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63/2 (SEM-3) ZOO 301 (N/O)

2022

(Held in 2023)

ZOOLOGY

(Theory Paper)

Paper Code : ZOO 301

(New and Old)

(Biological Tools And Techniques)

Full Marks – 80

Pass Marks – 32

Time – Three hours

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

1. Choose the correct answers from the following
(all compulsory) : 1×6=6
 - (a) In a Transmission Electron Microscope (TEM), images collected from tissue section will show dark spots at chromosome region while the cytoplasm will show almost white spots, because
 - (i) Cytoplasm cannot be stained by osmium tetra oxide

[Turn over

- (ii) Chromosome is high molecular weight compared to cytoplasmic contents
 - (iii) Chromosome reflects all the electron beams
 - (iv) Cytoplasm absorbs all the electron beams
- (b) Which of the following factors increases the sedimentation of molecules during centrifugation ?
- (i) Small size of the separating molecules
 - (ii) High viscosity of the medium
 - (iii) Higher buoyancy property of the medium
 - (iv) Bigger size of separating molecule
- (c) Movement of molecules during isoelectric focusing is based on
- (i) pH of the molecule
 - (ii) Isoelectric point of the molecule
 - (iii) Mass of the molecule
 - (iv) Charge of the gel matrix

- (d) Two protein molecules of the same molecular weight may migrate to different positions during electrophoresis, because of
- (i) charge difference
 - (ii) size difference
 - (iii) Both (i) and (ii) above
 - (iv) Either (i) or (ii) above
- (e) If a PCR machine working 70% efficiency produces 142 copies of product after five cycles of PCR, what was the initial number of DNA templates ?
- (i) Ten
 - (ii) Eight
 - (iii) Nine
 - (iv) Eleven
- (f) Which of the following reaction can modify and cut both Thymine and Cytosine during chemical method of DNA sequencing ?
- (i) Hydrazine, Formic acid and Piperidine
 - (ii) Dimethyl sulfate and Piperidine
 - (iii) Hydrazine, Sodium chloride and Piperidine
 - (iv) Hydrazine and Piperidine

2. Answer the following questions (*all compulsory*)
 $2 \times 5 = 10$

- (i) What do you mean by optical sectioning?
- (ii) What are the advantages of density gradient centrifugation?
- (iii) What are universal and degenerate PCR primers?
- (iv) What are the differences between PCR cycle and DNA replication?
- (v) What do you mean by gene knockout?

3. Answer any *six* from the following questions :
 $5 \times 6 = 30$

- (a) Describe the miRNA gene silencing technique.
- (b) Describe how you establish parental relationship using DNA fingerprinting technique.
- (c) Describe the working principle of dark field microscope using suitable diagram.
- (d) Write a short note on ion exchange chromatography.

- (e) What is IC₅₀? How do you calculate it?
- (f) Write short note on CRISPER method of gene editing.
- (g) How colony hybridization techniques help to identify success of gene cloning?
- (h) What are the major factors that determine good primer designing?
- (i) Write short note on centrifugation technique.

4. Answer any *two* from the following questions :
 $10 \times 2 = 20$

- (a) Describe the working principles of scanning electron microscope using diagram. 10
- (b) Describe the Enzymatic method of DNA sequencing. Illustrate with a suitable DNA sequence and gel-banding diagram.
 $6 + 4 = 10$
- (c) Describe the different steps of a normal microtomy. How is microtomy different from cryotomy?
 $5 + 5 = 10$

5. Answer any *one* of the following questions :

$$14 \times 1 = 14$$

- (a) What is a blank solution in a colorimetric analysis? Describe colorimeter and spectrophotometer with diagrams. What are the major differences between the two instruments?

$$2 + 8 + 4 = 14$$

- (b) What is retention time? Describe the instrumentation setup and working principles of Gas and Affinity chromatography.

$$4 + 8 + 2 = 14$$