



AMREF INTERNATIONAL UNIVERSITY

SCHOOL OF MEDICAL SCIENCES

DEPARTMENT OF REHABILITATION MEDICINE

BACHELOR OF SCIENCE IN PHYSIOTHERAPY

END OF EXAMINATIONS MAY TO AUGUST 2026

UNIT CODE: PHT 127

UNIT NAME: HUMAN PHYSIOLOGY- RESPIRATORY, DIGESTIVE AND RENAL SYSTEMS.

DATE: 10th AUGUST 2026

TIME: 2 HOURS START:11AM FINISH:1PM

All students will have two (2) hours to complete the examination

- 1. Attempt all questions as per the instruction**
- 2. It is the student's responsibility to report any page and number missing in this paper.**
- 3. Check that the paper is complete**
- 4. Total number of pages is 10 including the cover.**
- 5. Read through the paper quickly before you start.**

SECTION ONE; Multiple Choice Questions. Answer All the Questions (30 Marks)

Q1. During clinical rotation a physiotherapist asks a student why carbon dioxide diffuses across the alveolar-capillary membrane more readily than oxygen. Which of the following responses is most accurate?

- A. CO₂ has a higher molecular weight than oxygen
- B. CO₂ is approximately 20 times more soluble than oxygen
- C. CO₂ has a larger partial pressure gradient
- D. CO₂ binds more strongly to hemoglobin

Q2. A physiotherapist assesses a patient recovering from thoracic surgery. Spirometry reveals a marked reduction in vital capacity (VC). When analyzing the components contributing to VC, which of the following combinations should be considered?

- A. Tidal Volume + Inspiratory Reserve Volume + Residual Volume
- B. Inspiratory Reserve Volume + Tidal Volume + Expiratory Reserve Volume
- C. Tidal Volume + Residual Volume
- D. Inspiratory Capacity + Residual Volume

Q3. During a histology practical, students examine lung tissue and identify cells responsible for surfactant production. Which of the following cell types should they identify?

- A. Type I pneumocytes
- B. Alveolar macrophages
- C. Type II pneumocytes
- D. Club cells

Q4. A physiotherapy researcher on physiology investigates the components of pulmonary surfactant. Which of the following substances constitutes the major surface tension-reducing component?

- A. Elastin
- B. Collagen
- C. Dipalmitoyl phosphatidylcholine
- D. Hemoglobin

Q5. A physiotherapy student is asked to determine Inspiratory Capacity (IC) from spirometry data. Which of the following formulae correctly describes IC?

- A. $TV + ERV$
- B. $IRV + RV$
- C. $TV + IRV$
- D. $VC + RV$

Q6. A physiotherapy student is analyzing factors affecting diffusion across the respiratory membrane. According to Fick's Law, which of the following changes would increase gas transfer?

- A. Increased membrane thickness
- B. Reduced surface area
- C. Increased pressure gradient across the membrane
- D. Reduced alveolar ventilation

Q7. A patient accidentally aspirates water while drinking. Which of the following reflexes is most immediately activated to protect the lower respiratory tract?

- A. Swallowing reflex
- B. Cough reflex
- C. Gag reflex
- D. Hiccup reflex

Q8. A peanut is accidentally inhaled by a child and becomes lodged in the respiratory tract. Based on the anatomy of the bronchial tree, in which of the following is it most likely to lodge?

- A. Left main bronchus
- B. Trachea
- C. Right main bronchus
- D. Larynx

Q9. A premature infant develops respiratory distress because of inadequate surfactant production. Which of the following outcomes is most likely?

- A. Increased lung compliance
- B. Collapse of alveoli during expiration
- C. Increased oxygen diffusion rate
- D. Excessive bronchodilation

Q10. A patient has damage to the loop of Henle. Which of the following renal functions would be most impaired?

- A. Filtration of plasma proteins
- B. Formation of a concentrated urine
- C. Secretion of renin
- D. Production of erythropoietin

Q11. A healthy student drinks several glasses of water before a physiology practical session. During the lesson, the lecturer explains that the first step in urine formation occurs in the renal corpuscle. Which of the following processes is responsible for the movement of water and small solutes from the glomerular capillaries into Bowman's capsule?

- A. Tubular secretion
- B. Tubular reabsorption
- C. Glomerular filtration
- D. Excretion

Q12. A patient loses a large amount of glucose in the urine because the kidneys fail to reclaim it from the filtrate. Which of the following urine-forming processes has been impaired?

- A. Filtration
- B. Reabsorption
- C. Secretion
- D. Micturition

Q13. An engineer is asked to design an artificial kidney that mimics normal urine formation. Which of the following sequences should be included?

- A. Secretion → Filtration → Reabsorption
- B. Reabsorption → Filtration → Secretion
- C. Filtration → Reabsorption → Secretion
- D. Reabsorption → Secretion → Filtration

Q14. During an anatomy practical, a student traces the path of blood entering the kidney. The lecturer asks which vessel carries blood directly into the kidney from the abdominal aorta. Which of the following vessels is the correct answer?

- A. Renal vein
- B. Interlobular artery
- C. Renal artery
- D. Afferent arteriole

Q15. A physiology student learns that blood reaches the glomerulus through a specialized vessel. Which of the following vessels delivers blood directly into the glomerulus?

- A. Efferent arteriole
- B. Renal vein
- C. Afferent arteriole
- D. Peritubular capillary

Q16. A renal researcher studies the unique blood supply of the nephron and asks students why the efferent arteriole is important. Which of the following is its primary role?

