

J: Biotechnology

Q. 1 – Q. 6 carry one mark each.

- Q.1 A thermostable DNA polymerase that can carry out both reverse transcription reaction and polymerization has been isolated from
- (A) *Thermococcus litoralis* (B) *Thermus aquaticus*
(C) *Thermotoga maritima* (D) *Thermus thermophilus*
- Q.2 When present in tissue culture medium, gibberellin
- (A) helps to break dormancy of buds and bulbs
(B) promotes dormancy development in buds and bulbs
(C) is regarded as plant growth inhibitor
(D) prevents normal recognition of auxin molecule
- Q.3 To promote attachment and spreading of anchorage-dependent animal cells, the surface of the culture vessel needs to be coated with
- (A) trypsin (B) collagen (C) pronase (D) polyglycol
- Q.4 For amplification of GC rich sequences by polymerase chain reaction, identify the reagent that binds and stabilizes AT sequences and destabilizes GC regions.
- (A) Tetramethyl ammonium chloride
(B) Betaine
(C) 7-deaza-2'-deoxyguanosine triphosphate
(D) Sodium dodecyl sulphate
- Q.5 Which of the following statements is INCORRECT about immobilized plant cell cultures?
- (A) It is possible to use high cell densities
(B) Cells remain active for long periods
(C) Cell products or inhibitors can be removed easily
(D) It provides low shear resistance to cells
- Q.6 All the cells that participate in immune responses originate from a population of
- (A) neutrophils (B) stem cells (C) macrophages (D) lymphocytes

W

Q. 7 – Q. 24 carry two marks each.

- Q.7 Identify the natural plant growth regulators from the following list.
 (P) Zeatin
 (Q) Benzylaminopurine (BAP)
 (R) Indole-3-acetic acid (IAA)
 (S) 2,4-Dichlorophenoxyacetic acid
- (A) P, Q (B) Q, S (C) P, R (D) R, S
- Q.8 A hybrid derived from the fusion of a myeloma cell (HPRT⁻) with an antibody secreting B-lymphocyte (HPRT⁺) can be selected to produce monoclonal antibody by growing in a medium containing
- (A) thiamine, hypoxanthine, aminopterin
 (B) thymidine, histidine, aminopterin
 (C) uridine, hypoxanthine, aminopterin
 (D) thymidine, hypoxanthine, aminopterin
- Q.9 Match items in group 1 with correct options from those given in group 2.
- | Group 1 | Group 2 |
|--------------------------------|---|
| P. VNTR sequence | 1. Gene regulation on the same chromosome |
| Q. Leader sequence | 2. Ribosome binding site |
| R. SD sequence | 3. DNA finger printing |
| S. <i>cis</i> -acting sequence | 4. Functions in attenuation |
- (A) P-3, Q-1, R-4, S-2 (B) P-2, Q-3, R-1, S-4
 (C) P-3, Q-4, R-2, S-1 (D) P-3, Q-1, R-2, S-4
- Q.10 During cultivation of microorganisms in a fermenter, various parameters are controlled by appropriate sensor (probe). Match each probe in group 1 with the appropriate response mechanism in group 2.
- | Group 1 (Probe) | Group 2 (Response) |
|------------------------|---|
| P. Thermistor | 1. Activation of acid / alkali pump |
| Q. Oxygen electrode | 2. Activation of vegetable oil pump |
| R. Metal rod | 3. Activation of hot / cold water pump |
| S. pH electrode | 4. Increase / decrease in stirrer motor speed |
- (A) P-2, Q-3, R-1, S-4 (B) P-1, Q-2, R-4, S-3
 (C) P-3, Q-2, R-4, S-1 (D) P-3, Q-4, R-2, S-1
- Q.11 Which of these mice fail to develop a thymus?
- (A) Mountain mice (B) Beige mice
 (C) Knock out mice (D) Nude mice

Q.18 Match items in group 1 with correct options from those given in group 2

Group 1

- P. Amperometric biosensor
- Q. Evanescent wave biosensor
- R. Calorimetric biosensor
- S. Potentiometric biosensor

Group 2

- 1. Light beam
- 2. Flux of redox electrons
- 3. Field effect transistors
- 4. Exothermic reaction

