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

Q.10 Match the items in Group 1 with an appropriate description in Group 2 :

Group 1	**Group 2**
P. UPGMA	1. Protein sequence database
Q. CLUSTAL	2. Phylogenetic analysis
R. SWISS-PROT	3. 3-D structure visualization
S. RasMol	4. Multiple sequence alignment

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

Q.11 Match the properties in Group 1 with the downstream operations in Group 2 :

Group 1	**Group 2**
P. Size	1. Extraction
Q. Density	2. Distillation
R. Volatility	3. Filtration
S. Solubility	4. Sedimentation

(A) P-3, Q-4, R-2, S-1
(B) P-4, Q-1, R-2, S-3
(C) P-4, Q-3, R-1, S-2
(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	1. Food and energy source
Q. Opines	2. Tumor formation
R. Virulence genes	3. Hairy root induction
S. *Aux* and *cyt* genes	4. T-DNA transfer and integration

(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-2, R-4, S-1
(C) P-1, Q-3, R-4, S-2
(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) Q, 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	1. Protein-protein interaction
Q. Yeast two-hybrid system	2. VNTR
R. DNA fingerprinting	3. DNA binding protein
S. SAGE	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	Group 2
P. Erythropoietin	1. Blood clot
Q. Anti-fibrin 99	2. Binding and transport of iron
R. Collagenase	3. Anaemia
S. Transferrin	4. Animal cell separation

(A) P-3, Q-1, R-4, S-2
(B) P-3, Q-4, R-1, S-2
(C) P-2, Q-3, R-1, S-4
(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	Group 2
P. Ethanol from glucose	1. *Aspergillus niger*
Q. Probiotics	2. *Leuconostoc mesenteroides*
R. Citric acid	3. *Saccharomyces cerevisiae*
S. Sauerkraut	4. *Bifidobacterium*

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

Q.20 A RNA polymerization assay was performed using ^{3}H UTP as the labelled nucleotide with a specific activity of 500 μCi / μmol (1 μCi = 2.2×10^{6} 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 ^{3}H. 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 μmol 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 μmol 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