PG/IVS/ZOOL/Z-403/09

2009

ZOOLOGY

PAPER—Z-403

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

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

Ilustrate the answers wherever necessary

(*Fishery Special*)

GROUP—A

(*Limnology and Oceanography*)

1. Answer *two* questions from the following: 2 × 2

(*a*) Depict the global distribution of water through Pie-chart.

(*b*) Enlist major chemical components of sea-water.

(*c*) Define and mention different subzones in coastal environment.

(*d*) Why upwelling is directly connected with fishery productivity?

2. Answer *two* questions from the following: 4 × 2

(*a*) Briefly highlight the values of wetland.

(*b*) Give a classificatory scheme of plankton.

(*c*) Why mangrove ecosystem is considered as most productive ecosystem?

(*d*) Mention differences between lotic and lentic water bodies based on their physicochemical properties.

3. Answer *one* question from the following: 8×1

(*a*) Define Lake. Give a classificatory scheme of lake based on its origin, productivity and mixing pattern. Add a note on the seasonal dynamics of thermal stratification. $1\frac{1}{2} + 4(1 + 1 + 2) + 2\frac{1}{2}$

(*b*) Define tide. How does it form? Mention it's different types and significance. $2 + 2 + 2 + 2$

GROUP—B

(*Inland and Marine Fisheries*)

4. Answer *two* questions from the following: 2×2

(*a*) Name the marine products of India having export potential.

(*b*) State the mode of functioning of 'facultative stabilization pond.

(*c*) What are the major differences between inshore and offshore fisheries ?

(*d*) Write down the adverse effects of raw sewage on aquatic life.

5. Answer any *two* of the following: 4 × 2

(*a*) Write short notes on any *two*: 2 × 2

(*i*) Conservation and management practices of marine fisheries

(*ii*) Public health fishery

(*iii*) Composition of sewage.

(*b*) What is estuary ? State the divisions of an estuary on the basis of salinity. 2 + 2

(*c*) Write short notes on: 2×2

(*i*) Management of the mangrove environment

(*ii*) Fish resources in inland water bodies.

(*d*) (*i*) State the different trophic phase of a new reservoir.

(*ii*) Name two cultivable shell-fish in India. 2×2

6. Answer *one* of the following: 8×1

(*a*) (*i*) What is remote sensing? How it works? $1 + 2\frac{1}{2}$

(*ii*) Distinguish between Active Remote Sensor Vs. Passive Remote Sensor. $2\frac{1}{2}$

(*iii*) State the uses of remote sensing system. 2

(*b*) Write short notes on any *four*: 2×4

(*i*) Eutrophication in reservoir

(*ii*) Chemical nature of raw sewage

(*iii*) Pelagic and demersal fisheries

(*iv*) Exclusive Economic Zone (EEZ)

(*v*) Coastal Regulation Zone (CRZ)

(*vi*) Law of demishing return

(*vii*) Back Water Fishery

(*viii*) Fish migration.

GROUP—A

(*Human Ecology*)

1. Answer any *two* of the following: 2×2

(*a*) What is thermal inversion?

(*b*) Differentiate between point and non-point pollution.

(*c*) Distinguish between restoration and reclamation.

(*d*) State two compelling reasons for carrying out ecological restoration.

2. Answer any *two* of the following: 4 × 2

(*a*) What are total fertility rate and replacement fertility? State impact of these on the human demography?

(*b*) Enlist negative and positive impacts of urbanization on biodiversity.

(*c*) Enlist types of indoor pollution.

(*d*) Justify the statement— Ecotourism and Sustainable development are interdependant.

3. Answer *one* of the following: 8 × 1

(*a*) Discuss the human population growth on the basis of doubling time. Calculate the doubling time for a population which is growing at a rate of 1·75% per year. In which year global population crossed the 6 billion mark. 5 + 2 + 1

(*b*) Classify different types of solid wastes on the basis of their source and chemical nature. Mention various management strategies adopted for solid wastes. 4 + 4

GROUP—B

(*Aquatic Ecology*)

4. Answer *two* questions from the following: 2 × 2

(*a*) Make a schematic classification of zooplankton

(*b*) Write a note on Bioremediation.

(*c*) Mention different zones in marine environment.

(*d*) Define thermal stratification.

5. Answer *two* questions from the following: 4 × 2

(*a*) Classify cakes based on mixing patterns.

(*b*) Mention threats to coreal ecosystem in India.

(*c*) Highlight the objectives of Integrated Coastal Zone management.

(*d*) Conservation strategy for marine biodiversity.

6. Answer *one* question from the following: 8 × 1

(*a*) Mention the types, source and physicochemical properties of waste water. Briefly discuss operating principle of tertiary sewage water treatment plant. (1 + 1 + 3) + 3

(*b*) Define mangrove ecosystem. Why this ecosystem is considered as the most productive ecosystem? Mention the structural components of this ecosystem. 2 + 3 + 3

(*Genetics & Molecular Biology Special*)

GROUP—A

(*Recombinant DNA and Molecular Analysis*)

1. Answer any *two* questions: 2 × 2

(*a*) Compare the purposes of *denaturating* and *non-denaturating* gel electrophoresis of proteins. 2

(*b*) What is a *reporter* gene ? Cite example. 1 + 1

(*c*) Briefly describe the principle of *mass spectrometry*. 2

(*d*) Which one of the following is most variable in an organism— *genome*, *proteome* or *transcriptome* ? Explain your answer with proper arguments. 2

2. Answer any *two* questions: 4 × 2

(*a*) A diploid animal cell contains 2×10^6 base pairs of DNA:

(*i*) How many *nucleosomes* are present in the cell ?

