Q. No. BTE 812/ 39

B.TECH/EVEN
REG/(22-23)

Even Semester End-term Examination, 2022-23

MEDICAL AND PHARMACEUTICAL BIOTECHNOLOGY

BTE 812

Full Marks : 60 *Time* : 3 Hours

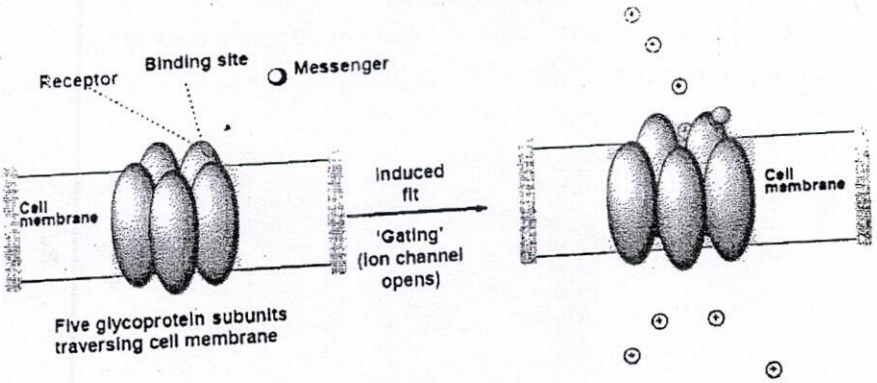
The figures in the margin indicate full marks.

Answer any *four* questions from **Part A.**
Answer any *four* questions from **Part B.**

Question No.	Body of the Question	Marks	Mapped CO

PART A

1. The figure below illustrates the opening of an ion channel brought about by the binding of a messenger to the binding site of a receptor. Study the diagram and answer the questions that follow.



(*Turn Over*)

Cationic ion channels for K^*, Na^*, Ca^{2*} (e.g. nicotinic) = excitatory Anionic ion channels for Cl^- (e.g. $GABA_A$) = inhibitory

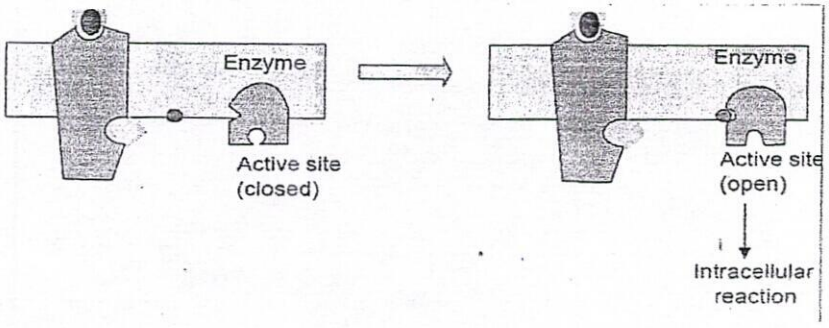
(i) What is the biological macromolecule to which the messenger binds? State whether it is an unmodified or modified macromolecule and state why you think so. 1.5 CO1

(ii) Why is the presence of the receptor in the cell membrane necessary for the passage of the ions into the cell? 2 CO1

(iii) With reference to the above diagram, state which part of the structure constitutes the ion channel complex and which part is the receptor. 1 CO1

(iv) Draw a generalized schematic diagram to clearly illustrate how binding of the messenger causes an induced fit and thus opens the ion channel. 3 CO1

2. The diagram below illustrates the later stages in a mechanism of a drug binding to a particular type of receptor. Study the diagram and answer the questions that follow.



(*Continued*)

(i) What type of receptors are shown? (Remember that there are stages before this in the full mechanism.) 1 CO1

(ii) Redraw only the left hand side part of the above diagram and identify the various parts by labelling them neatly. (Remember to label the various sites also.) 2.5 CO1

(iii) Draw the four stages that come before the above two. (You may use an alternative schematic representation if you wish.) 4 CO1

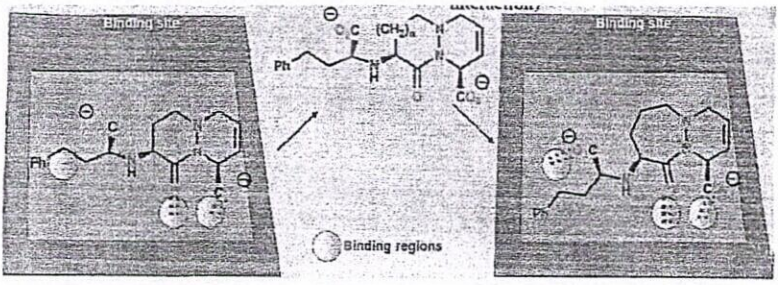
3. (i) With help of schematic diagrams explain how kinase linked receptors play a dual role of receptor and enzyme. 3 CO1

(ii) How are kinase linked receptors similar to G-protein coupled receptors and how are they different? 2 CO1

(iii) What reaction is catalyzed by the enzymatic aspect of kinase linked receptors? Which part of a protein substrate undergoes this reaction in the case of tyrosine kinase receptors? 2 CO1

(iv) Does induced fit play a role in the functioning of these receptors? 0.5 CO1

4. The following diagram illustrates the development of the ACE inhibitor cilazaprilat. What strategy of drug design for optimizing drug-target interaction does it represent? Explain how this has been achieved here. 7.5 CO1



5. Explain how the following strategies can help improve drug-receptor interaction (*any three*):

7.5 CO1

(a) variation of alkyl substituents;

(b) variation of aryl substituents;

(c) ring variations (actually the ring fusion strategy);

(d) rigidification (you need not explain the various methods of rigidification).

