

POSTGRADUATE INSTITUTE OF MEDICINE  
UNIVERSITY OF COLOMBO

POSTGRADUATE DIPLOMA IN MOLECULAR MEDICINE  
(SEMESTER I) EXAMINATION – JANUARY, 2010

Date : 19 January 2010

Time : 1.00 p.m. – 4.00 p.m.

SEQ PAPER I  
(FOUNDATION MODULE)

Answer all **six (06)** questions.

Answer each question in a separate answer book.

1.

- 1.1 Describe the microscopic anatomy of an alveolus in the lung. (40 marks)
- 1.2 List the factors that affect diffusion of gases across the alveolar capillary membrane. (20marks)
- 1.3 Name the major factors that affect blood pressure. (10 marks)
- 1.4 Give the physiological basis of reduced systolic blood pressure following a severe blood loss. (30 marks)

2.

- 2.1 Describe the microscopic structure of an intestinal villus. (30 marks)
- 2.2 Explain the digestion and absorption of lipids in the small intestine. (35 marks)
- 2.3 List five actions of thyroxine. (15 marks)
- 2.4 Explain the actions of thyroxine in physical and mental development. (20 marks)

3.

- 3.1 Draw and label a diagram of a nephron. (25 marks)
- 3.2 Explain the actions of the following hormones on the kidney.
  - 3.2.1 Anti diuretic hormone (ADH). (25 marks)
  - 3.2.2 Aldosterone. (25 marks)
- 3.3 Write a short note on spermatogenesis. (25 marks)

4.

- 4.1 Write a short note on the cytoplasmic membrane of bacteria. (30 marks)
- 4.2 What are dimorphic fungi? Give two examples. (20 marks)
- 4.3 Outline how you would collect a skin scraping from a superficial fungal lesion on the body. (20 marks)
- 4.4 List the stages that take place in virus replication. (15 marks)
- 4.5 List the transmission mechanisms in a viral infection. (15 marks)

5.

- 5.1 Give the biochemical action of sulphonamides. (40 marks)
- 5.2 Explain in biochemical terms how aspirin acts as an anti-inflammatory drug. (40 marks)
- 5.3 Explain the production of lactic acid in hypoxic muscles. (20 marks)

6.

- 6.1 Explain the role of glutamate dehydrogenase in amino acid metabolism. (40 marks)
- 6.2 Explain the role of the pentose phosphate pathway in
  - 6.2.1 Red blood cells. (30 marks)
  - 6.2.2 Nitric oxide production. (30 marks)

POSTGRADUATE INSTITUTE OF MEDICINE  
UNIVERSITY OF COLOMBO

POSTGRADUATE DIPLOMA IN MOLECULAR MEDICINE  
(SEMESTER I) EXAMINATION – JANUARY, 2010

Date : 20 January 2010

Time : 1.00 p.m. – 4.00 p.m.

SEQ PAPER II  
(CELL AND MOLECULAR BIOLOGY MODULE)

Answer all **six (06)** questions.

Answer each question in a separate answer book.

1.

- 1.1 Describe the process of meiosis I in oogenesis. (70 marks)  
1.2 How do numerical chromosome anomalies occur in meiosis I? (15 marks)  
1.3 Write the karyotypes of three such numerical chromosome anomalies. (15 marks)

2.

- 2.1 Explain the role of microtubules in mitosis. (50 marks)  
2.2 Explain the principle of separation of proteins by ion exchange chromatography. (50 marks)

3.

- 3.1 Describe the mechanism used for determining the correct reading frame during translation by prokaryotes in comparison to eukaryotes. (50 marks)  
3.2  
3.2.1 What is two channel microarray? (10 marks)  
3.2.2 Briefly explain how you would prepare a sample material in two channel DNA microarray to profile lung carcinoma specific gene expression. (40 marks)

4.

4.1 Briefly explain the importance of constructing a genomic DNA library.

(Do not write about construction of a library)

(30 marks)

4.2 A 20 kb circular plasmid is digested with restriction enzymes *EcoRI* and *HindIII* individually and then in combination. The resulting fragment sizes are determined by means of electrophoresis. The results are as follows:

(70 marks)

<i>EcoRI</i> alone	Fragments of 6 kb and 14 kb
<i>HindIII</i> alone	Fragments of 7 kb and 13 kb
<i>EcoRI</i> and <i>HindIII</i>	Fragments of 2 kb, 4 kb, 5kb and 9kb

Make a restriction map of the circular molecule and indicate the relative positions of the *EcoRI* and *HindIII* restriction sites.

(Hint : place one *EcoRI* site at '12 o'clock' and position the remainder relative to this site).

5. Explain how the following events regulate gene expression.

5.1 Chromosome remodelling.

(50 marks)

5.2 Cytoplasmic polyadenylation.

(50 marks)

6. Write short notes on two of the following.

6.1 End replication problem in linear chromosomes.

(50 marks)

6.2 Versatility of PCR.

(50 marks)

6.3 Transient gene expression.

(50 marks)

POSTGRADUATE INSTITUTE OF MEDICINE  
UNIVERSITY OF COLOMBO

POSTGRADUATE DIPLOMA IN MOLECULAR MEDICINE  
SEMESTER I EXAMINATION – JANUARY, 2010

Date: 21 January 2010

Time: 1.00 p.m. - 4.00 p.m

SEQ PAPER III  
(IMMUNOLOGY MODULE)

Answer all six (6) questions.

Answer each question in a separate answer book

1.

- 1.1 Draw and label a diagram to show the basic structure of the CD8 T cell receptor (30 marks)
- 1.2 Name the different types of T cells. (10 marks)
- 1.3 Describe the functions of NK cells in viral infections. (60 marks)

2.

- 2.1 Name the different types of adhesion molecules. (20 marks)
- 2.2 Describe the protective role of adhesion molecules of a cell against apoptosis. (30 marks)
- 2.3 Outline the functions of selectins that are expressed on T cells (50 marks)

3.

- 3.1 What is autoimmunity? (20 marks)
- 3.2 Describe the different types of **pathological** mechanisms involved in autoimmune disorders giving examples. (80 marks)

Contd..../2-

4.

- 4.1 What is an immune modulator? (20 marks)
- 4.2 Describe the role of defective dendritic cells in the development of autoimmunity. (50 marks)
- 4.3 Briefly describe the site of action of different types of intracellular immunosuppressant used in clinical practice. (30 marks)

5

- 5.1 Briefly describe the different types of hypersensitivity reactions. (40 marks)
- 5.2 Describe the changes that occur in a B cell after recognition of an antigen. (30 marks)
- 5.3 Briefly describe the functions of IgM antibodies. (30 marks)

6.

- 6.1 List the cells which express Fc receptors. (20 marks)
- 6.2 Describe the mechanism involved in antibody directed cell mediated cytotoxicity. (50 marks)
- 6.3 Describe the functions of IgE immunoglobulin. (30 marks)