



**PROGRAM** : NATIONAL DIPLOMA  
SOMATOLOGY

**SUBJECT** : ANATOMY AND PHYSIOLOGY 1

**CODE** : SAP 101

**DATE** : SUPPLEMENTARY EXAMINATION

**DURATION** : 180 MINUTES

**WEIGHT** : 50:50

**TOTAL MARKS** : 140

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**EXAMINERS** : MR I PATEL  
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**MODERATORS** : MRS B THOMAS  
MR I PATEL

**NUMBER OF PAGES** : 18 PAGES

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**INSTRUCTIONS** : THIS EXAM PAPER AS WELL AS THE MULTIPLE  
CHOICE ANSWER SHEET MUST BE RETURNED WITH  
THE EXAMINATION SCRIPTS.

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**REQUIREMENTS** : 2 x EXAMINATION SCRIPTS  
1 x MULTIPLE CHOICE ANSWER SHEET

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**INSTRUCTIONS TO CANDIDATES:**

1. THIS PAPER CONSISTS OF 3 SECTIONS.  
**SECTION A** CONSISTS OF MULTIPLE CHOICE QUESTIONS THAT MUST BE ANSWERED ON THE MULTIPLE CHOICE ANSWER SHEET PROVIDED.  
**SECTIONS B AND C** MUST EACH BE ANSWERED IN SEPARATE EXAMINATION ANSWER SCRIPTS.
  2. **PLEASE LABEL THE COVER OF EACH EXAMINATION ANSWER SCRIPT, SECTION B AND SECTION C.**
  3. THIS QUESTION PAPER MUST BE RETURNED WITH ALL YOUR EXAMINATION ANSWER SCRIPTS.
  4. MARK ALLOCATION: ½ MARK PER FACT UNLESS INDICATED OTHERWISE.
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**SECTION A**

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

**MULTIPLE CHOICE QUESTIONS AVAILABLE ON REQUEST**

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**SUBTOTAL SECTION A: 40**

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**SECTION B**

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

**QUESTION 1: HUMAN BODY ORIENTATION**

- 1.1 Name the organ system that corresponds to each of the following statements:
- 1.1.1 The pumping and transport of blood. (½)
- 1.1.2 Protection, support and provides a framework that muscles use to cause movement. (½)
- 1.1.3 Locomotion, facial expression, maintaining posture and produces heat. (½)
- 1.1.4 Form external body covering, synthesizes vitamin D, protects deeper tissues. (½)
- 1.1.5 Components include the brain and spinal cord. (½)
- 1.1.6 Breaks down food into smaller, absorbable units for energy. (½)
- 1.1.7 Keeps the body constantly supplied with oxygen and removes the carbon dioxide. (½)
- 1.1.8 Regulates water, electrolytes and the acid base balance. (½)
- 1.1.9 Glands secrete hormones that regulate various processes e.g. growth, metabolism, etc. (½)
- 1.1.10 Production of offspring. (½)
- 1.2 State whether each of the following statements are **true or false**.
- 1.2.1 The highest level of structural organization in humans is the organismal level. (½)
- 1.2.2 Joints are part of the muscular system. (½)
- 1.2.3 The spleen and the tonsils are part of the digestive system. (½)
- 1.2.4 The lymphatic system secretes hormones that regulate processes such as growth, reproduction, and nutrient use by cells. (½)
- 1.2.5 Excretion is the process of removing wastes from the body. (½)
- 1.2.6 Most homeostatic control mechanisms are negative feedback reactions. (½)
- 1.3 Fill in the blanks regarding directional terms. You need only write the question number and your corresponding answer.
- 1.3.1 The head is \_\_\_\_\_ to the trunk. (½)
- 1.3.2 The arms are \_\_\_\_\_ to the chest. (½)

- 1.3.3 The skin is \_\_\_\_\_ to the skeleton. ( $\frac{1}{2}$ )
- 1.3.4 The knee is \_\_\_\_\_ to the thigh. ( $\frac{1}{2}$ )

**[10]****QUESTION 2: CHEMISTRY**

- 2.1 Define the term isotope. ( $2 \times \frac{1}{2} = 1$ )
- 2.2 Describe the difference between a covalent bond and an ionic bond. ( $4 \times \frac{1}{2} = 2$ )
- 2.3 Name the **three** subatomic particles and state the electrical charge of each. ( $6 \times \frac{1}{2} = 3$ )

