

2021**Molecular Biology and Biotechnology****[HONOURS]****Paper : IX**

Full Marks : 80

Time : 4 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.**Use separate answer script for each GROUP.***GROUP-A****(Marks : 40)**

1. A. Choose the correct answer from the options given below: $1 \times 6 = 6$

- a) In plant tissue culture organogenesis means
- i) Formation of callus
 - ii) Genesis of organ
 - iii) Formation of root and shoot from callus
 - iv) None of the above

- b) First transgenic crop was
 - i) Pea
 - ii) Tobacco
 - iii) Flax
 - iv) Cotton
- c) *Agrobacterium* based gene transfer is efficient in
 - i) Only with monocots
 - ii) Only with dicots
 - iii) With both monocots and dicots
 - iv) With majority of monocots and few dicots
- d) A major application of embryoculture is in
 - i) Clonal propagation
 - ii) Production of Embryoids
 - iii) Overcoming hybridization barriers
 - iv) Introduction of somaclonal variations
- e) Select the wrong statement about the plasmid
 - i) It is extrachromosomal
 - ii) It is double stranded

- iii) It's replication does not depend upon host cell
- iv) It is closed and circular DNA
- f) DMSO (Dimethyl sulfoxide) is used as
 - i) Gelling agent
 - ii) Alkylating agent
 - iii) Chelating
 - iv) Cryoprotectant

B. State whether the following statement is **True** or **False**: $1 \times 5 = 5$

- a) Plant tissue culture technique is a redefined method of asexual reproduction.
- b) Enzymes required to obtain wall-free naked protoplasts are cellulase and proteinase.
- c) The medium used for batch culture is usually the same as for callus growth except agar is omitted.
- d) Plant transgenesis is the indirect transfer of genes to plants.
- e) The phenomenon of the reversion of mature cells to the meristematic state leading to the formation of callus is known as de-differentiation.

- 2. Answer any **three** of the following: $2 \times 3 = 6$
 - a) Name two popular media formulations used for plant tissue culture.
 - b) What are the differences (two points) between somatic and zygotic embryogenesis?
 - c) What is electroporation?
 - d) What is marker gene? Give example.
 - e) What is synthetic seed?
- 3. Answer any **two** of the following: $4 \times 2 = 8$
 - a) What are the advantages and disadvantages of somaclonal variations? $2 + 2$
 - b) What is bioreactor? What is the advantage of using haploid cell in cell culture? Give one advantage of using cell culture. $1 + 1\frac{1}{2} + 1\frac{1}{2}$
 - c) What is batch culture? What type of culture is required for production of secondary metabolites? Give one example of media for culture of banana and rice. $2 + 1 + 1$
- 4. Answer any **three** of the following: $5 \times 3 = 15$
 - a) What is depolarization? Write down the significance of using haploids. $2 + 3$
 - b) Describe the different techniques of isolation of protoplast, culture them and fusion. Mention their applications. $3 + 2$

- c) What is clonal propagation? How can you produce virus free plants by tissue culture process? 2+3
- d) Describe the structure of Ti plasmid with particular emphasis on T-DNA structure. How do the different sequences help in infection and T-DNA transfer. $2\frac{1}{2} + 2\frac{1}{2}$
- e) What is somatic embryogenesis? Give the applications and advantages of it. $2 + 1\frac{1}{2} + 1\frac{1}{2}$

GROUP-B

(Marks : 40)

5. A) Choose the correct answer from the options given below: $1 \times 6 = 6$
- i) Coliform in drinking water indicates
- Fecal contamination
 - Microbial activity of soil
 - High organic matters
 - None of the above
- ii) A complete patent specification shall disclose
- All the methods of performing the invention
 - All anticipated uses of the invention

- c) The best method of performing the invention
- d) All of the above

iii) Biodiversity

- increases towards the equator
 - decreases towards the equator
 - remains same throughout the planet
 - has no effect on change in latitude
- iv) What was first clinical gene therapy was used for treating?
- Rheumatoid arthritis
 - Chicken pox
 - Diabetes mellitus
 - Adenosine deaminase deficiency
- v) What might be the advantage of beginning gene therapy prior to birth?
- This would give the body plenty of time
 - The body would not reject it as it has not yet recognized 'self'
 - The cells being extremely young are receptive of gene therapy
 - None of these

- vi) In hybridoma technology
- B-cells are fused with myeloma cells
 - T-cells are fused with myeloma cells
 - B-cells are fused with T-cells
 - None of the above

B. State whether the following statement is **True** or **False**: $1 \times 5 = 5$

- Objective of bioremediation is ecorestoration and prevention of further pollution.
- An ovum is haploid.
- Lichen is considered as indicator of SO_2 pollution.
- An enzyme purified from soil extract is patentable.
- Incidence of black foot disease is due to arsenic pollution.

6. Answer any **three** of the following: $2 \times 3 = 6$

- What is subunit vaccine?
- What is biosensor?
- Mention the purpose of protecting trademark.
- What is a stem cell?
- What are the demerits of *in situ* bioremediation?

7. Answer any **two** of the following: $4 \times 2 = 8$

- What is bioethics? Mention bioethical concern. $2 + 2$
- Why do people get bone marrow transplants? What is an allogeneic bone marrow transplant? $2 + 2$
- What do you mean by Totipotency? Why embryonic stem cells are not considered totipotent? $2 + 2$

8. Answer any **three** of the following: $5 \times 3 = 15$

- Mention the major approaches for the conservation of biodiversity. Mention major anthropogenic influences on change in biodiversity. $3 + 2$
- Describe hybridoma technology and its application. $3 + 2$
- Write short notes : $2 \frac{1}{2} + 2 \frac{1}{2}$
 - Gene Bank
 - Biomonitoring of environment
- What is the impact of mercury pollution on human? How do bacteria volatilize mercury? $2 + 3$
- Describe general protocol of animal cell culture. How does it differ from plant cell culture? $3 + 2$