UNIVERSITY OF JOHANNESBURG

PROGRAM	:	*BIOMEDICAL TECHNOLOGY*
SUBJECT	:	**ANATOMY AND PHYSIOLOGY 1**
CODE	:	**APA 1111**
DATE	:	MID-YEAR SUPPLEMENTARY EXAMINATION 27 JULY 2016 (072X)
DURATION	:	08:00 – 11:00
WEIGHT	:	50: 50
TOTAL MARKS	:	150

EXAMINER/S	:	MR. T.T. NYAKUDYA
MODERATOR	:	MRS A. KADER
NUMBER OF PAGES	:	14 PAGES

INSRUCTIONS	:	THIS QUESTION PAPER MUST BE RETURNED WITH THE MULTIPLE CHOICE ANSWER SHEET AND THE EXAMINATION SCRIPTS.

REQUIREMENTS	:	1 X EXAMINATION SCRIPTS 1 X MULTIPLE CHOICE ANSWER SHEET

INSTRUCTIONS TO CANDIDATES:

1. THIS PAPER CONSISTS OF 3 SECTIONS.

   SECTION A CONSIST OF MULTIPLE CHOICE QUESTIONS THAT MUST BE ANSWERED ON THE **MULTIPLE CHOICE ANSWER** SHEET PROVIDED.

   SECTIONS B and **SECTION C** MUST BE ANSWERED IN **ONE EXAMINATION SCRIPT.**

2. THIS QUESTION PAPER MUST BE RETURNED WITH ALL YOUR EXAMINATION SCRIPTS AND THE MULTIPLE CHOICE ANSWER SHEET

SECTION A

Answer the following questions on the multiple choice answer sheet provided. Read the instructions carefully and select the single, most correct answer for each question.

1) The sum of all chemical reactions in living organisms are called:
A) digestion.
B) metabolism.
C) excretion.
D) secretion.
E) respiration.

2) Which of the following is the correct sequence, going from simplest to most complex, in the levels of structural organisation of the human body?
A) chemical, tissue, cellular, organ system, organ, organismal
B) chemical, cellular, tissue, organ, organ system, organismal
C) cellular, chemical, tissue, organ, organ system, organismal
D) cellular, tissue, chemical, organ, organ system, organismal
E cellular, chemical, tissue, organ system, organismal, organ

3) The maintenance of a constant and optimal internal environment in an organism is termed:
A) positive feedback.
B) homeostasis.
C) negative feedback.
D) effector control.
E) integration.

4) A cut that passes parallel through the long axis of the body and divides the body into equal left and right halves is known as a:
A) frontal section.
B) coronal section.
C) transverse section.
D) midsagittal section.
E) horizontalsection.

5) The chemical behavior of an atom is determined by:
A) the number of protons.
B) the number of neutrons.
C) the number and arrangement of electrons.
D) the size of the atom.
E) the mass of the atom.

6) Ions with a positive charge are called:
A) cations.
B) anions.
C) radicals.
D) polyatomic ions.
E) isotopes.

7) Each of the following is an example of an inorganic compound, **EXCEPT**
A) water.
B) acids.
C) bases.
D) salts.
E) glucose.

8) Which of the following statements about water is **NOT** correct?
A) it is composed of polar molecules
B) it is responsible for about 2/3 of the mass of the human body
C) it has a relatively low heat capacity
D) it can be considered a 'universal solvent'
E) it contains hydrogen bonds

9) Functions of the cell membrane include all of the following, **EXCEPT**
A) separation of the cytoplasm from the extracellular fluid.
B) regulation of exchange of materials with the extracellular environment.
C) sensitivity to changes in the concentration of certain substances in the extracellular fluid.
D) identifying foreign substances and cells.
E) structural support.

10) Which of the following is not a function of membrane proteins?
A) binds to ligands
B) regulates the passage of ions
C) as carrier molecules for various solutes
D) anchors or stabilizers for the cell membrane
E) produces energy

11) The process by which molecules such as glucose are moved into cells along their concentration gradient with the help of membrane bound carrier proteins is called :
A) osmosis.
B) facilitated diffusion.
C) active transport.
D) endocytosis.
E) exocytosis.

12) The triplet codes needed to produce a specific polypeptide chain are found in the
A) chromosome.
B) gene.
C) codon.
D) anticodon.
E) polypeptide itself.

13) The tissue that always has a free surface exposed to the internal or external environment is
A) epithelial tissue.
B) connective tissue.
C) muscle tissue.
D) neural tissue.
E) contractive tissue.

14) The basic shapes of epithelial cells include all of the following, except
A) stratified.
B) squamous.
C) cuboidal.
D) columnar.
E) All of the above are correct.

15) Functions of connective tissue include
A) establishing a structural framework for the body.
B) storing energy reserves.
C) providing protection for delicate organs.
D) all of the above
E) A and C only

16) The most common type of cartilage is _____ cartilage.
A) ligamentous
B) hyaline
C) elastic
D) fibrous
E) osseous

17) The most abundant cells in the epidermis are
A) adipocytes.
B) keratinocytes.
C) Merkel cells.
D) melanocytes.
E) Langerhans cells.

18) The layer of the skin that contains the blood vessels and nerves closest to the surface of the skin is the _____ layer.
A) papillary
B) reticular
C) epidermal
D) subcutaneous
E) hypodermal

19) The categories of epithelial tissue membranes are:

A) synovial, cutaneous, and mucous membranes

B) synovial, cutaneous, and serous membranes

C) synovial, mucous, and serous membranes

D) synovial, mucous, and cutaneous membranes

E) mucous, cutaneous, and serous membranes

20) Which of the following is the correct sequence of layers of the epidermis going from outermost to innermost layer?

A) stratum spinosum, stratum granulosum, stratum corneum, stratum lucidum, stratum germinativum

B) stratum granulosum, stratum germinativum, stratum lucidum, stratum spinosum, stratum corneum

C) stratum germinativum, stratum corneum, stratum spinosum, stratum lucidum, stratum granulosum

D) stratum corneum, stratum lucidum, stratum granulosum, stratum spinosum, stratum germinativum

E) stratum corneum, stratum germinativum, stratum lucidum, stratum granulosum, stratum spinosum

21) Cells that synthesize the organic components of the bone matrix are called
A) osteocytes.
B) osteoprogenitor cells.
C) osteoblasts.
D) osteoclasts.
E) chondrocytes.

22) Which of the following is not a part of the axial division of the skeletal system?
A) skull
B) auditory ossicles
C) hyoid bone
D) pectoral girdle
E) vertebral column

23) The vertebral column contains _____ lumbar vertebrae.
A) 4
B) 5
C) 7
D) 12
E) 31

24) Which of the following is **NOT** a component of the appendicular skeleton?
A) scapula
B) sacrum
C) femur
D) humerus
E) os coxae

25) Compared to the hand, the foot
A) has more phalanges.
B) has fewer metatarsals than the hand has metacarpals.
C) has a more restricted range of movement.
D) contains ellipsoidal arches that help distribute body weight.
E) has the same number of tarsals as the hand has carpals.

26) A sarcomere is:
A) the non-functional unit of skeletal muscle
B) the area between two Z lines
C) the area between two intercalated discs
D) the wavy lines on the cell, as seen in a microscope
E) a compartment in a myofilament

27) Gustatory receptors are located:
A) in the eye
B) in the ear.
C) on the surface of the tongue.
D) in the nose.
E) on the skin.

28) The sympathetic and parasympathetic nervous systems are subdivisions of the:
A) central nervous system.
B) voluntary nervous system.
C) autonomic nervous system.
D) somatic nervous system.
E) peripheral nervous system.

29) Steroid hormones
A) bind to receptors on the surface of the cell.
B) function by way of a second messenger system.
C) cannot diffuse through the cell membrane.
D) bind to intracellular receptors.
E) function by activating cAMP.

30) The hormone oxytocin
A) promotes uterine contractions.
B) is responsible for milk production in the mammary glands.
C) regulates blood pressure.
D) governs the ovarian cycle.
E) governs the levels of tissue androgens.

31) The posterior pituitary gland secretes
A) Follicle stimulating hormone (FSH).
B) Thyroid stimulating hormone (TSH).
C) Adrenocorticotropic hormone (ACTH).
D) Antidiuretic hormone (ADH).
E) Melanocyte stimulating hormone (MSH).

32) The dense layer of collagen fibers that surround an entire skeletal muscle is the
A) tendon.
B) epimysium.
C) endomysium.
D) perimysium.
E) fascicle.

7/...

33) Action potentials are conducted into a skeletal muscle fibre by:
A) motor end plates.
B) neuromuscular junctions.
C) transverse tubules.
D) triads.
E) sarcoplasmic reticulum.

34) During muscle contraction calcium ions from the endoplasmic reticulum binds to_____
A) actin molecules
B) myosin heads
C) tropomyosin molecules
D) troponin molecules
E) the tail portion of the myosin molecule

35) The most important factor in decreasing the intracellular [Ca^{2+}] after contraction is:
A) active transport of calcium across the sarcolemma.
B) active transport of calcium into the sarcoplasmic reticulum.
C) active transport of calcium into the synaptic cleft.
D) diffusion of calcium out of the cell.
E) diffusion of calcium into the sarcoplasmic reticulum.

