

MASTER OF BIO-MEDICAL ENGINEERING FIRST YEAR SECOND SEMESTER – 2022

BIOSENSORS AND DEVICES

Time: 3h

Full Marks: 100

Part-I (50marks)

Use Separate Answer scripts for each Group / answer any five questions etc.

Answer any five questions.

1. State whether the statements are true or false:
 - i. Oral delivery provides faster drug action than intravenous delivery.
 - ii. Presence of food accelerate rate of absorption.
 - iii. Plasma bound drug do not provide any action.
 - iv. Prolongation of drug action can be achieved by increasing renal excretion.
 - v. In French Drogue means dry herb.
 - vi. In membrane permeation control drug delivery system drug release takes place following Fick's law of diffusion for porous polymeric membrane.
 - vii. Absorption of drug faster after taking food compare to empty stomach.
 - viii. Drugs with same bioavailability value provide same drug action.
 - ix. Ionized form of drug is also available for distribution.
 - x. When drug dissolve in the polymer matrix, drug release rate become proportional to the square root of time for polymer matrix diffusion controlled DDS.

2. Differentiate between Osmotic pressure, hydrodynamic pressure and vapor pressure/activated DDS.

3. Define drug as per WHO. Write the advantage and disadvantages of conventional oral drug delivery system. Classify conventional DDS based on dosage form and Classify conventional parental DDS.
1.5+3.5+ (3+2)

4. Write the effect of pH partition theory on drug absorption. What is tortuosity? Write attributes of drugs with high first pass metabolism. What are the three basic requirements of newer drug delivery system?
5+2+2+1

5. Write short note on the following:
 - i) Chemotherapeutic agent
 - ii) First pass metabolism
 - iii) Bioavailability
 - iv) pinocytosis

6. Write the sites involved in drug metabolism. Write a short note on Prodrug including the significance of Levodopa & dopamine in this respect, Among 'Sulfasalazine & 5-aminosalicylic acid'-which one you choose to treat chron's disease and why? Write a short note on magnetically activated DDS.
2+(1+2)+2+3

7. What do you mean by clearance? Write effect of pH in renal excretion of drugs. Differentiate between ion activated drug delivery and iontophoresis activated DDS.
5+5

8. Define feedback regulated DDS. Propose affinity based feedback regulated DDS for insulin delivery.

[Turn over

Ref. No.: EX/PG/BME/T/128B/2022

Master of Biomedical Engineering Examination, 2022

(1st Year, 2nd Semester)

Biosensors and Devices

Time: Three hours

Part-II

Full Marks: 50

Use separate answer script for each part

Answer any five questions

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| Q-1) | Describe Clark oxygen electrode and explain its operation. Include sketches and circuit diagram in your answer. | 10 Marks |
| Q-2) | Mention the components of an automated biochemical analysis system and describe and explain the operation of each component briefly. | 10 Marks |
| Q-3) (a) | Describe and explain "Entrapment method" for enzyme immobilization | 5 Marks |
| Q-3) (b) | Mention the essential characteristics of a reference electrode. Describe with a neat sketch a reference electrode | 5 Marks |
| Q-4) | Describe and explain how chemiluminescence can be used to design a biosensor. Include neat sketch in your answer | 10 Marks |
| Q-5) | Describe the principle of surface plasmon resonance and explain how it can be used to design a biosensor. Include neat sketches in your answer | 10 Marks |
| Q-6) | Describe and explain with neat sketch the working principle of Coulter Counter. | 10 Marks |
| Q-7) (a) | Explain the underlying principle of interference type optical filter. Include neat sketch in your answer | 6 Marks |
| Q-7) (b) | Explain the operation of a variable capacitance based displacement transducer | 4 Marks |
| Q-8) | Explain with neat sketch the method of linear sweep voltammetry | 10 Marks |