MEDICAL & PHARMACEUTICAL BIOTECHNOLOGY
(BIOT 4233)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) The concentration of insulin present in soluble insulin preparations (fast acting insulins) is the following
(a) 1×10-9M
(b) 1×10-3M
(c) 1×10-7M
(d) none of the above

(ii) Vancomycin acts by forming a complex with multiple points of contact to which of the following terminal residues of the peptidoglycan?
(a) D-alanyl D-alanine
(b) L-alanyl D-alanine
(c) L-alanyl L-alanine
(d) D-alanyl D-Lactate

(iii) Which of the following domain can bind with the DNA alone
(a) ZFHD1
(b) FRB
(c) p65
(d) FKBP12

(iv) CD4 markers are present on the surface of
(a) Cytotoxic T cells
(b) Helper T cells
(c) B cells
(d) RBC

(v) The Human Leucocyte Antigen gene resides on
(a) Chromosome 5
(b) Chromosome 6
(c) Chromosome 7
(d) Chromosome 8

(vi) Which of the following does not represent a clinical trial type?
(a) Factorial design
(b) Cross over design
(c) Hybrid design
(d) Teratogenicity profile

(vii) Which of the following is NOT a class of antibiotics?
(a) RNA synthesis inhibitors
(b) Protein synthesis inhibitors
(c) Folic acid antagonists
(d) Catecholamines

(viii) Which antibodies are used for ELISA technique?
(a) Primary antibodies
(b) Secondary antibodies
(c) Primary as well as secondary antibodies
(d) Primary, secondary and tertiary antibodies

(ix) Which among the following body fluid cannot be used in a non-invasive biosensor
(a) Tear
(b) Sweat
(c) Blood
(d) Saliva

(x) Biosensors which detect changes in current is known as
(a) Calorimetric biosensors
(b) Piezoelectric biosensors
(c) Amperometric biosensors
(d) Optical biosensors

Fill in the blanks with the correct word

(xi) CD8 markers are present on the surface of _____.

(xii) The catalytic component of the RISC is known as _____.

(xiii) Embryonic stem cells is obtained from _____ cells.

(xiv) _____ is defined as the time required by a drug to exactly reduce its original concentration to half, as a result of biological elimination.

(xv) HPLC stands for _____.

Group - B

2. (a) In the development cycle of a large molecule pharmaceutical/biopharmaceutical where does the pharmacokinetic (PK) profile determination fit in? What are the typical measurement variables in the determination of the PK profile for a therapeutic drug? What are two important characteristics of a drug that are established from its PK profile? *[(CO1)(Remember-understand/IOCQ)]*

(b) What are the types of interferons? How does interferon signal transduction happen? Use a table to identify minor and major potential adverse side effects of interferons. What is the most significant impact of this in terms of an interferon's maximum the rapeuticdose? *[(CO1)(Understand/LOCQ)]*

(c) Using one example, illustrate the role that intelligent data mining and cell based assays could play in distinguishing pharmacodynamic endpoints of the activity profile of a biopharmaceutical versus a small molecule pharmaceutical. *[(CO2)(Understand-Analyse/IOCQ)]*

4 + 4 + 4 = 12

3. (a) Name four categories of tests that are undertaken on a potential new drug during pre-clinical trials. What are the properties that are generally measured to establish the pharmacokinetic profile of a drug? Define bioavailability of a drug using two common drug administration modes as examples. *[(CO1)(Understand/LOCQ)]*

(b) Explain how recombinant DNA technology has assisted the production of pharmaceutically important proteins? Use examples to illustrate each aspect of improvement. *[(CO2)(Explain/IOCQ)]*

(2 + 3 + 2) + 5 = 12

Group - C

4. (a) Compare the three generations of vaccines. *[(CO4)(Compare/IOCQ)]*

(b) Illustrate the working principle of FACS. *[(CO3)(Illustrate/HOCQ)]*

(c) What do you mean by CD markers? *[(CO3)(Remember/LOCQ)]*

5 + 5 + 2 = 12

5. (a) Write notes on Antisense RNA therapy. *[(CO4)(Explain/HOCQ)]*

(b) State the barriers of pharmacogenomics. *[(CO4)(Analyze/IOCQ)]*

(c) What do you mean by embryonic stem cells. *[(C42)(Remember/LOCQ)]*

5 + 4 + 3 = 12

Group - D

6. (a) How is proteomics utilized in new drug development? Name two diseases where the the development of biomarkers have been particularly prolific. What are the requirements of an ideal biomarker? What are the characteristics of a protein that make it a definite biomarker? *[(CO3)(Understand/LOCQ)]*

(b) How does size exclusion (SE) HPLC find use in the pharmaceutical industry? Briefly outline its operating principles. *[(CO4)(Remember/LOCQ)]*

(3 + 1 + 2 + 2) + (2 + 2) = 12

7. (a) "Many of the conditions that develop into diseases, happen because at the molecular level, there is a change in amount, function or activity of one or more proteins" Explain this statement pointwise with emphasis on the role of proteomics in human disease and drug therapy. *[(CO3)(Analyse/HOCQ)]*

(b) Name two diseases where the development of biomarkers has been especially productive. In each instance name one biomarker protein. *[(CO4)(Remember/LOCQ)]*

(c) What are the four common immunoassay types? In which category does a sports anti-doping immunoassay fall? Name six important "wet experimental" parameters (e.g. coating buffer is one) that are important for development of an an antibody-antigen immunoassay. What are the technical factors that establish "proof of concept" in an immunoassay? *[(CO2)(Apply/IOCQ)]*

4 + 2 + (2 + 1 + 1 + 2) = 12

Group - E

8. (a) Enumerate the catalytic functions of lactate dehydrogenase in our body. *[(CO6)(Enumerate/IOCQ)]*

(b) Design the working principle of Human Immunodeficiency Virus Rapid Test Kit. *[(CO6)(Design/HOCQ)]*

(c) What do you mean by thermistors? *[(CO5)(Remember/LOCQ)]*

4 + 5 + 3 = 12

9. (a) Discuss the role of Gamma-glutamyltransferase in the living system. *[(CO6)(Analyse/IOCQ)]*

(b) Illustrate the use of a piezoelectric biosensor in defence sector. *[(CO5)(Illustrate/IOCQ)]*

(c) Enumerate the characteristics of a non-invasive biosensor. *[(CO5)(Remember/LOCQ)]*

3 + 5 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.54	41.67	19.79