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Printed Page:-4 **Subject Code:- ABT0701**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: VII - THEORY EXAMINATION (2025 - 2026)
Subject: Gene Expression and Transgenic

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*
1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*
2. *Maximum marks for each question are indicated on right -hand side of each question.*
3. *Illustrate your answers with neat sketches wherever necessary.*
4. *Assume suitable data if necessary.*
5. *Preferably, write the answers in sequential order.*
6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Which organism has the highest number of vectors? (CO1, K1) 1

(a) Yeast
(b) Mammalian cells
(c) E.coli
(d) Fungi

1-b. Which of the following is NOT a common component of a recombinant protein expression vector? (CO1, K1) 1

(a) Promoter
(b) Terminator sequence
(c) Antibiotic resistance gene
(d) Introns

1-c. Integral membrane proteins are proteins that: (CO2, K1) 1

(a) Are located exclusively in the cytoplasm
(b) Span the lipid bilayer of cellular membranes
(c) Are synthesized by ribosomes in the nucleus
(d) Lack secondary structures

1-d. In recombinant protein expression, the promoter is responsible for: (CO2, K1) 1

(a) Strong and constitutive
(b) Weak and inducible
(c) Viral
(d) None of the above

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1-e. What is the primary function of the central vacuole in a plant cell? (CO3, K1) 1

(a) Storage of genetic information
(b) Photosynthesis
(c) Storage of water and nutrients
(d) Protein synthesis

1-f. Which organelle in plant cells is responsible for photosynthesis? (CO3, K1) 1

(a) Mitochondrion
(b) Chloroplast
(c) Golgi apparatus
(d) Nucleus

1-g. Transgenic animals have _____ (CO4, K1) 1

(a) foreign protein
(b) foreign gene
(c) foreign lipid
(d) foreign amino acid

1-h. What is the primary purpose of creating transgenic animals? (CO4, K1) 1

(a) To enhance their natural beauty
(b) To study the effects of genetic modifications
(c) To increase their population in the wild
(d) To develop new animal species

1-i. What is the primary purpose of creating transgenic animals in medical research? (CO5, K1) 1

(a) To produce designer pets
(b) To develop genetically modified crops
(c) To study the effects of specific genes on health and disease
(d) To create new species of animals

1-j. Which type of animal is often used as a model organism in transgenic research due to its genetic similarity to humans? (CO5, K1) 1

(a) Zebrafish
(b) Fruit fly (Drosophila)
(c) Mouse
(d) Earthworm

2. Attempt all parts:-

2.a. What is a promoter in a protein expression vector? (CO1, K1) 2

2.b. What are some common host organisms used for over-expressing integral membrane proteins? (CO2, K1) 2

2.c. Name one commonly used method for introducing foreign DNA into chloroplasts. (CO3, K1) 2

2.d. What is a transgenic animal? (CO4, K1) 2

2.e. What are some examples of transgenic animals used in pharmaceutical research? (CO5, K1) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	What are recombinant protein expression vectors, and why are they important in biotechnology? (CO1, K2)	6
3.a.(ii)	How do expression vectors differ from cloning vectors, and why are they important for tag-free protein expression? (CO1, K2)	6

3.b. Answer any one of the following:-

3.b.(i)	What are the advantages of using mammalian cell lines for overexpressing integral membrane proteins? (CO2, K2)	6
3.b.(ii)	What is the role of baculovirus in insect cell expression systems, and how does it work? (CO2, K2)	6

3.c. Answer any one of the following:-

3.c.(i)	What is chloroplast transformation, and why is it used in plant single-cell systems? (CO3, K2)	6
3.c.(ii)	What is cell-free protein expression, and why is it useful in research and industrial applications? (CO3, K2)	6

3.d. Answer any one of the following:-

3.d.(i)	What are transgenic animals, and how are they different from genetically modified organisms (GMOs)? (CO4, K2)	6
3.d.(ii)	Discuss the ethical concerns related to the utilization of transgenic animals in research and biotechnology. (CO4, K2)	6

3.e. Answer any one of the following:-

3.e.(i)	What are the applications of transgenic animals in biotechnology? (CO5, K2)	6
3.e.(ii)	How can transgenic animals be used in the field of regenerative medicine and organ transplantation? (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Discuss the role of promoters in recombinant protein expression vectors. How do different promoters influence the level of protein expression? (CO1, K3)	10
4-b.	Explain the concept of fusion tags in recombinant protein expression. What are their purposes, and how can they be used to facilitate protein purification? (CO1, K3)	10

5. Answer any one of the following:-

5-a.	What are the different host systems used for recombinant protein expression, and what factors influence the choice of host organism? (CO2, K3)	10
5-b.	Explain the various types of expression vectors used in host expression systems. Compare and contrast prokaryotic and eukaryotic expression vectors in terms of structure, features, and applications. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	Compare and contrast different chromatography techniques used in protein purification. (CO3, K3)	10
6-b.	Explain the concepts of Good Manufacturing Practices (GMP) and Good	10

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	Laboratory Practices (GLP) in the context of protein expression and purification. What are the key requirements and regulations to ensure quality, safety, and reproducibility in protein production? (CO3, K3)	
7. Answer any <u>one</u> of the following:-		
7-a.	Discuss the role of embryonic stem cell-mediated gene transfer in studying human development and disease modeling. How does this approach contribute to our understanding of genetic disorders and their treatment? (CO4, K3)	10
7-b.	Discuss the retrovirus-mediated gene transfer approach for creating transgenic animals. (CO4, K3)	10
8. Answer any <u>one</u> of the following:-		
8-a.	Discuss the use of transgenic animals in biopharmaceutical production. (CO5, K3)	10
8-b.	What are some examples of successful applications of transgenic animals in humanized animal models in medical research? (CO5, K3)	10