



**PROGRAM** : *BIOMEDICAL TECHNOLOGY*

**SUBJECT** : **ANATOMY AND PHYSIOLOGY 1**

**CODE** : **APB 1112**

**DATE** : YEAR-END EXAMINATION  
14 NOVEMBER 2017

**DURATION** : 12:30 – 15:30

**WEIGHT** : 50: 50

**TOTAL MARKS** : 130

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**EXAMINER** : MS R. DANGAREMBIZI

**MODERATOR** : MR T.T NYAKUDYA

**NUMBER OF PAGES** : 13 PAGES

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

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**REQUIREMENTS** : 1 X EXAMINATION SCRIPT  
1 X MULTIPLE CHOICE ANSWER SHEET

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**INSTRUCTIONS TO CANDIDATES:**

1. THIS PAPER CONSISTS OF 2 SECTIONS.

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

**SECTIONS B** MUST BE ANSWERED IN THE **SEPARATE EXAMINATION SCRIPT** PROVIDED.

2. THIS QUESTION PAPER MUST BE RETURNED WITH YOUR EXAMINATION SCRIPTS.

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**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.*

**Multiple choice questions removed**

**SUBTOTAL SECTION A: 40**

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## SECTION B

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

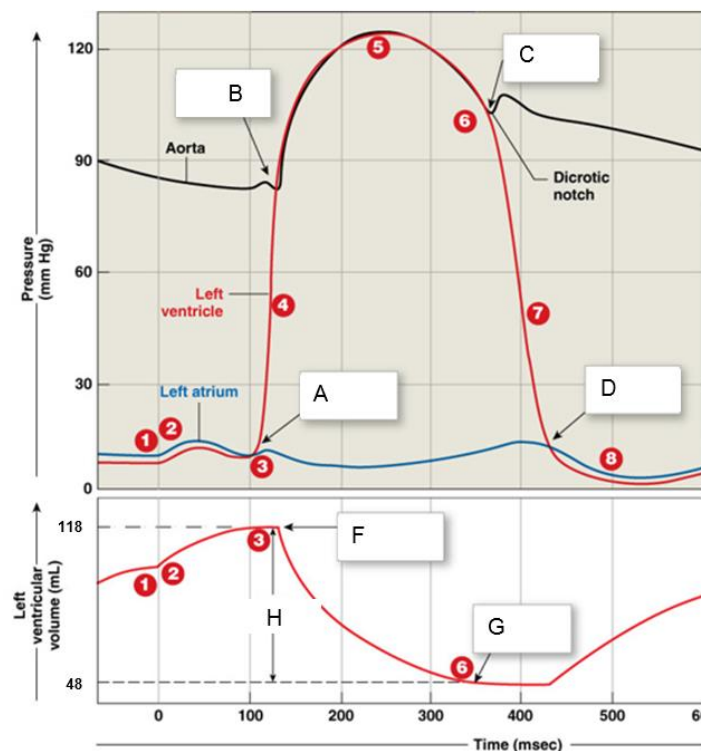
### QUESTION ONE – BLOOD

- 1.1 Describe **THREE** functions of blood. (6 x ½ = 3)
- 1.2 Describe **THREE** important effects that erythrocyte shape has on its function. (6 x ½ = 3)
- 1.3 A laboratory technician mislabeled blood and instead of labelling one sample type "**A positive**", he wrote "**O negative**". The blood was then given to a number of patients. Using your knowledge of blood typing explain what would happen if this blood were to be given to:
- 1.3.1 a patient with blood group **A negative** (4 x ½ = 2)
- 1.3.2 a patient with blood group **AB positive** (4 x ½ = 2)
- 1.3.3 a patient with blood group **O negative** (4 x ½ = 2)
- 1.3.4 Giving examples, distinguish between a universal donor and a universal recipient. (6 x ½ = 3)

**[15]**

### QUESTION TWO – THE CARDIOVASCULAR SYSTEM

- 2.1 The diagram below shows the pressure-volume relationship that occurs during a cardiac cycle. Study the diagram and answer the questions that follow.



- 2.1.1 Briefly explain what occurs at point 2. (3 x ½ = 1½)
- 2.1.2 Name the valve that closes at point A and opens at point D. (½)
- 2.1.3 Describe the events occurring at circles 4 and 7. (6 x ½ = 3)