6. Consider the following equation:

$$\text{Log } (1/C) = - k_1 (\log P)^2 + k_2 \log P + k_3 \sigma + k_4 Es + k_5$$

(i) What is the name of this equation (named after a scientist)? 1.5 CO1

(ii) Write the names of and briefly explain what is meant by the symbols P, σ, and E_s and their significance with respect to the functioning of drugs.

6 CO1

(*Continued*)

PART B

7. i. With a generalized schematic diagram describe the structure of a biosensor.

   ii. How would you develop microbial biosensors to detect environmental contaminants? 4+3.5 C03

8. i. For diagnostic assays, what is meant by sensitivity, specificity, and simplicity?

   ii. What is a molecular beacon probe, and how does it work?

   iii. State two non-radioactive detection methods. 3+2.5+2 COl

9. i. Why is it difficult to genetically transform various *Streptomyces* spp. and how to overcome it?

   ii. Describe the strategy for the synthesis of novel antibiotics with an example 3+4.5 CO2

10. i. Mention two different approaches for recombinant insulin production.

    ii. Name two commercial available insulins.

    iii. How would you modify growth hormone to make it longer-acting? 4+1+2.5 CO3

11. i. Discuss the reasons for creating humanized monoclonal antibodies.

ii. Design a mouse that produces only human antibodies? 4+3.5 CO4

12. i. Diagnosis of diseases like cancer by proteomic study: Discuss briefly.

ii. What is gene therapy? 6.5+1 CO2

COURSE OUTCOMES

CO1: To give an understanding of various techniques of modern biotechnology in the field of Medical Science.

CO2: To provide knowledge about the concept and application of monoclonal antibody technology

CO3: To demonstrate and provide examples on how to use microbes and mammalian cells for the production of pharmaceutical products

CO4: To explain the general principles of generating transgenic plants, animals and microbes

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Q. No. BTE 814/ 38

B.TECH/EVEN
REG/(22-23)

Even Semester End-term Examination, 2022-23

BIOETHICS &IPR

BTE 814

Full Marks : 60 *Time* : 3 Hours

The figures in the margin indicate full marks.

Answer any *six* questions.

Question No.	Body of the Question	Marks	Mapped CO

1. (a) What are the basic criteria for granting a patent in India? Are there any exceptionns?

   (b) What is the importance of 'claims' in writing a patent?

   (c) Can you enumerate the advantages of filing a patent through PCT? 5+3+ 2 CO4

2. (a) In a typical biotechnology business model, who are the stake holders?

   (b) Would government versus private funding affect a biotech reserach driven industry?

   (c) Comment on the impact of bio piracy in the Biotechnology industry. 3+3+4 CO3

3. You have engineered a recombinant yeast with a commercially available plasmid, which you have used successfully for a brewing process with sufficiently increased yield. You would like to claim rights for your work in India.

   Trace the process of your patenting attempt. Specify what you would be patenting and how. 10 CO4

4. (a) Write a short note on WTO.

   (b) Does the TRIPS agreement apply to all WTO members-Explain?

   (c) What is the significance of the TRIPS Council? 5+2+3 CO5

5. (a) What are the different types of containment-Elaborate.

   (b) What do you mean by triple packaging system? Why is it advantageous?

   (c) If you want to perform your research activities with risk group2 pathogenic organisms, let's say here in NIT Durgapur, what are the steps you need to follow before starting your work? What factors would you keep in mind during your work? 3+2+ 5 CO1

6. (a) How is the concept of Geographical indicators linked to biodiversity?

   (b) What does the term in-situ and ex-situ conservation mean in biodiversity? Under what circumstances would an ex-situ conservation be more beneficial?

c) Discuss the concept of sustainable use in Biodiversity. 2+4+4 CO3

7. "Eugenics and patents" poses a controversial, polarising yet much needed discussion, particularly in biotech industry. Are you in favour of it? Or against it? Would your viewpoints differ if the same was restricted to specific DNA sequences or genes? -Defend you stand 10 CO5

8. (a) What do you mean by Intellectual property rights?

(b) Do IP rights always have to be registered? Which agency (s) in India looks after IP rights?

(c) The symbol of Maharaja in Air India is an example of which form of IP- Justify.

