

## SECTION B

**ANSWER ANY FIVE (5) OF THE FOLLOWING NINE QUESTIONS**  
**COMPLETE ALL PARTS OF ANY QUESTION WHICH HAS SEVERAL PARTS**  
**START EACH QUESTION ON A NEW PAGE**  
**EACH QUESTION IS WORTH 10 MARKS**

1.
  - (a) With the aid of diagrams, describe the molecular structure of a typical membrane-bound ion channel.
  - (b) Explain what is meant by channel “gates” and explain how these gates can be opened or closed by various factors.
  
2. *It is a hot day, and the subject for your physiology experiment feels thirsty. His initial urine sample has a density greater than that of water.*
  - (a) Describe the likely pattern of antidiuretic hormone (ADH) release, and therefore urine volume and urine concentration that will follow his ingestion of 1 litre of water.
  - (b) Explain the physiological mechanisms that bring about the changes you have described.
  
3. Discuss the processes involved in elimination of drugs from the body and describe how impairment of these processes may affect a person’s response to an orally-administered drug.
  
4. Describe the anatomy of the peripheral nervous system (a diagram may be used). Include the neurotransmitters and receptors that are found at each synapse. Give an example of a drug that acts at each of these sites and the related pathology (if possible).
  
5. Describe the outcome on hemopoiesis of high exposure of the human body to gamma-radiation.
  
6. Discuss the roles played by the following structures in the act of picking up a pen and writing a signature on a whiteboard:
  - i. posterior parietal cortex
  - ii. premotor cortex
  - iii. supplementary motor cortex
  - iv. corticospinal pathway
  - v. dorsal columns of the spinal cord

Where appropriate, consider the interaction between structures.

7.
  - (a) Summarize the characteristics of short-term and long-term memory in humans.
  - (b) Describe the characteristics of anterograde and retrograde amnesia and explain what goes wrong with normal brain function in these two types of amnesia.
  
8. Describe the physiology of pain perception. Give an example of an opioid that is used to treat pain and describe its mechanism of action.
  
9. Discuss factors that determine whether inflammation occurs in the central nervous system. In your answer, describe the type of inflammation that may occur in the central nervous system.