2.1.4 Name the valve that opens at point **B** and closes at point **C**. (½)

2.1.5 Describe the events that take place at point **8**. (2 x ½ = 1)

2.1.6 Using the values obtained from the graph, determine or calculate:

2.1.6.1 End-diastolic volume. (1)

2.1.6.2 End systolic volume. (1)

2.1.6.3 Stroke volume. (4 x ½ = 2)

2.1.6.4 Ejection fraction. (3 x ½ = 1½)

2.2 Explain the physiological basis for heart sounds S1 and S2. (2 x ½ = 1)

2.3 Identify the **TWO** types of cardiac muscle cells and state the function of each. (4 x ½ = 2)

**[15]**

### **QUESTION THREE – BLOOD VESSELS AND CIRCULATION**

3.1 Tabulate **FIVE** differences between arteries and veins. (10 x ½ = 5)

**[5]**

### **QUESTION FOUR – THE RESPIRATORY SYSTEM**

4.1 The following questions refer to **Boyle's law**:

4.1.1 State Boyle's law. (4 x ½ = 2)

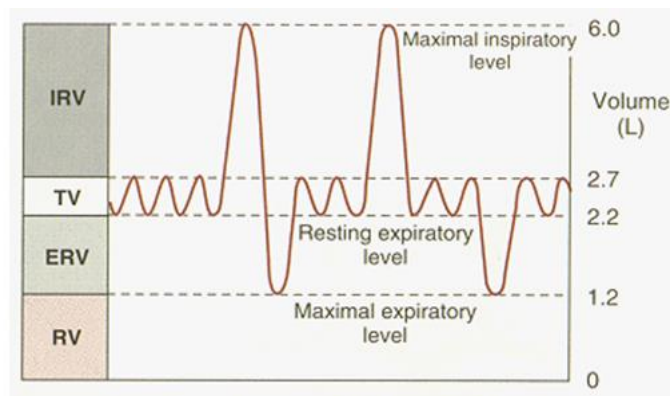
4.1.2 Explain how Boyle's law can be used to explain the mechanisms of inspiration and expiration.

(8 x ½ = 4)

4.2 Match the structure in Column A to its correct function in Column B. You need only write down the question number and your answer. (8 x ½ = 4)

Column A	Column B
4.2.1 Lamina propria	A) Prevents alveoli from collapsing
4.2.2 Alveoli	B) Production of sound
4.2.3 Surfactant	C) Warms and humidifies inhaled air for arrival at lower respiratory organs
4.2.4 Cilia	D) Sweep debris towards pharynx
4.2.5 Nasal mucosa	E) Supports the respiratory epithelium
4.2.6 Larynx	F) Site where gaseous exchange takes place
4.2.7 Pneumocytes type II	G) Branches into secondary bronchi
4.2.8 Primary bronchus	H) Produce surfactant

4.3 Spirometry- refer to the graph below and answer the questions that follow.



4.3.1 Define each of the following lung volumes:

4.3.1.1 Tidal volume.

(2 x ½ = 1)

4.3.1.2 Residual Volume.

(2 x ½ = 1)

4.3.2 Use the graph to calculate the following lung volumes. Show all calculations and units.

4.3.2.1 Tidal volume.

(2 x ½ = 1)

4.3.2.2 Inspiratory reserve volume.

(2 x ½ = 1)

4.3.2.3 Expiratory reserve volume.

(2 x ½ = 1)

**[15]**

### **QUESTION FIVE – THE DIGESTIVE SYSTEM**

5.1 Discuss the **SIX** general functions of the digestive system.

(12 x ½ = 6)

5.2 The digestive system consists of a digestive tract as well as accessory organs. Identify any **FOUR** accessory organs of the digestive system and give **ONE** function of each.

(8 x ½ = 4)

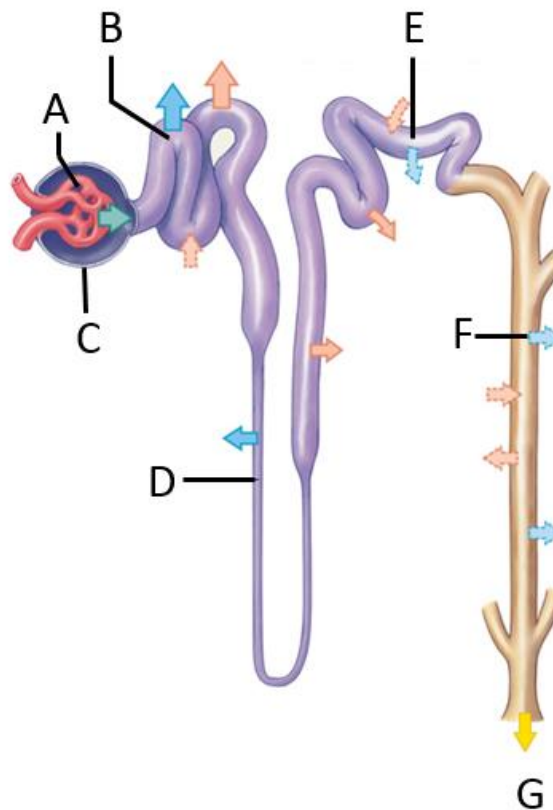
**[10]**

### **QUESTION SIX – THE URINARY SYSTEM**

6.1 Describe the any **THREE** functions of the urinary system.

(6 x ½ = 3)