- A. Carries blood away from the glomerulus
- B. Returns urine to the bladder
- C. Supplies blood to the renal pelvis
- D. Delivers blood into Bowman's capsule

Q17. During a physiology lecture, students are told that the kidney contains two capillary beds connected by arterioles. Which of the following capillary networks surrounds the renal tubules and facilitates reabsorption?

- A. Glomerular capillaries
- B. Vasa recta and peritubular capillaries
- C. Renal sinus vessels
- D. Segmental arteries

Q18. A first-year student is asked to design and arrange the renal vessels in the correct order of blood flow. Which of the following is the correct sequence?

- A. Renal artery → Renal vein → Afferent arteriole → Glomerulus
- B. Renal artery → Afferent arteriole → Glomerulus → Efferent arteriole
- C. Glomerulus → Renal artery → Efferent arteriole → Renal vein
- D. Afferent arteriole → Renal vein → Glomerulus → Efferent arteriole

Q19. A 20-year-old student swallows a mouthful of food during lunch. The food bolus moves from the pharynx toward the stomach through coordinated muscular contractions. Which of the following structures is primarily responsible for transporting the food bolus to the stomach?

- A. Duodenum
- B. Oesophagus
- C. Jejunum
- D. Colon

Q20. A first-year physiology student is asked to design and arrange the organs through which food normally passes. Which of the following sequences is correct?

- A. Mouth → Oesophagus → Stomach → Small Intestine → Large Intestine
- B. Mouth → Stomach → Oesophagus → Small Intestine → Large Intestine
- C. Mouth → Pharynx → Large Intestine → Stomach → Small Intestine
- D. Mouth → Oesophagus → Large Intestine → Stomach → Small Intestine

Q21. A first-year physiology student learns that protein digestion begins before food reaches the small intestine. During a physiology practical, the lecturer asks where protein digestion is initiated. Which of the following organs begins the chemical digestion of proteins?

- A. Mouth
- B. Oesophagus
- C. Stomach
- D. Colon

Q22. A physiology student is asked to design and arrange the events involved in protein digestion in their correct order. Which of the following sequences is the most accurate?

- A. Amino acid absorption → Pepsin action → Trypsin action
- B. Pepsin action in stomach → Trypsin action in small intestine → Amino acid absorption
- C. Trypsin action → Pepsin action → Amino acid absorption
- D. Pepsin action → Amino acid absorption → Trypsin action

Q23. A first-year physiotherapy student is asked to explain the primary role of the renal system during a physiology seminar. Which of the following functions best describes the overall role of the renal system?

- A. Production of digestive enzymes
- B. Regulation of the internal environment by forming urine and maintaining homeostasis
- C. Transport of oxygen to tissues
- D. Production of hormones for growth

Q24. A patient experiences a significant drop in blood pressure due to haemorrhage. The kidneys respond by releasing renin. Which of the following is the purpose of renin release?

- A. Increase urine production immediately
- B. Stimulate red blood cell production
- C. Help restore blood pressure through the renin-angiotensin-aldosterone system (RAAS)
- D. Promote glucose excretion

Q25. A patient develops complete kidney failure. Which of the following substances would most likely accumulate in the blood?

- A. Oxygen
- B. Hemoglobin
- C. Urea
- D. Saliva

Q26. A scientist develops a drug that completely stops peristalsis throughout the digestive tract. Which of the following would most likely happen?

- A. Food would move faster through the gut
- B. Nutrient absorption would increase immediately
- C. Movement of food through the digestive tract would be severely impaired
- D. Bile secretion would increase

Q27. A patient accidentally inhales smoke containing particulate matter. The upper respiratory tract attempts to prevent the particles from reaching the lungs. Which of the following mechanisms contributes most directly to this protective function?

- A. Gastric acid secretion
- B. Filtration by nasal hairs and mucus
- C. Contraction of the diaphragm
- D. Production of bile

Q28. A tumor obstructs the left main bronchus completely. which of the following is the most likely outcome?

- A. Ventilation of only the upper lobe is affected
- B. Ventilation of the entire left lung is severely reduced
- C. Ventilation of the right lung is abolished
- D. Gas exchange remains normal

Q29. A patient aspirates a small peanut while eating. Imaging reveals that the foreign body has lodged in the right main bronchus rather than the left. Which of the following anatomical features best explains this finding?

- A. The right main bronchus is narrower than the left
- B. The right main bronchus is more vertical and wider than the left
- C. The left main bronchus is shorter than the right
- D. The left main bronchus has more cartilage rings

Q30. A severe asthma attack causes constriction of smooth muscle in the airways. Which of the following parts of the lower respiratory tract is primarily responsible for this increase in airway resistance?

- A. Trachea
- B. Primary bronchi
- C. Bronchioles
- D. Alveolar ducts

SECTION TWO; Short Answer Questions .Answer all the questions (20 marks)

Q31. Briefly explain the role of the paranasal sinuses and name the four paired pairs. **(5 Marks)**

Q32. Briefly describe the anatomical differences between the right and left lungs. **(5 Marks)**

Q33. Briefly explain logically, the mechanism of inspiration. **(5 Marks)**

Q34. Briefly explain how contraction of the diaphragm facilitates inspiration. **(5 Marks)**

SECTION THREE; Long Answer Questions. Attempt Any of the Two (20 marks)

Q35. Describe the process of urine formation in the nephron. **(10 Marks)**

Q36. Describe in detail the mechanism of breathing during quiet and forced respiration.

Q37. Outline a detailed explanation of protein digestion and absorption **(10 Marks)**

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