Answer any three questions. Please write your name on each answer. Your answers should be in essay form, but they may be illustrated with diagrams or tables. Answers should be direct and clear, and they should refer to experimental evidence and/or clinical relevance as appropriate.

1. How do we know that solute flux through specific ion channels mediates the action potential in nerves? How do local anaesthetic drugs affect this mechanism, and why are they useful clinically?

2. Discuss how the structural organisation of a G-protein coupled receptor enables coupling between binding of a ligand and activation of intracellular signalling cascades.

3. Discuss the action of acetylcholine at the neuromuscular junction and how drugs and toxins can affect neuromuscular transmission.

4. Outline the main features of the ECG and describe examples of common dysrhythmias. Give THREE examples of anti-dysrhythmic drugs, their pharmacological targets and main cellular electrophysiological effects.

5. Define Starling’s Law of the Heart and assess its functional importance. What is the underlying mechanism, and how may it be modulated physiologically and pharmacologically?

6. How does the sino-atrial node control heart rate and how is its activity regulated?

7. Compare and contrast the mechanisms that regulate local blood flow to the lungs and to skeletal muscle.

8. Describe key mechanisms by which gases, fluids, electrolytes and macromolecules cross the capillary endothelium.

9. Discuss the concepts of lung compliance and airway resistance, how these parameters influence the process of breathing, and how they may change in respiratory disease.

10. Compare and contrast the dissociation curves of blood for carbon dioxide and oxygen. Comment on the physiological significance of the two curves.

END OF PAPER