UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	HDB20103
COURSE TITLE	:	HUMAN PHYSIOLOGY
PROGRAMME NAME	:	BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)
DATE	:	31 JANUARY 2026
TIME	:	2:00PM - 5:00PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Answer ALL questions for Section A.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. ☐ *Tick if applicable*
9. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 14 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

1. Which situation best illustrates positive feedback?

   A. Regulation of blood pressure

   B. Thermoregulation

   C. Control of blood glucose

   D. Blood clotting

2. Increased parasympathetic activity causes _____.

   A. pupil dilation

   B. increased heart rate

   C. increased blood glucose

   D. increased gastrointestinal motility

3. The absolute refractory period occurs because _____.

   A. Na^+ channels are inactivated

   B. Na^+ channels are open

   C. Ca^{2+} channels are blocked

   D. K^+ channels are open

4. Inhibitory postsynaptic potentials (IPSPs) are generated by _____.

   A. