

## K : Biotechnology

**K1** For each sub-questions given below, four alternatives are provided of which only one is correct. Write the correct answer in the answer book by writing A, B, C or D along with the corresponding sub-question number. (25 X 1 = 25)

1.1 The precursor for penicillin-G biosynthesis during fermentation process is

- (A) Phenylacetic acid
- (B) Phenoxyacetic acid
- (C) Acetic acid
- (D) None of the above

1.2 Callus formation from mature tissue explant occurs through

- (A) Dedifferentiation
- (B) Redifferentiation
- (C) Both (A) and (B) of the above
- (D) None of (A) and (B)

1.3 RNA is very much susceptible to hydrolysis in alkali because

- (A) It contains uracil residues in its structure
- (B) Its 2'-OH group participate in intramolecular cleavage of phosphodiester backbone
- (C) Cleavage occurs in the glycosylic bonds of purine bases
- (D) Cleavage occurs in the glycosylic bonds of pyrimidine bases

1.4 The typical coenzyme present in the methanogens is

- (A) Coenzyme A
- (B) Coenzyme Q
- (C) Coenzyme M
- (D) None of the above

1.5 Large scale clonal propagation practically means raising a population of plantlets from

- (A) A single cell
- (B) A single explant
- (C) Many explants from a single plant
- (D) Many explants from a group of plants

1.6 T4 Polynucleotide kinase is used for

- (A) Labelling 3' ends of DNA
- (B) Labelling 5' ends of DNA
- (C) Creating blunt ends of DNA
- (D) Dephosphorylation of DNA

- 1.7 Energy capture efficiency of the aerobic cells using glucose as a substrate is
- (A) 50%
  - (B) 40%
  - (C) 30%
  - (D) 20%
- 1.8 Plant secondary metabolites production in suspension culture is mainly targeted for
- (A) Obtaining metabolites in aseptic condition
  - (B) Enhanced in vitro production of desired metabolite
  - (C) Enhanced production of all metabolites
  - (D) Obtaining new metabolites
- 1.9 A plasmid cloning vector should contains all of the following sequences except
- (A) Origin of replication
  - (B) Inducible promoter
  - (C) Selectable marker gene
  - (D) Multiple cloning sites
- 1.10 For scaling up of a bioreactor, the following parameter is assumed to be constant
- (A) Airflow rate
  - (B) Diameter of the impeller
  - (C) Agitator speed
  - (D) Volumetric mass transfer coefficient
- 1.11 Stable transformation of plants is reliably obtained by
- (A) *Agrobacterium* plasmid integration
  - (B) Electroporation
  - (C) Microinjection
  - (D) Silicon carbide whisker
- 1.12 In baculovirus expression vector foreign genes are expressed from the promoter of
- (A) Polyhedrin gene
  - (B) Bacteriophage T7 gene
  - (C) *E. coli lacZ* gene
  - (D) Yeast phosphoglycerate kinase gene
- 1.13 Mechanism of separation of contaminants present in air by fibrous media are
- (A) Interception
  - (B) Inertial impaction
  - (C) Diffusion
  - (D) All of the above

- 1.14 The length of each boarder sequence in Ti - plasmid is about
- (A) 25 million base pairs
  - (B) 200 kilo base pairs
  - (C) 25 kilo base pairs
  - (D) 25 base pairs
- 1.15 Enzyme used in 'cycle' sequencing of DNA is
- (A) T7 DNA polymerase
  - (B) T4 DNA polymerase
  - (C) Klenow DNA polymerase
  - (D) Taq DNA polymerase
- 1.16 Ethanol concentration is lowest in
- (A) Wine
  - (B) Beer
  - (C) Brandy
  - (D) Rum
- 1.17 Plastome is
- (A) A type of plastid
  - (B) An organellar genome
  - (C) Plasmalemma protein
  - (D) None of A / B / C
- 1.18 Recombinant live attenuated vaccine against hepatitis B was prepared from
- (A) Plasma of chronically infected individual
  - (B) Recombinant yeast expressing hepatitis B surface antigen
  - (C) Recombinant vaccinia virus expressing hepatitis B surface antigen
  - (D) Transgenic plants expressing hepatitis B surface antigen
- 1.19 The following cross-linking agents may be used for the immobilization of enzymes
- (A) Glutaraldehyde
  - (B) Cyanogen bromide
  - (C) Thionyl chloride
  - (D) All of the above
- 1.20 Which of the following statements is most appropriate for recombinant antibody production in transgenic plants?
- (A) A very high level expression is always obtained
  - (B) Light promote more antibody production
  - (C) Such antibodies are free from other antigen of animal origin
  - (D) Functional antibody cannot be produced in plants

- 1.21 Cells deficient in hypoxanthine guanine phosphoribosyl transferase (HPRT) enzyme rely on
- (A) Synthesis of purine deoxynucleotides by salvage pathway
  - (B) Synthesis of purine deoxynucleotides by de novo pathway
  - (C) Supply of hypoxanthine in the culture medium
  - (D) Supply of thymidine in the culture medium
- 1.22 Enhanced axillary branching for multiple shoot production is promoted by
- (A) 2,4 - D
  - (B) Abscisic acid
  - (C) Gibberellic acid
  - (D) Benzyl adenine
- 1.23 The following culture systems are used for growing large amount of anchorage dependent animal cells except
- (A) Roller bottle
  - (B) Airlift fermenter
  - (C) Hollow fibre reactor
  - (D) Microcarriers
- 1.24 Viral replication within cells is inhibited by
- (A) IL - 4
  - (B) IL - 1
  - (C) IFN $\alpha$
  - (D) TNF $\alpha$
- 1.25 In large scale fermentation process, air is sterilized by
- (A) Jute fiber
  - (B) Membrane
  - (C) Cotton fiber
  - (D) Glass wool fiber

K2 Match the organisms in Column A with the product in Column B. (5)

**Column A**

- (A) *Thermus aquaticus*
- (B) *Acetobacter aceti*
- (C) *Bacillus thuringiensis*
- (D) *Saccharomyces carlsbergensis*
- (E) *Haemophilus influenzae*

**Column B**

- 1. Beer
- 2. Bioinsecticides
- 3. Hind III
- 4. Taq I
- 5. Vinegar



**K3** Match the secondary metabolites in Column A with their most appropriate chemical characteristics in Column B. (5)

**Column A**

- (a) Diosgenin
- (b) Ajmalicine
- (c) Shikonin
- (d) Digoxin
- (e) Scopolamine

**Column B**

- 1. Holoside
- 2. Pyrrolizidine alkaloid
- 3. Indole alkaloid
- 4. Naphthoquinone nucleus
- 5. Cardenolide
- 6. Saponin
- 7. Tropane alkaloid

**K4** (A) Name two metal ions which play important role in citric acid fermentation. (1)

(B) How is the agitator speed in a fermenter correlated with the power drawn by the agitator? (1)

(C) How does the sulfanilamide kill the bacteria? (1)

(D) Human insulin gene cloned from a cDNA library into pUC19 could not be expressed. Justify the reason. (1)

(E) Mention the specific role of acetosyringone in *Agrobacterium* mediated plant transformation? (1)

**K5** (A) The volume of a chemostat system is 1000 l. The feed flow rate to the reactor is 200 l/h and the glucose concentration in the feed is 5 g/l. Determine cell and glucose concentration in the effluent of the reactor under steady state conditions. Use the following constants for the cells:

$$\mu_{max} = 0.3 \text{ h}^{-1}, K_S = 0.1 \text{ g/l}, Y_{x/s} = 0.4 \text{ (g dw cells/g glucose)} \quad (3)$$

(B) Find out the dilution rate which gives maximum biomass productivity. (2)

**K6** (A) What are the characteristics of 'normal' primary animal cells? (2)

(B) Name different methods for the separation of different cell types from a mixed population of animal cells? (2)

(C) What is transgene? (1)