36) Which of the following statements is **INCORRECT**?
A) When the sarcomeres are fully shortened, contraction cannot occur.
B) When the sarcomeres are slightly less than fully shortened, contraction cannot occur.
C) Sarcomeres can produce the most tension when stimulated over a relatively narrow range of resting lengths.
D) When the muscle is fully stretched, contraction cannot occur.
E) All sarcomeres in a muscle fibre contract and relax together.

37) Which of the following is **NOT** a function of the neuroglia?
A) support.
B) information processing.
C) secretion of cerebrospinal fluid.
D) isolation of neurons.
E) phagocytosis.

38) Which of the following is **NOT** involved in creating the resting potential of a neuron?
A) diffusion of potassium ions out of the cell
B) diffusion of sodium ions into the cell
C) membrane permeability for sodium ions greater than potassium ions
D) membrane permeability for potassium ions greater than sodium ions
E) The interior of the cell membrane has an excess of negatively charged protein molecules.

39) Axons crossing from one side of the spinal cord to the other within the gray matter are found in the
A) anterior gray horns.
B) lateral gray horns.
C) posterior gray horns.
D) gray commissures.
E) white commissures.

40) The cranial nerves that are involved in controlling eye movements are
A) I, II, and III.
B) III, IV, and VI.
C) II, III, and IV.
D) II and VI.
E) III and V.

41) The division of the autonomic nervous system that prepares the body for activity and stress is the _____ division.
A) sympathetic
B) parasympathetic
C) craniosacral
D) intramural
E) somatomotor

42) Olfactory receptors are located
A) in the eye
B) in the ear.
C) on the surface of the tongue.
D) in the nose.
E) on the skin.

43) The transparent portion of the eye is the
A) conjunctiva.
B) cornea.
C) iris.
D) pupil.
E) canthus.

44) Sound waves are converted into mechanical movements by the
A) auditory ossicles.
B) cochlea.
C) oval window.
D) round window.
E) tympanic membrane.

45) In the light-adapted state
A) visual receptors are much more sensitive to stimulation.
B) visual receptors are much less sensitive to stimulation.
C) we can only see black and white.
D) we can see better in the dark.
E) colors are very dull.

9/...

46) Each of the following hormones is an amino acid derivative **EXCEPT.**
A) epinephrine.
B) norepinephrine.
C) thyroid hormone.
D) thyroid stimulating hormone.
E) melatonin.

47) The zona glomerulosa of the adrenal cortex produces
A) androgens.
B) glucocorticoids.
C) mineralocorticoids.
D) epinephrine.
E) norepinephrine.

48) The chief cells of the parathyroid glands produce a hormone that
A) stimulates the formation of white blood cells.
B) increases the level of calcium ions in the blood.
C) increases the level of sodium ions in the blood.
D) increases the level of potassium ions in the blood.
E) increases the level of glucose in the blood.

49) Thyroid hormone contains the mineral
A) sodium.
B) potassium.
C) iron.
D) iodine.
E) zinc.

50) Growth hormone does all of the following, except:
A) promotes bone growth.
B) promotes muscle growth.
C) promotes neuron growth and development.
D) is glucose sparing.
E) promotes amino acid uptake by cells.

SUBTOTAL SECTION A: 50

SECTION B

Answer this section in the answer script provided. Label the cover of this script, SECTION B and **C.**
Ensure that you number your answers exactly as the questions are numbered

QUESTION ONE – INTRODUCTION TO ANATOMY AND PHYSIOLOGY

1.1. Differentiate between positive and negative feedback mechanisms. (2 x 1 = 2)

1.2. Name the organ system responsible for each of the following functions.
1.2.1. Transports blood throughout the body
1.2.2. Allows for gaseous exchange in our body
1.2.3. Provides protection to internal organs and assists in thermoregulation
1.2.4. Provides immunity against pathogens
1.2.5. Uses chemical messengers to regulate body functions
1.2.6. Filters the blood to remove excess substances and waste

(6 x ½ =3)

1.3. Provide the correct directional term for each of the following, when the body is in the anatomical position: (3 x ½ =1½)

1.3.1. The eyes are found _____ to the mouth.
1.3.2. The thorax is found _____ to the dorsum.
1.3.3. The auris is found _____ to the nasus.

