



**AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF MEDICAL SCIENCES
DEPARTMENT OF REHABILITATION MEDICINE
BACHELOR OF SCIENCE IN PHYSIOTHERAPY**

END OF TRIMESTER EXAMINATIONS JANUARY TO APRIL 2026

UNIT CODE: PHT 129

UNIT NAME: Human Physiology: Respiratory, Digestive and Renal systems

DATE: 17th APRIL 2026

TIME: 2 Hours

START: 9:00am-FINISH: 11:00am

INSTRUCTIONS

- 1. All students will have two (2) hours to complete the examination**
- 2. This is an online exam, Attempt all questions as per the instruction**
- 3. It is the student's responsibility to report any page and number missing in this paper.**
- 4. Check that the paper is complete**
- 5. Total number of pages is 6 including the cover.**
- 6. Read through the paper quickly before you start.**

Section A. MCQs. Answer all the questions (30 Marks)

1. Activation of which hormone would increase both gastric acid secretion and gastric mucosal growth, (1 mark)
 - a. Secretin
 - b. Motilin
 - c. Gastrin
 - d. Somatostatin
2. The primary function of gastric mucus is to:
 - a. Activate pepsin
 - b. Digest carbohydrates
 - c. Protect mucosa from acid and pepsin
 - d. Stimulate gastrin
3. During the gastric phase of secretion, the strongest stimulus for acid secretion is:
 - a. Sight of food
 - b. Amino acids in stomach
 - c. Low duodenal pH
 - d. Sympathetic activation
4. Which stimulus primarily increases enzyme-rich pancreatic secretion. (1 mark)
 - a. Secretin
 - b. Somatostatin
 - c. Cholecystokinin
 - d. Sympathetic activation
5. The primary driving force for bile formation is:
 - a. passive diffusion of bilirubin
 - b. active secretion of bile salts into canaliculi
 - c. water movement through tight junctions
 - d. gal bladder contraction
6. Which hormone causes gallbladder contraction and relaxation of the sphincter of oddi. (1 mark)
 - a. gastrin
 - b. secretin
 - c. motilin
 - d. cholecystokinin
7. If a substance has clearance equal to GFR, it is: (1 mark)
 - a. secreted only
 - b. reabsorbed only
 - c. filtered but neither secreted nor reabsorbed
 - d. completely reabsorbed

8. During fertilization, the acrosome reaction is triggered primarily by: (1 mark)
 - a. Progesterone from granulosa cells
 - b. binding to zona pellucida glycoprotein ZP3
 - c. sperm capacitation
 - d. estrogen surge
9. Capacitation primarily involves which physiological change in sperm. (1 mark)
 - a. Acquisition of tail motility
 - b. Removal of glycoprotein coat
 - c. Increased DNA synthesis
 - d. Increased ATP production
10. Which event occurs immediately after LH surge. (1 mark)
 - a. Corpus luteum formation
 - b. Completion of meiosis II
 - c. Ovulation within 24-36 hours
 - d. Endometrial shedding
11. Progesterone levels are highest during which phase. (1 mark)
 - a. Early follicular
 - b. Ovulatory
 - c. Late follicular
 - d. luteal
12. If fertilization does not occur, menstruation results primarily from: (1 mark)
 - a. estrogen surge
 - b. LH decline
 - c. FSH decline
 - d. Progesterone withdrawal
13. Polycystic ovarian syndrome (PCOS) infertility is most commonly due to:
 - a. Failure of fertilization
 - b. Blocked fallopian tubes
 - c. Chronic anovulation
 - d. Lack of estrogen
14. Alveolar dead space increases when: (1 mark)
 - a. airway resistance decreases
 - b. blood flow to alveoli decreases
 - c. tidal volume increases
 - d. CO₂ production increases
15. Dead space can be calculated using which equation. (1 mark)
 - a. Henderson-hasselbalch
 - b. Fick principle
 - c. Bohr equation
 - d. Starling equation