(d) What would be the basic difference between registered and unregistered IP rights? 2+2+3+3 CO3

COURSE OUTCOMES

CO1: To understand the nature of hazards related to biotechnology and the importance of biosafety in research.

CO2: To learn and debate on different ethical issues of applications of Biotechnology research including recombinant DNA technology and Human trials.

CO3: To realize the importance and basics of intellectual property Rights and laws implemented in this regard.

CO4: To learn the basic way to file claim of a patent.

CO5: To understand the idea about Entrepreneurship and its economic implication in the area of biotechnology research

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Q. No. BTE 610/ 38

B.TECH/EVEN
REG/(22-23)

Even Semester End-term Examination, 2022-23

ANIMAL BIOTECHNOLOGY

BTE 610

Full Marks : 60 *Time* : 3 Hours

The figures in the margin indicate full marks.

Answer the following questions. 1×10=10

1. Herpes Simplex virus infects which cell?
2. Lentivirus mediated gene expression is stable or transient?
3. Name one serum free media.
4. HeLa cell is what kind of cell.
5. How the lymphoblast cells grow? (Attach or suspension).
6. Embryonic stem cells are pluripotent or totipotent?
7. Ovarian stimulation is used to produce single egg or multiple egg.
8. Phenol red changes the media colour from red to yellow due to acidic or basic pH.
9. What is PBS, required for cell culture?
10. Name one virus which can insert genetic material to a specific point on chromosome 19?

(*Turn Over*)

Answer any *five* questions 10×5=50

1. (a) What are stem cells? Describe the unique characteristics of stem cells. 4

   (b) What are the major types of Stem Cells and where are they found? 2

   (c) Name the four transcription factors which are sufficient to produce the iPS cell and 2

   (d) describe their function in reprogramming. 2

2. (a) Describe the four viral vectors use for gene therapy. 4

   (b) Describe the main features of the lentivirus. 3

   (c) Describe liposome and 47^{th} chromosome. 3

3. (a) Describe the cause of female infertility and male infertility. 3

   (b) What is in vitro fertilization? What is ovarian stimulation? 3

   (c) Function of acrosome reaction and functions of acrosome enzymes (Hyaluronidase, Acrosin and Proacrosin). 4

4. (a) What is serum and described its function in media. 3

   (b) What are the advantages and disadvantages of serum in media? 3

(c) What is pH indicator and its role in cell culture. 2

(d) Name antibiotics which are commonly used in cell culture media?

5. (a) What is CRISPR ? 1

(b) What is spacer sequences and where it is originated from? 2

(c) What is Tracr RNA and what is guider RNA. 2

(d) What is Cas and describe CRISPR/Cas mediated gene editing technology 1+4

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

Even Semester End-Term Examination, 2022-23

Course Code: BTE614
Course Name: Molecular Virology

Full Marks: 60
Time: 3 *h*

Instructions: Answer all the questions.

Q. No.	Questions	Marks	Mapped CO
1.	What do you understand by "reservoir" and vector in viral propagation? Give one example of each.	4	CO1
2.	What is basic reproduction number (R_0) of a virus infection? On which factors R_0 depends on.	2 + 3	CO1
3.	Why do we say virus particles are metastable?	2	CO1
4.	If a highly specific antibody against the spike protein of SARS CoV2 is injected in our body, how is it going to affect the virus infection and why?	3	CO2
5.	Edward Jenner created the first safe vaccine against which virus? What was the logic behind his strategy?	2	CO2
6.	What is incubation period in viral infection and what type of immune response is usually observed during this period?	3	CO1
7.	How hemagglutination assay can be used to detect influenza virus?	3	CO2
8.	How influenza virus escapes from endosome? How this process can be used as a target for anti-influenza therapy?	3 + 2	CO2
9.	Depict the steps in retroviral life cycle using a flow chart.	5	CO1
10.	What is viral plaque assay? Will it be possible to perform viral plaque assay for a virus which is released from host cells by budding off and not lysis. Explain why.	2 + 1 + 1	CO2
11.	State true or false and justify. a) Retroviruses can produce at least 8 proteins from 3 genes present in their genome. b) Virus infection may depend on the pH of cellular compartments. c) All viral particles contain DNA or RNA polymerase in it. d) A potent vaccine which provides long term protection exists against influenza virus. e) Rabies virus is a neurotropic virus.	3 X 5	CO1 CO1 CO1 CO3 CO1
12.	What is a viral vector vaccine? How is it different than a mRNA vaccine?	2 + 2	CO3
13.	Fill in the blanks with appropriate word/s: a) Vaccines can be used for _____ as well as _____ of a viral infection, whereas anti-viral drugs are mostly used for _____ of viral infections. b) Acycloguanosine (Acyclovir) is a _____ analogue which inhibits _____ of Herpesvirus.	1 X 5	CO2 CO2

Course Outcomes

- CO1: Acquire an understanding of virus life cycle and host-virus interactions.
- CO2: Acquire an idea about detection, prevention and treatment of virus infections.
- CO3: To learn about use of virus in biotechnology.