal
- (iii) The cyclical activity of an animal
- (iv) A change over time

(b) When there is a chronic deficiency in sleep the situation is called —

- (i) Jetlag
- (ii) rotating shift work
- (iii) circadian rhythm
- (iv) sleep debt

2. Write short notes on **any two** from the following :  $1 \frac{1}{2} \times 2 = 3$

- (a) Circannual rhythm
- (b) Zeitgebers
- (c) Entrainment.

3. Describe the working principle of biological clock. Write the factors affecting the biological clock. 3+2=5
  4. Define circalunar rhythm with a suitable example. Describe the factors influencing biological rhythms. 2+3=5
  5. Describe the molecular basis of circadian rhythms in drosophila clock gene. 5
  6. Write short notes on **any two** from the following : 2½×2=5
    - (a) SCN
    - (b) Depression and sleep disorders
    - (c) Human circadian rhythms
    - (d) Chronopharmacology.
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14 (ZOO-1) 1044

**2021**

**( Held in 2022 )**

**ZOOLOGY**

Paper : ZOO-1044

Full Marks : 30+10=40

Time : Two hours

***The figures in the margin indicate full marks for the questions.***

**UNIT-1**

Answer Q.No. **1** and **any three** from the rest.

1. Answer **any six** questions from the following : 1×6=6

(a) Define Pleiotropy.

(b) Write *two* characteristics of Z-DNA.

(c) What is Philadelphia chromosome ?

(d) Name the transition in amino acid sequence of  $\beta$ -globin gene in sickle cell anemia disease.

*Contd.*

- (e) Write the name of the virus causing cervical cancer in human female.
- (f) Write the advantage of pUC19 plasmid over pBR322 plasmid during cloning.
- (g) Which gene of mitochondrial DNA is used for DNA barcoding of mammal?
2. Write with suitable diagram about the structure of a typical bacteriophage with a note on phage therapy.  $5+3=8$
3. Define oncogenes and proto-oncogenes. Explain with suitable example how chromosomal rearrangement leads to formation of cancer in human.  $2+6=8$
4. Describe the process of transformation and transduction in bacteria with suitable diagram.  $4+4=8$
5. Write short notes on **any two** from the following:  $4 \times 2 = 8$
- (a) Organization of chromatin in eukaryotic cells
- (b) Tumour suppressor genes
- (c) Tumour inducing retroviruses.

## UNIT-2

Answer Q.No. 1 and **any one** from the rest.

1. Answer **any three** from the following :

1×3=3

- (a) What are the functions of puffs of polytene chromosome ?
- (b) Name the enzymes responsible for sex determination in reptiles.
- (c) State the probable reasons when an individual with 44+XY karyotype is phenotypically female.
- (d) What is sex mosaic ?
- (e) Name *any two* genetic diseases caused due to sex chromosome anomalies.

2. What are giant chromosomes ? Describe the types of giant chromosomes with a note on mechanism of formation of giant chromosome.

1+3+3=7

3. What is dosage compensation ? How dosage compensation mechanism in *Drosophila* is different from mammals.

1+6=7

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14 (ZOO-1) 1054

**2021**

**( Held in 2022 )**

**ZOOLOGY**

Paper : ZOO-1054

Full Marks : 20+20=40

Time : Two hours

***The figures in the margin indicate full marks for the questions.***

**UNIT-1**

*Answer Q. No. 1 and any three from the rest.*

1. Fill in the blanks : **(any five)** 1×5=5

(a) The amount of radiant energy in all wave-lengths that crosses unit area per unit time is called \_\_\_\_\_.

(b) The vertical components of benthos are known as \_\_\_\_\_ and \_\_\_\_\_.

Contd.

- (c) The rooted vegetation along the shore is called as \_\_\_\_\_ zone.
- (d) Open water dominated by plankton is called as \_\_\_\_\_ zone.
- (e) The wetlands those are associated with lakes, ponds or dammed river channels are called as \_\_\_\_\_ wetlands.
- (f) The rapid growth portion of the Sigmoid curve is referred to as \_\_\_\_\_.