16. If tidal volume= 500 mL and dead space= 150 mL, what volume participates in gas exchange. (1 mark)
- 150 mL
 - 250 mL
 - 350 mL
 - 500 mL
17. Why does V/Q mismatch typically produce hypoxemia before hypercarpna. (1 mark)
- Co₂ diffuses slower than O₂
 - Hyperventilation eliminates excess CO₂ efficiently
 - Peripheral chemoreceptors are insensitive
 - Pulmonary arteries constrict
18. Compared to systemic circulation, pulmonary circulation is characterized by: (1 mark)
- Higher resistance
 - Muscular arterioles
 - Lower compliance
 - Low pressure, high compliance
19. The primary stimulus for ventilation under normal resting condition is:
- Decreased PO₂
 - Increased H⁺ in CSF
 - Lung stretch
 - Increased arterial lactate
20. Peripheral chemoreceptors increase firing significantly when: (1 mark)
- PaO₂ <80 mmHg
 - PaO₂ <70 mmHg
 - PaO₂ <60 mmHg
 - PaO₂ <90 mmHg
21. Rapid shallow breathing in pulmonary edema is due to activation of: (1 mark)
- Stretch receptors
 - Irritant receptors
 - J receptors
 - Central chemoreceptors
22. CO₂ stimulates ventilation primarily because it:
- Directly stimulates carotid body
 - Crosses BBB and forms H⁺ in CSF
 - Decreases hemoglobin affinity
 - Causes pulmonary vasodilation

23. A patient with metabolic acidosis due to renal failure develops hyperventilation. The mechanism is:
- Central chemoreceptor activation by CO₂
 - Peripheral chemoreceptor activation by H⁺
 - Stretch receptor stimulation
 - Apneustic center inhibition
24. A patient with renal artery stenosis would exhibit which primary JGA response. (1 mark)
- Increased macula densa NaCl delivery
 - Increased afferent stretch
 - Decreased renin secretion
 - Increased renin secretion
25. Which pair correctly represents the three major components of the JGA. (1 mark)
- Macula densa, podocytes, endothelial cells
 - Granular cells, macula densa, extraglomerular mesangial cells
 - Mesangial cells, podocytes, proximal tubule
 - DCT, PCT, afferent arteriole
26. A patient hyperventilates due to anxiety. What immediate change occurs. (1 mark)
- Increased PaCO₂
 - Increased hydrogen concentration
 - Increased bicarbonate reabsorption
 - None of the above
27. Anatomical dead space refers to: (1 mark)
- non-perfused alveoli
 - air in conducting airways
 - collapsed alveoli
 - residual lung volume
28. Stretch of the intestinal smooth muscle causes contraction independent of neural input. This demonstrates: (1 mark)
- Hormonal regulation
 - Long reflex pathway
 - Gastrocolic reflex
 - None of the above
29. The hormone that causes the luteinizing hormone surge before ovulation is:
- Progesterone
 - Estrogen
 - FSH
 - prolactin

30. Which buffer system acts fastest in correcting acid-base imbalance. (1 mark)
- renal system
 - respiratory system
 - phosphate buffer
 - protein buffer

SECTION B. Answer all the questions. 20 marks

31. Calculate the V/Q ratio and state the physiological implication of a patient with ventilation of 4 l/min and perfusion of 2 L/min. (3 marks)
32. State and define 3 lung volumes in the respiratory cycle. (6 marks)
33. State one difference between a restrictive lung disease and obstructive lung disease. (2 marks)
34. Define oxygen diffusion gradient. (1 mark)
35. CO₂ is transported from tissues to lungs in 3 major forms, name them. (3 marks)
36. State 4 organic components found in saliva. (4 marks)
37. Approximately how much saliva is secreted per day by an adult. (1 mark)

SECTION C. Long structured question. Attempt any of two questions. 20 marks

38. a. Outline the stages of saliva formation (6 marks)
- b. List 2 enteric nervous system plexuses and their roles. (4 marks)
39. Define and outline the components and role of the juxtaglomerular apparatus. (10 marks)
40. Outline the ovarian cycle. (10 marks)