1.4. Provide the correct anatomical term for each of the following: (3 x ½ =1½)
1.4.1. Mouth
1.4.2. Leg
1.4.3. Arm

[8]

QUESTION TWO – BASIC CHEMISTRY

2.1. Using the key choices below, select the correct responses to the following descriptive statements. Only write down the question number and the appropriate **alphabet** in your answer sheet. (8 x ½ = 4)

KEY CHOICES

A. Atom *C. Nucleus* *E. Ion* *G. Isotopes* *I. Protons*

B. Electrons *D. Energy* *F. Matter* *H. Neutrons* *J. Valence*

2.1.1. An electrically charged particle capable of gaining or losing electrons
2.1.2. Anything that takes up space and has mass (weight)
2.1.3. Responsible for most (if not all) of an atom's mass
2.1.4. Negatively charged particles, forming part of an atom
2.1.5. The outermost electron shell is known as the _____ shell.
2.1.6. The ability to do work
2.1.7. The smallest particle of an element that retains the properties of the element
2.1.8. Have same number of protons and electrons, but neutron numbers vary

2.2. For each of the following structures:

(a) Classify it according to the **FOUR** classes of organic compounds and
(b) State **ONE** function for each: (8 x ½ = 4)

2.2.1 Glucose
2.2.2 Enzymes
2.2.3 Ribonucleic acid
2.2.4 Phospholipid

[8]

QUESTION THREE – THE CELL

3.1 Name **THREE** types of extracellular fluid in the human body and briefly describe where each type is found. (6 x ½ =3)

3.2. List **ONE** function for each of the following: (6 x ½ =3)

3.2.1. Mitochondria
3.2.2. Ribosomes
3.2.3. Golgi apparatus
3.2.4. Lysosome
3.2.5. Endoplasmic reticulum
3.2.6. Centrioles

3.3. Tabulate any **TWO** differences between DNA and RNA. (4 x ½ = 2)

[8]

QUESTION FOUR – BASIC TISSUE

4.1. List the **FOUR** types of basic tissue and in **ONE WORD** state their function. (8 x ½ = 4)

4.2. Match the tissue in Column A to its correct description or location in Column B. You need only provide the question number and the letter of your chosen answer. (8 x ½ = 4)

Column A	Column B
4.2.1. Fibrocartilage 4.2.2. Dense regular connective tissue 4.2.3. Hyaline cartilage 4.2.4. Adipose tissue 4.2.5. Transitional epithelium 4.2.6. Simple cuboidal epithelium 4.2.7. Osseous tissue 4.2.8. Simple squamous epithelium	A. is made up of a single layer of flattened cells. B. have cells that sit inside cavities called lacunae. C. forms tendons and ligaments. D. forms the articular cartilage at synovial joints. E. is found in the kidney, the spleen and bone marrow. F. found in the bladder. G. forms cushion-like discs between the vertebrae. H. contain fat cells that store lipids. I. found covering the ovaries and lining duct of the kidney tubule.

[8]

QUESTION FIVE– THE INTEGUMENTARY SYSTEM

5.1. Name the **FIVE** layers of the epidermis starting with the layer closest to the dermis. (5 x ½ = 2½)

5.2. Provide **THREE** physiological reasons as to why skin color differs. (3 x ½ = 1½)

5.3. List any **TWO** functions for each of the following:
5.3.1. Sebaceous glands (2 x ½ = 1)
5.3.2. Sudoriferous glands (2 x ½ = 1)

5.4. Name the **TWO** types of sudoriferous glands. (2 x ½ = 1)

[7]

QUESTION SIX – THE SKELETAL SYSTEM

6.1. List any **FOUR** functions of the skeletal system. (4 x ½ = **2)**

6.2. Match the joint named in Column A to the correct term or description in Column B. You need only provide the question number and the letter of your chosen answer.
(10 x ½ = 5)

Column A	Column B
6.2.1. Synarthroses	A. First carpometacarpal joint
6.2.2. Amphiarthrosis	B. Bones connected by ligament
6.2.3. Gomphosis	C. Rotation of the axis and atlas
6.2.4. Synostosis	D. Bones separated by a fibrocartilage
6.2.5. Synchrondosis	E. Slightly moveable joint
6.2.6. Syndesmosis	F. Acromioclavicular joint
6.2.7. Symphisis	G. Two bones bound by a rigid cartilage
6.2.8. Gliding joint	H. Two bones that completely fuse
6.2.9. Pivot joint	I. Immovable Joint
6.2.10. Saddle joint	J. Teeth bound to bony sockets by periodontal ligaments

6.3 Compare and contrast the factors that alter the blood calcium levels by completing the following table. You need only provide the question number and the letter of your chosen answer.
(6 x ½ = 3)

