



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2023/2024 ACADEMIC YEAR

FIRST TRIMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN PHYSIOTHERAPY

COURSE CODE: BSP 433

COURSE TITLE: BASIC SCIENCES PAPER I

DATE: Monday 4th December 2023 **TIME:** -8:00am – 10:00am

INSTRUCTIONS TO CANDIDATES

Answer all Sections

Sec A: Multiple Choice Questions (MCQ) (20 Marks)

Sec B: Short Answer Questions (SAQ) (40 Marks)

Sec C: Long Answer Questions (LAQ) (40 Marks)

TIME: 3 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.



SECTION A: MULTIPLE CHOICE QUESTIONS (MCQs)

(20 marks)

HUMAN ANATOMY

1. The following are cervical branches of the facial artery except
 - A. Tonsillar branch
 - B. Ascending palatine artery
 - C. Submental artery
 - D. Angular artery
2. The hypothalamus is a part of the:
 - A. Diencephalon
 - B. Mesencephalon
 - C. Myelencephalon
 - D. Yelencephalon
3. Which of the following connects the two hemispheres of the cerebrum?
 - A. Calcarine sulcus
 - B. Longitudinal cerebral fissure
 - C. Corpus callosum
 - D. Central sulcus
4. Most of the facial muscles are derived from which pharyngeal arch:-
 - A. First
 - B. Second
 - C. Third
 - D. Fourth
5. Which of the following bones is part of the pelvic girdle?
 - A. Femur
 - B. Tibia
 - C. Sacrum
 - D. Radius
6. Which part of the ear is responsible for transmitting sound vibrations to the inner ear?
 - A. Cochlea
 - B. Tympanic membrane (eardrum)
 - C. Eustachian tube
 - D. Vestibule
7. How many pairs of ribs are there in the human body?
 - A. 8
 - B. 10
 - C. 12
 - D. 14
8. The process by which the heart contracts and pumps blood is called:
 - A. Diastole
 - B. Systole
 - C. Vasodilation
 - D. Venule contraction
9. The sternoclavicular joint:
 - A. Communicates with the manubriosternal joint
 - B. Is mostly stabilised by the costoclavicular lig
 - C. Is the fulcrum of movements at the sternoclavicular joint
 - D. Contains 2 fibrocartilage discs
10. The subacromial bursa:
 - A. Is strengthened anteriorly by the glenohumeral ligaments
 - B. Lies under the coracoacromial lig
 - C. Envelopes the distal end of the coracoid process

- D. If inflamed will be more tender when abducted
11. Anatomical snuff box:
 - A. Has EPL on its ulnar side
 - B. Lies between EPL and APL
 - C. Has the trapezoid palpable at its base
 - D. Is most obvious with the thumb fully abducted
 12. Serratus anterior
 - A. Medially rotates shoulder
 - B. Protracts scapula
 - C. Is unipennate
 - D. Arises from the upper 6 ribs
 13. The femoral triangle:
 - A. Is bounded by adductor longus and magnus
 - B. Has the fascia lata lining its floor
 - C. Femoral a is between the femoral v and n
 - D. Bounded superiorly by the lacunar lig
 14. The hip joint:
 - A. Derives its stability largely from the shape of its articular surfaces
 - B. Has the ischiofemoral as its strongest lig
 - C. Is only supplied by the obturator and sciatic nn
 - D. Is limited in full extension by the pubofemoral lig
 15. Which does not attach to the greater trochanter?
 - A. Piriformis
 - B. Glut max
 - C. Obturator internus
 - D. Obturator externus
 16. Which muscle is not used in forced expiration?
 - A. Transversus abdominis
 - B. Rectus abdominis
 - C. Diaphragm
 - D. External obliques
 17. The vena cava foramen in the diaphragm is at level of
 - A. T12
 - B. T8
 - C. T10
 - D. L1
 18. Regarding the descending part of the thoracic aorta
 - A. Begins at level of T3
 - B. Passes through the diaphragm behind the lateral arcuate ligament
 - C. Begins at the beginning of the arch of the aorta
 - D. Passes to the abdomen at the level of T12
 19. Which heart valve has 2 cusps
 - A. Aortic
 - B. Mitral
 - C. Pulmonary
 - D. Pulmonary and aortic
 20. With regard to the spinal cord blood supply
 - A. There are 2 anterior spinal arteries
 - B. The anterior spinal artery arises from the vertebral a
 - C. The posterior spinal artery is singular
 - D. The posterior spinal artery arises from the posterior superior cerebellar