2. What do you know about the concept of Ecological niche ? Write about the types of Ecological niche. 1+4=5

3. Define population regulation. Write in details about density-dependent factors of population regulation. 1+4=5

4. (a) Write short notes on food chain and its types.

(b) Draw *any one* energy flow model.

$2\frac{1}{2} \times 2 = 5$

5. Define population and write about different attributes of population. 5

## UNIT-II

Answer Q. No. 1 and **any one** from the rest.

1. Answer **any four** questions from the following : 2½×4=10
    - (a) Nutrient Cycle.
    - (b) Anthropogenic interferences to Global carbon cycle.
    - (c) Define global warming and its causes.
    - (d) Principles of Biodiversity Conservation.
    - (e) Describe Global sulphur cycle.
  2. Write an elaborate note on the Environmental monitoring and documentation. 10
  3. Write a note on the Indirect drivers of biodiversity changes. 10
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14 (ZOO-1) 1064

**2021**

**( Held in 2022 )**

**ZOOLOGY**

Paper : ZOO-1064

Full Marks : 20+20=40

Time : Two hours

***The figures in the margin indicate full marks for the questions.***

**UNIT-I**

Question Nos. 1 and 2 are **compulsory**.  
Answer **any three** questions from the rest.

1. What is redox potential ? Calculate redox potential  $E$  of the system  $\text{NAD}^+/\text{NADH}$  against hydrogen electrode, if the standard redox potential  $E'_0$  is  $0.32V$  and ratio  $\text{NAD}^+/\text{NADH}$  is  $10 : 1$ . (Temp.  $25^\circ\text{C}$ ,  $R = 8.3143\text{J.K}^{-1}\text{mol}^{-1}$ ,  $F = 96487\text{J.V}^{-1}\text{mol}^{-1}$ )  
1+2=3

Contd.

2. Consider a 51 residue long protein containing only 100 bonds about which rotation can occur. Assume that 3 orientations per bond are possible. Based on these assumptions, how many conformation will be possible for this protein? 2

3. Comment on how enzyme kinetics is different from equilibrium kinetics and what is the disadvantage of equilibrium kinetics for studying enzyme.

The  $K_m$  of a Michaelis-Menten enzyme for a substrate is  $1.0 \times 10^{-4}M$ . At a substrate concentration of  $0.20M$ ,  $V_0 = 43\mu M/min$  for a certain enzyme concentration. What is the value of  $V_0$  for this enzyme at a substrate concentration of  $0.20M$ ? 3+2=5

4. Write an explanatory note on coordinate regulation of glycolysis and gluconeogenesis. 5

5. What is allosteric regulation? Discuss the different types of allosteric regulation with proper illustration. 1+4=5

6. Write in detail about peptide bond formation and torsional rotation with diagram. Write down the salient features of Ramachandran plot. 2+3=5

## UNIT-II

Question Nos. 1 and 2 are **compulsory**.  
Answer **any three** questions from the rest.

1. The plasmid cDNA is a closed circular double-stranded DNA molecule with 5,500bp.

(a) How many helical turns are there in relaxed molecule ?

(b) What is the linking number of molecule when it is relaxed B-DNA ?

$$1+1=2$$

2. Draw Shuttle for transfer acetyl groups from mitochondria to the cytosol or citrate malate pyruvate shuttle in fatty acid biosynthesis. Also write the net equation of fatty acid synthesis.

$$2+1=3$$

3. Write down the detailed pathway of Ornithine-Urea cycle. Add a note on the significance of Urea cycle.

$$4+1=5$$

4. What is promoter ? Write in details about the different types of RNA polymerase promoters of eukaryotes.

$$1+4=5$$

5. Write short notes on : 2+3=5
- (a) Telomere replication
  - (b) Replication of Mitochondrial DNA.
6. Explain the mechanism of 5'-capping and polyadenylation of eukaryotic pre-mRNA. 3+2=5
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