**[6]****QUESTION 3: CELLS**

- 3.1 Match the transport mechanism in Column A to the correct description in Column B. You need only provide the number and the corresponding letter of your answer choice. ( $6 \times \frac{1}{2} = 3$ )

Column A	Column B
3.1.1 Solute pumping	A. Movement of molecules down its concentration gradient.
3.1.2 Facilitated diffusion	B. Movement of water down its concentration gradient, and through a selectively permeable membrane.
3.1.3 Filtration	C. Movement of substance down a concentration gradient, using a membrane protein.
3.1.4 Osmosis	D. Movement of an amino acid against its concentration gradient.
3.1.5 Pinocytosis	E. Movement of a substance out of the cell.
3.1.6 Simple diffusion	F. Movement of extracellular fluid into the cell.
	G. Movement of extracellular solid particles into the cell.
	H. Water and solutes are forced through a membrane by hydrostatic pressure.

- 3.2 Name the intracellular organelle that performs each of the following functions:

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- (4 X 1/2 = 2)
- 3.2.1 Break down free radicals (1/2)
- 3.2.2 Digest worn-out material within the cell (1/2)
- 3.2.3 Direct the formation of the mitotic spindle (1/2)
- 3.2.4 Provides ATP for cellular energy (1/2)
- 3.2 List the **four** stages of mitosis. (4 x 1/2 = 2)
- 3.3 Name the **three** types of cell membrane junctions and explain the function of each. (6 x 1/2 = 3)
- [10]**

**QUESTION 4: BASIC TISSUES**

- 4.1 List **three** structural differences between skeletal and smooth muscle. (6 x 1/2 = 3)
- 4.2 The letters A – D refer to different tissue types. Read statements 4.2.1 – 4.2.10 and identify the tissue type (A, B, C or D) that corresponds to the description given. Only write the question number and the correct letter.

- A) Epithelial Tissue
- B) Connective tissue
- C) Muscle tissue
- D) Nervous tissue

- 4.2.1 is made up of a single layer of flattened cells (1/2)
- 4.2.2 has osteocytes that sit inside cavities called lacunae (1/2)
- 4.2.3 forms tendons and ligaments (1/2)
- 4.2.4 is found in synovial joints (1/2)
- 4.2.5 is found in lymph nodes, the spleen and the bone marrow (1/2)
- 4.2.6 has gap junctions and intercalated discs (1/2)

- 4.2.7 forms cushion-like discs between the vertebra (½)  
 4.2.8 contains fat cells that store lipids (½)  
 4.2.9 found covering the ovaries and duct of the kidney tubule (½)

(10 X 1/2 = 5)

- 4.2.10 forms a protective covering in the mouth, oesophagus and skin (½)  
 4.3 Name and briefly describe the **two** mechanisms of tissue repair.(4 x ½ = 2)

**[10]**

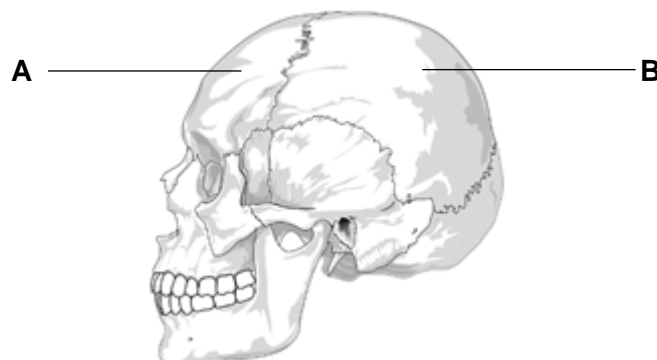
### **QUESTION 5: SKIN AND BODY MEMBRANES**

- 5.1 List the **two** layers of the dermis and provide **two** structures that can be found in each layer. (6 x ½ = 3)  
 5.2 Why is melanin production important? (2 x ½ = 1)  
 5.3 Name and describe the severity of damage associated with the **three** types of burns. (6 x ½ = 3)  
 5.4 Name the layers of the epidermis found on the forearm. (4 x ½ = 2)