6.2 Study the diagram below and answer the questions that follow:



- 6.2.1 Identify the structure in the diagram. (½)
- 6.2.2 Provide structural labels for A, B, C, D, E and F. (6 x ½ = 3)
- 6.2.3 What processes of urine formation occur at A, B and E? (1½)
- 6.2.4 Answer the following questions by writing down the correct letter only. The area on the above diagram:
- 6.2.4.1 where countercurrent multiplication occurs is indicated by the letter \_\_\_\_\_. (½)
- 6.2.4.2 where most nutrient reabsorption occurs is indicated by the letter \_\_\_\_\_. (½)
- 6.2.4.3 that is sensitive to the hormone anti-diuretic hormone (ADH) is indicated by the letter \_\_\_\_\_. (½)
- 6.2.4.4 where penicillin would be secreted is indicated by the letter \_\_\_\_\_. (½)
- 6.2.4.5 where secretion mostly occurs is indicated by the letter \_\_\_\_\_. (½)
- 6.2.4.6 that is sensitive to aldosterone is indicated by the letter \_\_\_\_\_. (½)
- 6.3 Describe the local pathway that occurs in the micturition reflex. (8 x ½ = 4)

**[15]**

**QUESTION SEVEN – THE REPRODUCTIVE SYSTEM**

7.1 Identify the **TWO** smooth muscles in males that are important to normal sperm development and explain their roles. (6 x ½ = 3)

7.2 Read the following statements and choose the correct structure from the list below that best fits each description. (10 x ½ = 5)

tunica albuginea	uterus	Cowper's glands	corona radiata
epididymis	uterine tubes	preputial glands	corpus albicans
vas deferens	seminal vesicles	secondary follicle	thecal cells
efferent ductules	ampulla	fibrinolysin	cervix

7.2.1 secretes about 60% of the volume of semen.

7.2.2 knot of pale scar tissue that remains in the ovary if fertilization does not occur.

7.2.3 dense layer of connective tissue surrounding the testes and the ovaries.

7.2.4 provides mechanical protection and nutritional support for the developing embryo.

7.2.5 protective layer of granulosa cells formed around the tertiary follicle.

7.2.6 secretes thick, alkaline mucus that helps to neutralize urinary acids remaining in the urethra.

7.2.7 acts as a recycling center for damaged spermatozoa.

7.2.8 secretes a waxy material known as smegma.

7.2.9 liquefies clotted semen after 15-30 minutes.

7.2.10 middle segment of uterine tube

7.3.1 The following paragraphs describe the process taking place during the uterine cycle. Complete the paragraph by filling in the missing words. You need only write down the question number and your answer. (10 x ½ = 5)

The uterine cycle can be divided into three phases: the menstrual, proliferative and the secretory phases. These phases occur in response to hormones associated with regulation of the ovarian cycle. The menstrual and proliferative phases occur during the **(7.3.1)** phase of the ovarian cycle, while the secretory phase corresponds to **(7.3.2)** phase of the ovarian cycle.

The uterine cycle begins with the onset of menses, an interval marked by degeneration of the **(7.3.3)** zone of the endometrium. Deterioration occurs in patches and is caused by constriction of the **(7.3.4)** arteries, which decrease blood flow to certain parts of the

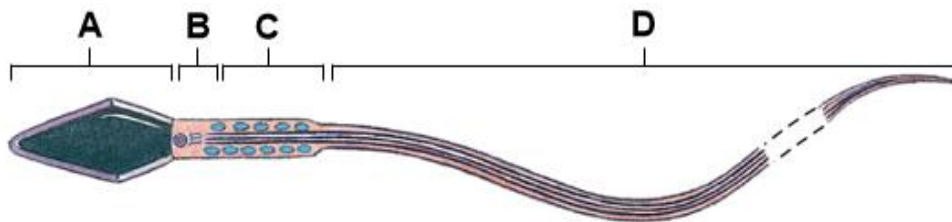
endometrium. Blood cells and degenerating tissues break away and enter the uterine lumen, eventually to be lost by passage through the vagina.

During the proliferative phase, epithelial cells of glands multiply and spread across endothelial surface. The proliferative phase is stimulated and sustained by the hormone **(7.3.5)** secreted by developing ovarian **(7.3.6)**. At this time, endometrial glands are manufacturing mucus rich in **(7.3.7)**.

The secretory phase begins at the time of **(7.3.8)**. During this phase, endometrial **(7.3.9)** enlarge, accelerating their rates of secretion. This activity occurs under the stimulatory effects of progestins and estrogens secreted by the **(7.3.10)** of the ovary.

7.4 Label the following diagram (**A-D**) of a sperm cell.

(4 x ½ = 2)



[15]

**SUBTOTAL SECTION B: 90**

**GRAND TOTAL: 130**