

KISII UNIVERSITY SPECIAL/SUPPLEMENTARY EXAMINATIONS

CIMS0114 –HUMAN PHYSIOLOGY

DAY: -----

DATE: -----

INSTRUCTIONS

1. Do not write anything on this question paper

PART 1- SECTION A: SHORT ANSWER QUESTIONS [60 MARKS]

Answer all questions

Each question carries 10 marks

1. Briefly discuss the main components of the sarcomere.
2. Discuss in summary the cells of the gastric pits and their functions.
3. Write short notes on the pancreas.
4. Briefly discuss functions of the liver.
5. Discuss the mechanism of contraction of the smooth muscle.
6. Compare and contrast the skeletal and cardiac muscles.

PART 1- SECTION B: LONG ANSWER QUESTIONS [40 MARKS]

- *Answer any two questions*
- *Each question carries 20 marks*

1. Discuss the regulation of gastric activity.
2. Discuss the mechanism of skeletal muscle contraction.
3. Discuss the digestion and absorption of the major food nutrients.

PART 2- SECTION A: MULTIPLE CHOICE QUESTIONS [15 QUESTIONS]

- *Answer all questions*

- *For each question choose the most correct option*
- *Each question carries ONE mark*

1. Bile

- A. Contains enzymes required for the digestion of fat.
- B. Contains unconjugated bilirubin.
- C. Salts make cholesterol more water-soluble.
- D. Pigments contain iron.

2. In the stomach

- A. pH rarely falls below 4.0.
- B. Pepsinogen is converted to pepsin by hydrochloric acid.
- C. Ferrous iron is reduced to ferric iron by hydrochloric acid.
- D. Acid secretion is inhibited by pentagastrin.

3. Intestinal secretions contain

- A. Potassium in a concentration similar to that in extracellular fluid.
- B. Enzymes that are released when the vagus nerve is stimulated.
- C. Enzymes that hydrolyze disaccharides.
- D. Enzymes that hydrolyze polysaccharides.

4. Pancreatic secretion

- A. In response to vagal stimulation is copious, rich in bicarbonate but poor in enzymes.
- B. In response to acid in the duodenum is scanty but rich in enzymes.
- C. In response to secretin secretion is low in bicarbonate.
- D. Contains enzymes that digest neutral fat to glycerol and fatty acids.

5. The liver is the principal site for

- A. Synthesis of plasma albumin.
- B. Synthesis of vitamin B12.
- C. Storage of vitamin C.
- D. Storage of calcium.

6. In the colon

- A. A greater volume of water is absorbed than in the small intestine.
- B. Mucus is secreted to lubricate the faecal contents.
- C. Faecal transit time is normally about 7 days.
- D. Faecal transit time is inversely related to its fibre content.

7. Gastric juice

- A. Is secreted when the vagus nerves are stimulated.
- B. Is secreted in vagotomized animals when food is chewed but not swallowed.
- C. Inactivates the digestive enzymes secreted with saliva.
- D. Does not irritate the oesophageal mucosa if regurgitated from the stomach.

8. An increase in body fat increases the

- A. Percentage of water in the body.
- B. Survival time during fasting.
- C. Specific gravity of the body.

- D. Probability of decreased morbidity and premature mortality.
9. Saliva is not necessary for
- Swallowing of food.
 - Normal speech.
 - Antisepsis in the mouth.
 - Taste sensation.
10. The stomach
- Is responsible for absorbing about 10 per cent of the ingested food.
 - Contains mucosal cells containing high concentrations of carbonic anhydrase.
 - Peristaltic contractions start from the pyloric region.
 - Motility increases when fat enters the duodenum.
11. The normally innervated stomach
- Is not stimulated to secrete gastric juice when food is chewed, even if it is not swallowed.
 - Cannot secrete HCl when its H1 histamine receptors are blocked.
 - And the denervated stomach can secrete gastric juice after a meal is ingested.
 - Empties more quickly than the denervated stomach.
12. The passage of gastric contents to the duodenum may cause
- Decrease in secretion of pancreatic juice rich in bicarbonate.
 - Increased gastric motility.
 - Contraction of the gallbladder.
 - Contraction of the sphincter of Oddi.
13. Bile salts
- Are the only constituents of bile necessary for digestion.
 - Have a characteristic molecule, part water-soluble and part fat-soluble.
 - Are reabsorbed mainly in the upper small intestine.
 - Are derived from cholesterol.
14. Secretion of gastric juice
- Increases when food stimulates mucosal cells in the pyloric region.
 - Is associated with a decrease in the pH of venous blood draining the stomach.
 - In response to food is reduced after vagotomy.
 - Is essential for protein digestion.
15. In the small intestine
- The enzyme concentration in intestinal juice is lower in the ileum than in the jejunum.
 - Vitamin B12 is absorbed mainly in the jejunum.
 - Water absorption is dependent on the active absorption of sodium and glucose.
 - Absorption of calcium occurs mainly in the terminal ileum.

