



**KISII UNIVERSITY**  
**UNIVERSITY EXAMINATIONS**

**SECOND YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF  
BACHELOR OF MEDICINE AND BACHELOR OF SURGERY [MBChB]  
END YEAR 2022/2023  
[MAY-AUGUST, 2023]**

**MEDS 211: MEDICAL PHYSIOLOGY I  
PAPER 2**

**STREAM: Y2S3**

**TIME: 3 HOURS**

**DAY: TUESDAY, 2:00 – 5:00 PM**

**DATE: 22/08/2023**

**INSTRUCTIONS**

**1. Do not write anything on this question paper.**

**SECTION A: SAQS (ANSWER ALL QUESTIONS: 6 MARKS EACH)**

1. Adrenaline usually produces a rise in blood pressure. But if an agent X known to influence specific adrenaline effects is injected before adrenaline, then administration of adrenaline produces a fall in blood pressure. Explain the mechanisms by which the agent X influences adrenaline affects to result in the observation?
2. Acetylcholine usually produces a fall in blood pressure. But if atropine is injected before acetylcholine, a high dose of acetylcholine gives a rise in blood pressure. Explain the mechanism by which atropine influences the effects of acetylcholine to produce the observation?
3. a) Tapping the patella tendon is followed by knee jerk and what is the physiological basis of this outcome?  
  
b) Explain why is there very little white matter in the sacral spinal cord as compared to the cervical cord?
4. a) Explain the doctrine of specific nerve energies?  
  
b) A transplanted heart is essentially a denervated heart does it show an increase in heart rate and cardiac output during exercise?

5. a) In blood, the ratio of white blood cells to red blood cells is about 1: 1000. But in the bone marrow, white cell precursors outnumber red cell precursors, the myeloid/erythroid ratio being 4:1. What is the reason for this apparent discrepancy?
- b) In the ABO system, if a blood group antigen is absent, why is the corresponding antibody present?

**6. Complete the following table**

|   | Tidal volume (per min) | Respiratory rate (mL) | Dead space (L/Min) | Pulmonary ventilation (L/min) | Alveolar ventilation |
|---|------------------------|-----------------------|--------------------|-------------------------------|----------------------|
| 1 | 600                    | 10                    | 150                |                               |                      |
| 2 | 400                    | 15                    | 150                |                               |                      |
| 3 | 300                    | 20                    | 150                |                               |                      |
| 4 | 200                    | 30                    | 150                |                               |                      |
| 5 | 150                    | 40                    | 150                |                               |                      |

Since alveolar ventilation is the physiologically useful fraction of pulmonary ventilation what does the above table tell you about?

- i. The effect of tidal volume on alveolar ventilation
  - ii. the effect of respiratory rate on alveolar ventilation
  - iii. which is the more efficient pattern of breathing: deep and slow vs shallow and rapid
7. a) Secretin and cholecystokinin, which normally inhibit acid secretion, have a stimulatory effect on pepsin secretion. What is the possible physiological relevance of this difference in effect?
- b) Explain how it is advantageous to have enzymes for the final digestion of carbohydrates and proteins located in the brush border rather than in the lumen?
8. a) The gastrointestinal tract absorbs nearly 10 litres of water in a day. Explain the sources and indicate volumes each of these sources contribute to the 10 liters?
- b) Explain why a person on a low sodium diet may develop elevated serum potassium levels (hyperkalaemia)?
- c) Explain the effect of aldosterone on acid-base balance?

9. Explain briefly why an increase in erythrocyte 2,3-Diphosphoglycerate (DPG) concentration at high altitude is helpful at moderately high altitudes but not at very high altitudes
10. Describe the interrelationships between Bohr effect and Haldane effect

**SECTION B: ESSAYS. Answer any TWO questions.**

1. Comparatively discuss the skeletal and cardiac muscle cells under the following headings **(20 marks)**
- a. Automaticity
  - b. Rhythmicity
  - c. Refractory period
  - d. All or non-law
  - e. staircase phenomenon
  - f. Length-tension relationship
  - g. Force -velocity relationship
2. (a). Discuss the lung volumes and capacities **(10 marks)**
- (b). Discuss the variations in V/Q ratio of a vertical lung and how the various V/Q mismatches are corrected by local lung tissue control mechanisms. **(10 marks)**
3. Focusing on the stomach, small intestines and large intestines discuss their handling of the 3 major nutrients, proteins, carbohydrates and triglycerides. **(20 marks)**