(*ii*) Give the numbers of molecules of each type of *histone proteins* associated with genomic DNA. 2 + 2

(*b*) Compare *siRNA* and *miRNA*. Mention at least two functions/applications of each of them. 2 + 2

(*c*) A 14 kb long piece of DNA is cut with EcoRI alone; by Sma I alone and both with Eco RI and Sma I in three separate reactions. The following results were obtained:

EcoRI reaction: 3-kb, 5-kb and 6-kb fragments

Sma I reaction: 7-kb and 7-kb fragments

Eco RI + Sma I reaction: 2-kb, 3-kb, 4-kb and 5-kb fragments.

Draw a map of the Eco RI and Sma I sites on this 14-kb piece of DNA indicating the relative positions of the restriction sites and distances between them. 4

(*d*) (*i*) What is the purpose of using *dideoxynucleotide* in *dideoxy sequencing reaction*?

(*ii*) What is *hot-start PCR*? When is it performed? 2 + 2

3. Answer any *one* question: 8 × 1

(*a*) (*i*) Briefly describe the working principle of *molecular beacons*.

(*ii*) Why *molecular beacons* are preferred over regular *DNA-intercalating dyes* during *quantitative PCR*?

(*iii*) What is C_T *value*?

(*iv*) Why *bis-acrylamide* is used in *polyacrylamide gels*? 2 + 2 + 2 + 2

(*b*) (*i*) What are the most common types of *histone modifications found in eukaryotes*?

(*ii*) Describe the *cellular functions of histone modifications*,

(*iii*) Give a schematic representation for large-scale *production of human growth hormone in E. coli*. 2 + 2 + 4

GROUP—B

(*Applied Genetics*)

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

(*a*) In *Huntington's disease*, *fragile X syndrome* and *Progressive motor degeneration*. All these diseases involve intergenic triplets. Mention them specifically for each disease.

(*b*) What do you mean by *Tn 5* element?

(*c*) Write the biological application of *Monoclonal antibody* (*MAb*).

(*d*) Give an estimated account of possible *immunoglobulin diversity* in human.

5. Answer any *two* questions from the following: 4 × 2

(*a*) Mention the characteristics feature of *IS element* with diagram. What is the difference between IS element and a *composite transposon*? 2 + 2

(*b*) What are *satellite DNAs* and explain the following classes of satellite DNA: 4

(*i*) Satellite 2 + 3

(*ii*) Satellite 1

(*iii*) α (*alphoid* DNA)

(*iv*) β (*Sau 3a* family).

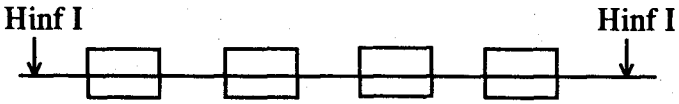
(*c*) What is *autoimmunity*? Add a note on *Myasthenia gravis*? 1 + 3

(*d*) Briefly describe the process of *RAG1/2 dependent recombination* process during generation of antibody diversity . 4

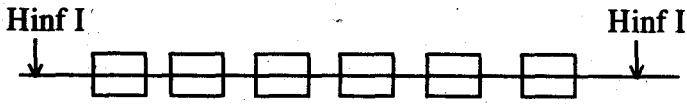
6. Answer any *one* question from the following: 8 × 1

(*a*) The diagarm below is an assumed distribution pattern of *similar tandem repeats* of six individuals in certain Indian populations. Arrows indicate the cutting sites of the enzyme *Hinf* I (*Haemophilus influengae*) adjacent to them.

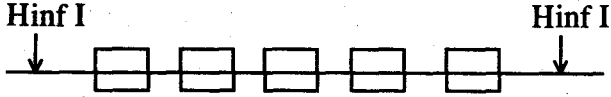
(*i*)

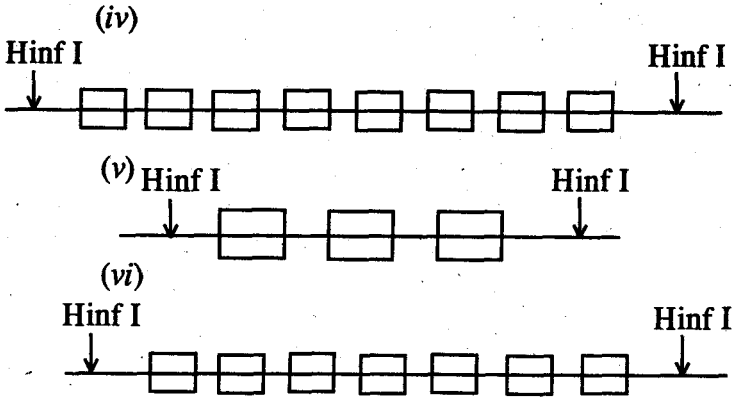


(*ii*)



(*iii*)





Draw how a DNA gel electrophoresis pattern of the DNA fragments would look like, after you digest the DNA of these six persons with *Hinf* I and hybridize them with labelled probes of the repeats & do an autoradiography. 8

(*b*) Write the principle of *immunofluorescence*. Describe briefly about *direct* and *indirect* immunofluorescence techniques. Mention its applications. 2 + 5 + 1