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

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

Q.19 For prediction of three dimensional structure of protein

- (P) homology modeling tries many possible alignments
- (Q) threading first identifies homologues
- (R) threading evaluates many rough models
- (S) homology modeling optimizes one model

- (A) Q, S
- (B) P, Q
- (C) R, S
- (D) Q, R

Q.20 Immobilization of enzymes

- (P) increases the specificity of the enzyme for its reactants
- (Q) facilitates reuse of the enzyme in batch reactions
- (R) makes it unsuitable for its use in a continuous reactor system
- (S) decreases the operational cost of the industrial process

- (A) Q, S
- (B) Q, R
- (C) R, S
- (D) P, Q

Q.21 Which of the following would result in somaclonal variation in micropropagated plants?

- (P) Propagation by axillary branching in the absence of plant growth regulators
- (Q) Cell suspension maintained for five years before induction of somatic embryogenesis
- (R) Callus induction using 20 μ M 2,4-Dichlorophenoxyacetic acid followed by shoot organogenesis
- (S) Shoot organogenesis from an explant in the absence of an intermediate callus phase

- (A) P, Q
- (B) Q, R
- (C) P, S
- (D) Q, S

Q.22 The enzymes that can be used in 5' end labeling of DNA are

- (P) alkaline phosphatase
- (Q) DNA ligase
- (R) terminal transferase
- (S) polynucleotide kinase

- (A) P, S
- (B) R, Q
- (C) P, R
- (D) R, S

Common Data Questions

Common Data for Questions 23, 24:

Lignocellulosic biomass was subjected to microbial composting. The microbial consortium produced an extracellular enzyme xylanase, which was a glycoprotein having a molecular weight of 68 kDa and a positive charge. An aqueous extract of the enzyme could be easily prepared from the compost.

- Q.23 What techniques would you recommend for confirming the molecular weight of the purified enzyme?
 (P) Isoelectric focusing
 (Q) SDS-PAGE
 (R) Native PAGE
 (S) Gel filtration
- (A) P, Q (B) Q, S (C) R, S (D) P, S
- Q.24 If Con A sepharose column was used for the purification of enzyme, the separation would be based on
- (A) molecular exclusion (B) affinity binding
 (C) ion exchange (D) hydrophobic interaction

Linked Answer Question: Q. 25 to Q. 26 carry two marks each.

Statement for Linked Answer Question 25 & 26:

DNA content of *Caenorhabditis elegans* was analysed and found to contain 1.0×10^8 bp.

- Q.25 How many standard λ - phage vector carrying 20kb DNA fragments or YACs carrying 250kb DNA fragments are theoretically required to constitute a complete *C. elegans* genomic library?
- (A) 500 λ - phage vectors or 40 yeast clones
 (B) 400 λ - phage vectors or 5000 yeast clones
 (C) 5000 λ - phage vectors or 400 yeast clones
 (D) 5×10^4 λ - phage vectors or 4000 yeast clones
- Q. 26 How many λ - phage vectors / yeast clones should be prepared in order to ensure that every sequence is included in the library?
- (A) 25×10^3 λ - phage vectors / 2000 yeast clones
 (B) 20×10^3 λ - phage vectors / 1600 yeast clones
 (C) 5×10^4 λ - phage vectors / 4000 yeast clones
 (D) 10×10^4 λ - phage vectors / 10000 yeast clones

Statement for Linked Answer Questions 27 & 28:

A bioreactor of working volume 50 m^3 produces a metabolite (X) in batch culture under given operating conditions from a substrate (S). The final concentration of metabolite (X) at the end of each run was 1.1 kg m^{-3} . The bioreactor was operated to complete 70 runs in each year.

- Q.27 What will be the annual output of the system (production of metabolite (X)) in kg per year?
- (A) 55 (B) 3850 (C) 45.5 (D) 77
- Q.28 What will be the overall productivity of the system in $\text{kg year}^{-1} \text{ m}^{-3}$?
- (A) 19250 (B) 38.50 (C) 3850 (D) 77

END OF THE SECTION

WWW. ONESTOPGATE.