SECTION B: SHORT ANSWER QUESTIONS (SAQS)

(5x3=15 Marks)

1. Enumerate branches from medial cord of brachial plexus.

2. Outline 5 characteristics that make the 1st rib atypical rib.
3. List the posterior muscles of the thoracic wall

MEDICAL PHYSIOLOGY

SECTION A: MULTIPLE CHOICE QUESTIONS

(20 Marks)

1. The haemoglobin oxygen dissociation curve moves up and to the left with
 - A. Increased hydrogen ion concentration
 - B. Hypothermia
 - C. Increased 2,3 DPG
 - D. Hypercarbia
2. Which one of the following definitions is incorrect
 - A. The respiratory minute volume equals the amount of air inspired per minute
 - B. Residual volume is the air left in the lungs after a maximal expiratory effort
 - C. Vital capacity is the maximal amount of air that can be expired after a normal inspiration
 - D. Physiological dead space is the amount of air not equilibrating with blood
3. In skeletal muscle
 - A. Tropomyosin is made up of 3 subunits
 - B. The heads of actin contain ATP hydrolysis sites
 - C. The myosin is contained entirely within the A band
 - D. Troponin T inhibits the interaction with myosin
4. With regard to the renin-angiotensin system
 - A. Prorenin has 50% the activity of renin
 - B. Renin secretion will be increased by propranolol
 - C. Angiotensinogen is synthesised by the liver
 - D. Angiotensin I is a potent vasodilator
5. What is the difference between “loose” connective tissue (CT) and “dense” connective tissue?
 - A. Fibres occupy most of the volume in dense CT
 - B. Dense CT includes cartilage, loose CT does not.
 - C. Loose CT has a good blood supply while dense CT does not.
 - D. Loose CT has no fibres (and dense CT does).
6. Blood flow through the heart follows which of the sequences listed below?
 - A. From left atrium, then mitral valve, right ventricle, aorta, left ventricle
 - B. From right atrium, then mitral valve, right ventricle, pulmonary trunk, left ventricle.
 - C. From pulmonary trunk, then tricuspid valve, left atrium, aortic valve, aorta
 - D. From vena cava, then right ventricle, pulmonary trunk, left ventricle, aorta.
7. Secretin:
 - A. Is a GIT hormone secreted from the pylorus.
 - B. Is secreted as a result of vagus nerve stimulation.
 - C. Stimulates gastric secretion.
 - D. Is released as a result of contact of acid chyme to the duodenal mucosa.
8. Which of the following changes tends to increase GFR?
 - A. Increased afferent arteriolar resistance
 - B. Decreased efferent arteriolar resistance
 - C. Increased glomerular capillary filtration coefficient
 - D. Increased Bowman’s capsule hydrostatic pressure
9. Mastication is important because:
 - A. Allows the salivary enzymes to act for a longer time.
 - B. Increase the surface area of the food particles.
 - C. Destroys the protective coating present around some foods.
 - D. All of the above.
10. Why is milk produced only after delivery, not before?
 - A. Levels of luteinizing hormone and follicle-stimulating hormone are too low during pregnancy to support milk production.
 - B. High levels of progesterone and estrogen during pregnancy suppress milk production