PART 2- SECTION B: TRUE OR FALSE (T/F) QUESTIONS [75 MARKS]

- *Answer all questions*
- *For each option indicate if it true [T] or false [F]*
- *Each option carries ONE mark*

1. In skeletal muscle neuromuscular junctions
 - A. The motor end plate is the motor nerve terminal.
 - B. Spontaneous (miniature) potentials may be recorded in the motor nerve terminal.
 - C. Motor nerve terminals have vesicles containing acetylcholine.
 - D. There is a high concentration of acetylcholinesterase.
 - E. Transmission is facilitated by botulinum toxin.

2. A skeletal muscle fibre
 - A. Membrane is negatively charged on the inside with respect to the outside at rest.
 - B. Contains intracellular stores of calcium ions.
 - C. Is normally innervated by more than one motor neurone.
 - D. Becomes more excitable as its resting membrane potential falls.
 - E. Becomes less excitable as the extracellular ionized calcium levels fall.

3. A somatic lower motor neurone
 - A. Innervates fewer fibres in an eye muscle than does one innervating a leg muscle.
 - B. Conducts impulses at a speed similar to that in an autonomic postganglionic neurone.
 - C. Is unmyelinated.
 - D. Conducts impulses which cause relaxation in some skeletal muscles.
 - E. Synapse with skeletal muscle but not with other neurones.

3. In skeletal muscle
 - A. Contraction occurs when its pacemaker cells depolarize sufficiently to reach the threshold for firing.
 - B. Calcium is taken up by the sarcotubular system when it contracts.
 - C. Actin and myosin filaments shorten when it contracts.
 - D. The sarcomeres shorten during contraction.
 - E. Contraction strength is related to initial length of the muscle fibres.

4. Visceral smooth muscle differs from skeletal muscle in that
 - A. It contracts when stretched.
 - B. It is not paralyzed when its motor nerve supply is cut.
 - C. Its cells have unstable resting membrane potentials.
 - D. It contains no actin or myosin.
 - E. Excitation depends more on influx of extracellular calcium than release of calcium from endoplasmic reticulum.

5. A property shared by
 - A. Skeletal and cardiac muscle is their striated microscopical appearance.
 - B. Skeletal and multiunit smooth muscle is that they are paralysed when their motor nerves are cut.
 - C. Cardiac and visceral smooth muscle is their spontaneous activity when denervated.
 - D. Skeletal and cardiac ventricular muscle is their stable resting membrane potential.
 - E. All varieties of muscle is that contraction strength is related to their initial length.

6. Muscle tone is reduced by
 - A. Curare-like drugs.
 - B. Lower motor neurone lesions.
 - C. Upper motor neurone lesions.
 - D. Cerebellar lesions.
 - E. Gamma efferent impulses to muscle spindles.

7. Characteristic features of cerebellar disease include loss of
- Muscle tone.
 - Muscle strength.
 - Conscious muscle-joint sense.
 - Ability to make precise muscle movements.
 - Ability to fix the gaze steadily on an object.
8. Histological and physiological study of skeletal muscle shows that the
- Distance between two Z lines remains constant during contraction.
 - Width of the anisotropic A band is constant during contraction.
 - Tension developed is maximal when actin and myosin molecules just fail to overlap.
 - Stimulus needed to cause contraction is minimal when applied at the Z line.
 - The T system of transverse tubules opens into the terminal cisterns of the sarcoplasmic reticulum.
9. Cardiac muscle is different from skeletal muscle because:
- Fast Na Channels
 - Slow Ca Channels
 - Presence of actin and myosin
 - Lower RMP
 - None of the above
10. 8. Histological and physiological study of skeletal muscle shows that the
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 - The T system of transverse tubules opens into the terminal cisterns of the sarcoplasmic reticulum.
11. The action potential of skeletal muscle
- has a prolonged plateau phase.
 - spreads inward to all parts of the muscle via the T tubules.
 - causes the immediate uptake of Ca^{2+} into the lateral sacs of the sarcoplasmic reticulum.
 - is longer than the action potential of cardiac muscle.
 - is not essential for contraction.
12. The functions of tropomyosin in skeletal muscle include
- sliding on actin to produce shortening.
 - releasing Ca^{2+} after initiation of contraction.
 - binding to myosin during contraction.
 - acting as a “relaxing protein” at rest by covering up the sites where myosin binds to actin.
 - generating ATP, which it passes to the contractile mechanism.
13. The cross-bridges of the sarcomere in skeletal muscle are made up of
- actin.
 - myosin.
 - troponin.
 - tropomyosin.
 - myelin.

14. The contractile response in skeletal muscle

A. starts after the action potential is over.

B. does not last as long as the action potential.

C. produces more tension when the muscle contracts isometrically than when the muscle contracts isotonicly.

D. produces more work when the muscle contracts isometrically than when the muscle contracts isotonicly.

E. decreases in magnitude with repeated stimulation.

15. Gap junctions

A. are absent in cardiac muscle.

B. are present but of little functional importance in cardiac muscle.

C. are present and provide the pathway for rapid spread of excitation from one cardiac muscle fiber to another.

D. are absent in smooth muscle.

E. connect the sarcotubular system to individual skeletal muscle cells.