## J: BIOTECHNOLOGY

## Q. 1 - Q. 7 carry one mark each.

- Q.1 The method used for prediction of three dimensional structure of a protein from known structure(s) of one or more related proteins is
  - (A) Multiple sequence alignment
  - (B) Homology modeling
  - (C) Phylogeny
  - (D) Docking
- Q.2 To produce plants that are homozygous for all traits, the best choice is
  - (A) Protoplast culture
  - (B) Cell suspension culture
  - (C) Anther and pollen culture
  - (D) Apical meristem culture
- Q.3 Restriction endonucleases from two different organisms that recognize the same DNA sequence for cleavage are called
  - (A) Isoschizomers
  - (B) Isozymes
  - (C) Concatamers
  - (D) Palindromes
- Q.4 Caspases are involved in the process of
  - (A) DNA replication
  - (B) Mutation and recombination
  - (C) Antibody synthesis
  - (D) Apoptosis
- Q.5 Baculovirus expression system is used to express heterologous genes in
  - (A) Mammals
  - (B) Plants
  - (C) Insects
  - (D) Yeasts
- Q.6 A culture vessel in which physical, physicochemical and physiological conditions, as well as cell concentration, are kept constant is known as
  - (A) Cell concentrator
  - (B) Biostat
  - (C) Batch bioreactor
  - (D) Incubator
- Q.7 Virus resistant transgenic plants can be developed by the expression of
  - (A) Cowpea trypsin inhibitor
  - (B) Crystalline toxin protein
  - (C) Defective movement protein
  - (D) Snowdrop lectin

# Q. 8 to Q.21 carry two marks each.

- Q.8 Which of the following are commonly used as reporter genes?
  - P. NPT gene
  - Q. Luciferase gene
  - R. CFTR gene
  - S. GFP gene
  - (A) Q, S

(B) R, S

(C) P, R

- (D) P, Q
- Q.9 Which of the following statements are true about glyphosate tolerant transgenic plants?
  - P. Transgenic plants detoxify glyphosate.
  - Q. Transgenic plants produce an altered enzyme that is not affected by glyphosate.
  - R. Transgenic plants sequester glyphosate in vacuoles.
  - S. Transgenic plants overcome the inhibition of aromatic amino acid biosynthesis.
  - (A) P, Q

(B) R, S

(C)Q,S

- (D) P, R
- Match the items in Group 1 with an appropriate description in Group 2:

#### **Group 1**

- P. UPGMA
- O. CLUSTAL
- R. SWISS-PROT
- S. RasMol

- Group 2
- 1. Protein sequence database
- 2. Phylogenetic analysis
- 3. 3-D structure visualization
- 4. Multiple sequence alignment

- (A) P-4, Q-1, R-2, S-3
- (C) P-2, Q-3, R-1, S-4

- (B) P-2, Q-4, R-1, S-3
- (D) P-2, Q-1, R-4, S-3
- Match the properties in Group 1 with the downstream operations in Group 2: Q.11

### **Group 1**

- P. Size
- Q. Density
- R. Volatility
- S. Solubility

# Group 2

- 1. Extraction
- 2. Distillation
- 3. Filtration
- 4. Sedimentation

- (A) P-3, Q-4, R-2, S-1
- (C) P-4, Q-3, R-1, S-2

- (B) P-4, Q-1, R-2, S-3
- (D) P-3, Q-2, R-4, S-1
- Q.12 Match the items in Group 1 with their functions in Group 2:

## **Group 1**

# Group 2

- P. rol genes
- Q. Opines
- R. Virulence genes
- S. Aux and cyt genes
- (A) P-4, O-3, R-2, S-1
- (C) P-1, Q-3, R-4, S-2

- 1. Food and energy source
- 2. Tumor formation
- 3. Hairy root induction
- 4. T-DNA transfer and integration
- (B) P-3, Q-2, R-4, S-1
- (D) P-3, Q-1, R-4, S-2

- Q.13 Which of the following statements hold true for pluripotent stem cells (PSCs) under in vitro conditions?
  - P. PSCs can be maintained in an undifferentiated state.
  - Q. PSCs exhibit abnormal and unstable karyotypes.
  - R. PSCs can differentiate into a wide variety of cell types.
  - S. PSCs cannot be passaged continuously.
  - (A) P, Q

(B) P, R

(C) Q, R

- (D) Q, S
- Q.14 Determine the correctness or otherwise of the following Assertion (a) and Reason (r):

Assertion (a): IPTG (Isopropylthiogalactoside) is a gratuitous inducer of lac operon.