- C. The alveolar cells of the breast do not reach maturity until after delivery.
 D. High levels of oxytocin are required for milk production to begin, and oxytocin is not secreted until the baby stimulates the nipple.
11. Which of the following hormones is not stored in its endocrine-producing gland?
 A. T₄
 B. PTH
 C. Aldosterone
 D. ACTH
12. A 40-year-old man, employed as a road construction worker for nearly 20 years, went to his clinician to report that he recently began to notice difficulty hearing during normal conversations. A Weber test showed that sound from a vibrating tuning fork was localized to the right ear. A Schwabach test showed that bone conduction was below normal. A Rinne test showed that both air and bone conductions were abnormal, but air conduction lasted longer than bone conduction. The diagnosis was
 A. sensorial hearing loss in both ears.
 B. sensorial deafness in the right ear.
 C. conduction deafness in the left ear.
 D. sensorineural deafness in the left ear.
13. When comparing the fovea with the periphery of the retina, which of the following statements is correct?
 A. The fovea contains an increased proportion of cones
 B. The fovea contains an increased proportion of ganglion cells
 C. The fovea contains an increased proportion of horizontal cells
 D. The fovea contains an increased proportion of rods
14. Which of the following substances is responsible for the umami taste sensation?
 A. Acetic acid
 B. Long-chained organic substances containing nitrogen
 C. Fructose
 D. Glutamate
15. Spermatogenesis is regulated by a negative feedback control system in which follicle-stimulating hormone (FSH) stimulates the steps in sperm cell formation. What is the negative feedback signal associated with sperm cell production that inhibits pituitary formation of FSH?
 A. Testosterone
 B. Inhibin
 C. Estrogen
 D. Luteinizing hormone
16. In controlling aldosterone secretion, angiotensin II acts on which of the following structures?
 A. Zona glomerulosa
 B. Zona fasciculata
 C. Zona reticularis
 D. Adrenal medulla
17. Neurons located in which of the following areas release serotonin as their neurotransmitter?
 A. Periaqueductal gray area
 B. Interneurons of the spinal cord
 C. Periventricular area
 D. Nucleus raphe magnus
18. When comparing the fovea with the periphery of the retina, which of the following statements is correct?
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 D. The fovea contains an increased proportion of rods
19. Inhibition of the myenteric plexus leads to which of the following?
 A. Increased Secretion of Secretin from the duodenum.
 B. Decreased gut motility.

- C. Hyperacidity in the stomach.
 - D. Diarrhea.
20. Stimulation of sub mucosal plexus result in an Increase in which of the following?
- A. Motility of the gut.
 - B. Secretion of the gut.
 - C. Sphincter tone.
 - D. Stomach ph.

SECTION B: SHORT ANSWER QUESTIONS

(5x3=15 Marks)

1. Discuss the thyroid hormone regulation mechanisms
2. Explain how static equilibrium is achieved through the ear
3. Formation of concentrated urine is one of the complex processes that takes place in the kidneys. Explain

CELL BIOLOGY & MICROBIOLOGY

SECTION A: MULTIPLE CHOICE QUESTIONS

(10 Marks)

1. In DNA therapeutic delivery into cells
 - A. Bacteria can carry agent for introduction
 - B. Repeated treatments are required
 - C. Viral methods offer large scale production advantages
 - D. Electroporation and *in situ* hybridization mediate agent transfers
2. Post translational modification
 - A. Causes splicing of protein disulphides
 - B. Takes place inside SER
 - C. Starts after entry into cisternae mediated by a leader sequence
 - D. Involves moiety addition in RER
3. Molecular evolution
 - (a) Commences with transposon drifts
 - (b) Explains principles of computational biology
 - (c) Emphasizes effects of single nucleotide changes
 - (d) Deals with depurination effects on assortative outcomes
4. In Northern blotting
 - (a) Endonucleases target specific recognin sites
 - (b) Data outcomes can be used to quantify stress levels
 - (c) DNA molecules are blotted onto nitrocellulose
 - (d) DNA ligase plays a DNA regulatory role
5. From NNI definition molecular nanoparticles
 - (a) Range in size from 1 to 110 nm
 - (b) Can be generated in plasmids
 - (c) Can be attrition-prepared
 - (d) Can be generated using transcription mechanosynthesis
6. Select a property that DOES NOT apply to DNA probes
 - (a) Fragment lengths range from 100-1000 nucleobases
 - (b) They strictly target complementary sequences for detection
 - (c) They are expressible *in vivo* via plasmids
 - (d) They can be accompanied by ³²P markers
7. Nc RNAs
 - (a) Include subsets encoded in extranucleous positions
 - (b) Mediate central dogma special transfers
 - (c) Transfer sequence information in hnRNA synthesis
 - (d) Include primary mRNA transcripts
8. Recombinant expression vectors
 - (a) Can be used for anti-diabetic insulin production