**[9]**

### **QUESTION 6: THE SKELETAL SYSTEM**

- 6.1 List **four** functions of the skeletal system. (4 x ½ = 2)  
 6.2 List the **four** steps that occur during bone fracture repair. (4 x ½ = 2)  
 6.3 Provide labels for the cranial bones A and B in the diagram below. (2 x ½ = 1)



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**[5]**

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**SUBTOTAL SECTION B: 50**

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**SECTION C**

*Answer this section in a SEPARATE script. Label the cover of this script, SECTION C.*

*Ensure that you number your answers exactly as the questions are numbered.*

**QUESTION 1: MUSCLE**

1.1 Name any **four** functions of skeletal muscle. (4 x ½ = 2)

1.2 Name the correct skeletal muscle structure described in each of the statements below:

1.2.1 A complex organelle consisting of bundles of myofilaments that fills the cytoplasm of a skeletal muscle fibre (½)

1.2.2 The protein that makes up the thin filaments (½)

1.2.3 The connective tissue sheath that surrounds a muscle fascicle (½)

1.2.4 The contractile unit between two Z discs (½)

1.3 Complete the following paragraph regarding the sliding filament theory by providing the missing words. You need only write the question number and your answer. (6 x ½ = 3)

The action potential formed at the sarcolemma moves into the interior of the muscle fibre via the (1.3.1), causing the release of (1.3.2) from the sarcoplasmic reticulum. This substance binds to regulatory proteins on (1.3.3), exposing the myosin binding sites. Myosin heads then bind to this molecule, thereby forming a (1.3.4). The myosin heads then pivot inwards. This movement is known as the (1.3.5). The molecule (1.3.6) then binds to the myosin heads in order to disconnect them.

1.4 Match the type of muscle contraction in column A to its description in column B. You need only provide the question number and your answer. (4 x ½ = 2)

Column A	Column B
1.4.1 Twitch 1.4.2 Complete tetanus 1.4.3 Summing of contractions 1.4.4 Incomplete tetanus	A. Contraction force increases as the effects of twitches are fused B. More complete fusion of twitches C. Smooth continuous contraction without any relaxation D. Single stimulus-contraction-relaxation cycle

1.5 Answer the following questions with regards to **anaerobic metabolism**:

- 1.5.1 Where in the cell does this metabolism occur? (½)  
 1.5.2 Does this metabolism require oxygen? (½)  
 1.5.3 How many molecules of ATP per glucose molecule does this metabolism produce? (½)  
 1.5.4 When is this type of metabolism used? (½)  
 1.5.5 Name any **two advantages** of this type of metabolism. (2 x ½ = 1)

**[12]**

## **QUESTION 2: DIGESTIVE SYSTEM**

- 2.1 Name the correct **function** of the digestive system referred to in each of the statements below:
- 2.1.1 Physically fragmenting food into smaller particles (½)  
 2.1.2 Enzymes break down large food molecules to their building blocks (½)  
 2.1.3 Transport of digested end products into the blood or lymph (½)  
 2.1.4 Elimination of indigestible food residues from the gastrointestinal tract (½)
- 2.2 Match the structure or component of the oral cavity in column A to its function in column B. You need only provide the question number and your corresponding answer. (6 x ½ = 3)

Column A	Column B
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2.2.1 Tonsils	A. Prevents food from entering the pharynx prematurely
2.2.2 Canines	B. Immune protection of the pharynx and oral cavity
2.2.3 Lingual frenulum	C. Teeth with rounded cusps for grinding food
2.2.4 Molars	D. Dissolves food so that it can be tasted
2.2.5 Uvula	E. Limits the posterior movement of the tongue
2.2.6 Saliva	F. Fang-like teeth for tearing or piercing into food

2.3 List any **three** types of cells that can be found in the gastric glands, and name **one** secretion of each. (6 x ½ = 3)

2.4 Complete the following table with regards to the hormones produced by the duodenum. You need only write the question number and your answer. (4 x ½ = 2)

Hormone:	Acts on:	Results in:
Cholecystokinin	Pancreas	2.4.1
	2.4.2	Increased bile secretion
2.4.3	Pancreas	Increased secretion of alkaline fluid
	Liver	2.4.4

2.5 Complete the following paragraph regarding protein digestion by providing the missing words. You need only write the question number and your answer. (6 x ½ = 3)

Protein digestion begins in the (2.5.1) with the enzyme (2.5.2), which digests proteins to large polypeptides. These large polypeptides are then digested by the pancreatic enzymes trypsin, (2.5.3) and (2.5.4) into small polypeptides. The final step in protein digestion is carried out by the (2.5.5) enzymes of the small intestine which digests the small polypeptides to (2.5.6).