Name of hormone	6.3.1	6.3.2
Effect on blood calcium levels	Increased	Decreased
Effect on kidneys	6.3.3	6.3.4
Effect on osteoblasts	Inhibited	6.3.5
Effect on osteoclasts	6.3.6	Inhibited

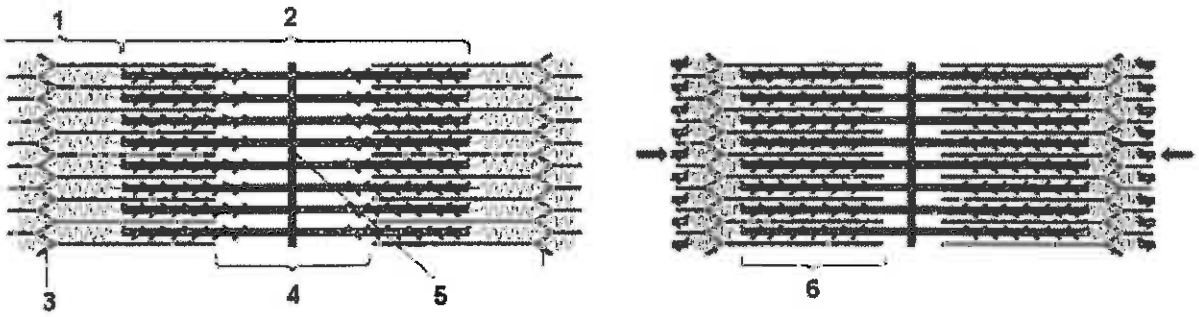
6.4 List any **TWO** anatomical adaptations to the female pelvis that allow for childbearing.
(2 x ½ = 1)
[11]

SUBTOTAL SECTION B: 50

SECTION C

QUESTION ONE – THE MUSCULAR SYSTEM

1.1 Study the diagrams below and answer the questions that follow:



1.1.1 Label the bands, lines and zones marked 1 – 6. (6 x ½ = 3)
1.1.2 List, in sequence, the molecular events that occur during the contraction cycle. (2½)

1.2 Give **ONE** function for each of the following components of sarcomere:
1.2.1 Transverse tubules (½)
1.2.2 Sarcoplasmic reticulum. (½)
1.2.3 Nebulin. (½)

1.3 Describe the **THREE** roles of ATP during muscle contraction. (3)
[10]

QUESTION TWO – THE ENDOCRINE SYSTEM

2.1 Name **TWO** hormones that affect metabolism and the glands from which they are produced. (4 x ½ = 2)

2.2 Briefly discuss the mechanism of peptide hormone action. (4 x ½ = 2)

2.3 Name and describe **THREE** ways by which hormonal secretion is regulated. (6 x ½ = 3)

2.4 Identify **TWO** gonadotropic hormones and name **ONE** effect of each on their target organs. (4 x ½ = 2)

2.5 Name the hormone that fits each of the following descriptions:

2.5.1 The hormone that stimulates red blood cell production

2.5.2 Necessary for childbirth (2 x ½ = 1)

[10]

QUESTION THREE – THE NERVOUS SYSTEM

3.1 List any **FOUR** functions of the hypothalamus. (4 x ½ = 2)

3.2 Name and describe **TWO** factors that influence the speed of action potential conduction. (4 x ½ = 2)

3.3 Name the **SIX** types of neuroglia in the nervous system and give **ONE** function of each. (12 x ½ = 6)

3.4 Regarding the **parasympathetic** nervous system:

3.4.1 Name the cranial nerves that carry motor commands to effectors. (4 x ½ = 2)

3.4.2 Name the neurotransmitter at the ganglia. (½)

3.4.3 Name the neurotransmitter at the target organ. (½)

3.4.4 List the any **FOUR** physiological changes brought about by parasympathetic stimulation. (4 x ½ = 2)

3.5 Compare the differences between the REM and deep sleep. You may tabulate your answer. (6 x ½ = 3)

3.6 List **FOUR** ways by which the brain is protected. (4 x ½ = 2)

[20]

QUESTION FOUR – THE SENSES

4.1 Distinguish between tonic and phasic receptors and give an example of each. (6 x ½ = 3)

4.2 Name the stimulus for each of the following receptors: (4 x ½ = 2)
4.2.1 Nociceptor
4.2.2Thermoreceptor
4.2.3 Mechanoreceptor
4.2.4 Chemoreceptor

4.3 Name the **TWO** photoreceptors associated with vision (2 x ½ = 1)

4.4 Briefly describe how the cochlear contributes to the process of hearing. (4 x 1 = 4)

[10]

SUBTOTAL SECTION C: 50

GRAND TOTAL: 150