- (b) Are hot plasmids for injection into viral replicons
 - (c) Are cloned by DNA splitting ligases
 - (d) Are extracted using DEAE-dextran
9. Lambda phage vectors
- (a) Are coliphage derivatives
 - (b) Are potent replicons
 - (c) Are inserted into targets with poly A tails
 - (d) Are commonly applied in expression of insulin
10. Transcription
- (a) Utilises DNA polymerase activities
 - (b) Is mediated by tRNA-involving decoding
 - (c) Translocates rRNA from the nucleus
 - (d) Takes place in the nucleus

SECTION B: SHORT ANSWER QUESTIONS

(5 Marks)

1. Explain the TF operation mechanisms

EXERCISE PHYSIOLOGY

SECTION A: MULTIPLE CHOICE QUESTIONS

(10 Marks)

1. Protein is not really a fuel source for exercise as all proteins are performing some function in the body. However, during exercise some protein is broken down to provide energy in the form of ATP. During prolonged submaximal exercise protein may provide what percentage of the energy expended?
 - A. 5-10%
 - B. 10-15%
 - C. 15-20%
 - D. Protein is only broken down to provide energy during maximal exercise
2. Which of the following would have the least effect on muscle anaerobic capacity?
 - A. Resting muscle glycogen concentration
 - B. Resting muscle PCr concentration
 - C. Muscle glycolytic enzyme activity
 - D. Muscle buffering capacity
3. In a sport such as soccer or rugby, the energy required to restore muscle PCr stores following a short intense sprint is derived from:
 - A. The high-energy phosphate system.
 - B. Anaerobic glycolysis.
 - C. The oxidation of muscle glycogen.
 - D. All the above.
4. Print interval training has been shown to result in:
 - A. Increases in muscle glycogen content.
 - B. Increases in maximal muscle oxidative enzyme activity.
 - C. Increases in maximal muscle glycolytic enzyme activity.
 - D. All the above
5. Which of the following training sessions would result in the greatest decrease in muscle glycogen concentration?
 - A. Four 30-second sprint intervals (total exercise time = 2 minutes)
 - B. Six 30-second endurance intervals at 100% VO₂ max (total exercise time = 3 minutes)
 - C. 4 minutes of continuous exercise at 100% VO₂ max
 - D. 60 minutes of continuous exercise at 75% VO₂ max

6. For which of the following sports would a training program for increasing maximal muscle glycogenolytic enzyme activity be least important?
 - A. Basketball
 - B. 200 m, track
 - C. High jump
 - D. 800 m, track
7. In which of the following events would the energy for muscle contraction come almost equally from PCr hydrolysis and anaerobic glycogenolysis?
 - A. Shot put
 - B. 100 m, track
 - C. 200 m, track
 - D. 400
8. Which of the following would have the least effect on the maximal anaerobic capacity of a muscle?
 - A. An increase in muscle glycogen concentration
 - B. An increase in muscle PCr concentration
 - C. An increase in muscle Na⁺/K⁺ pump capacity
 - D. An increase in muscle buffering capacity
9. The oxygen deficit
 - A. Refers to the elevated oxygen consumption after exercise
 - B. Refers to the 'lag' in oxygen uptake at the beginning of exercise
 - C. Is higher in trained individuals compared to non-trained
 - D. None of the above answers is correct.
10. Performing two minutes of high intensity exercise would involve what percentage of aerobic/anaerobic production of ATP?
 - A. 10% aerobic/90% anaerobic
 - B. 20% aerobic/80% anaerobic
 - C. 40% aerobic/60% anaerobic
 - D. 70% aerobic/30% anaerobic

SECTION B: SHORT ANSWER QUESTIONS

(5 Marks)

1. What is the Wingate anaerobic test and what is it designed to measure? Describe what the results include