**[13]**

### **QUESTION 3: RESPIRATORY SYSTEM**

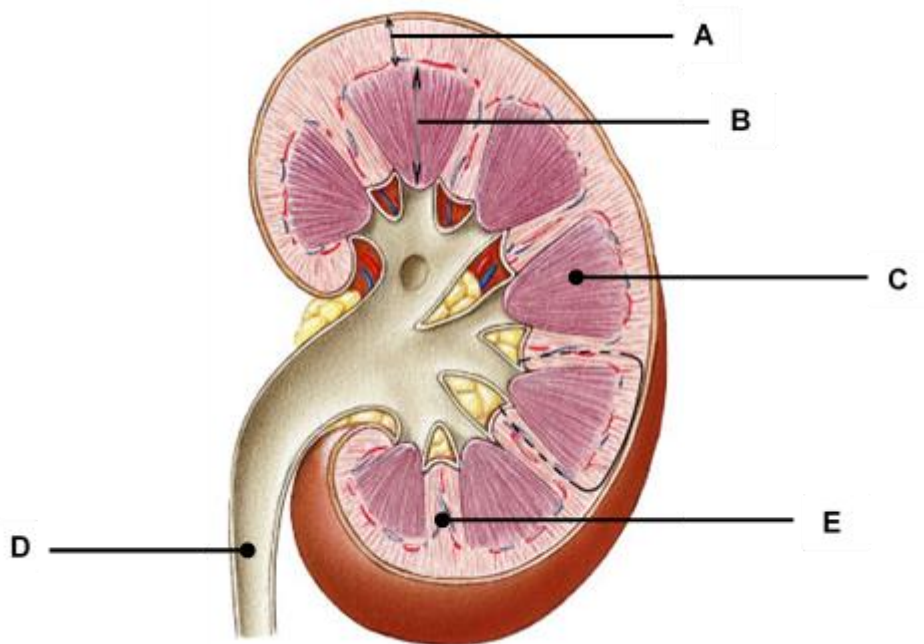
3.1 Name any **four** functions of the respiratory system. (4 x ½ = 2)

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- 3.2 Name and describe the **four** events that make up respiration. (8 x ½ = 4)
- 3.3 Name the correct respiratory volume or capacity described in each of the statements below:
- 3.3.1 Air that remains in the conducting zone passageways and never reaches the alveoli (½)
- 3.3.2 The total amount of exchangeable air (½)
- 3.3.3 The amount of air moved into and out of the lungs with each breath during normal quiet breathing (½)
- 3.3.4 The amount of air that can be forcibly exhaled after a tidal expiration (½)
- 3.3.5 The amount of air that remains in the lungs after the most strenuous expiration (½)
- 3.3.6 The total amount of air that the lungs can accommodate (½)
- 3.4 Describe how the **majority** of oxygen and carbon dioxide are transported in the bloodstream. (5 x ½ = 2½)
- 3.5 Name any **three** non-respiratory air movements. (3 x ½ = 1½)

**[13]**

**QUESTION 4: URINARY SYSTEM**

4.1 Label components A-E in the diagram of the kidney below: (5 x ½ = 2½)



4.2 Name the **five** areas of the renal tubule, in the correct order through which the filtrate passes. (5 x ½ = 2½)

4.3 Answer the following questions with regards to the formation of urine:

4.3.1 Name the **three** processes involved in the formation of urine. (3 x ½ = 1½)

4.3.2 Why is the blood pressure at the glomerulus higher than at any other capillary bed? (1)

4.3.3 Name **two** substances that do not pass from the glomerulus into Bowman's capsule. (2 x ½ = 1)

4.3.4 Name **two** substances that will be returned to the peritubular capillaries from the filtrate. (2 x ½ = 1)

4.3.5 Name **two** substances that will be moved from the peritubular capillaries into the filtrate. (2 x ½ = 1)

4.4 Briefly describe why micturition is a voluntary process. (3 x ½ = 1½)

**[12]**

**SECTION C SUBTOTAL: 50**

**TOTAL MARKS: 140**