**Reason (r)**: IPTG is an efficient inducer, but not a substrate of *lac* operon.

- (A) Both (a) and (r) are true and (r) is the correct reason for (a).
- (B) Both (a) and (r) are true but (r) is not the correct reason for (a).
- (C) (a) is true but (r) is false.
- (D) (a) is false but (r) is true.
- Q.15 Which of the following statements are true about bioreactors?
  - P. Continuous bioreactors provide less degree of control and uniform product quality than batch bioreactors.
  - Q. Batch bioreactors are ideally suited for reaction with substrate inhibition.
  - R. Choice of a bioreactor is dictated by kinetic considerations.
  - S. Fed batch bioreactors are also called semibatch bioreactors.
  - (A) P, Q

(B) O, S

(C) R, S

- (D) P, R
- Q.16 Match the items in Group 1 with correct options in Group 2:

#### **Group 1**

#### Group 2

- P. DNA footprinting
- Q. Yeast two-hybrid system
- R. DNA fingerprinting
- S. SAGE

- 1. Protein-protein interaction
- 2. VNTR
- 3. DNA binding protein
- 4. Transcriptome analysis

(A) P-1, Q-2, R-4, S-3

(B) P-3, Q-1, R-2, S-4

(C) P-3, Q-4, R-1, S-2

- (D) P-4, Q-2, R-1, S-3
- Q.17 Determine the correctness or otherwise of the following Assertion (a) and Reason (r):

**Assertion (a):** Bacterial growth is called synchronous when majority of the cells are in same stage of the bacterial cell cycle.

Reason (r) : Synchronous culture can be obtained by growing bacteria in an enriched medium

- (A) Both (a) and (r) are true and (r) is the correct reason for (a).
- (B) Both (a) and (r) are true but (r) is not the correct reason for (a).
- (C) (a) is true but (r) is false.
- (D) (a) is false but (r) is true.

Q.18 Match the products in Group 1 with their possible applications in Group 2:

### **Group 1**

- P. Erythropoietin
- Q. Anti-fibrin 99
- R. Collagenase
- S. Transferrin

#### Group 2

- 1. Blood clot
- 2. Binding and transport of iron
- 3. Anaemia
- 4. Animal cell separation

- (A) P-3, Q-1, R-4, S-2
- (C) P-2, Q-3, R-1, S-4

- (B) P-3, Q-4, R-1, S-2
- (D) P-2, Q-1, R-4, S-3
- Q.19 Match the products in Group 1 with their producer organisms in Group 2:

### Group 1

- P. Ethanol from glucose
- Q. Probiotics
- R. Citric acid
- S. Sauerkraut

- Group 2
- 1. Aspergillus niger
- 2. Leuconostoc mesenteroides
- 3. Saccharomyces cerevisiae
- 4. Bifidobacterium

- (A) P-1, Q-3, R-2, S-4
- (C) P-3, Q-4, R-2, S-1

- (B) P-3, Q-4, R-1, S-2
- (D) P-1, Q-4, R-3, S-2
- Q.20 A RNA polymerization assay was performed using  $^3H$  UTP as the labelled nucleotide with a specific activity of 500  $\mu$ Ci /  $\mu$ mol (1  $\mu$ Ci = 2.2 × 10 counts per min). After 10 min incubation, the trichloroacetic acid insoluble radioactivity was found to be 692521 counts per min as determined in a liquid scintillation counter working at 60% efficiency for  $^3H$ . The amount of UTP incorporated into the RNA will be
  - (A) 15 nmol

(B) 105 nmol

(C) 150 nmol

- (D) 50 nmol
- Q.21 One unit of glucoamylase enzyme activity is defined as the amount of enzyme required to produce 1  $\mu$ mol of glucose per min in a 4% solution of Lintner starch at pH 4.5 and 60 °C. If in a reaction mixture with 1 ml of the crude enzyme preparation containing 8 mg protein and 9 ml of 4.44% starch, 0.6  $\mu$ mol of glucose/ml-min is produced, what will be the specific activity of the crude enzyme preparation?
  - (A) 1 unit/mg protein

(B) 1.5 units/mg protein

(C) 0.25 units/mg protein

(D) 0.75 units/mg protein

## **END OF SECTION - J**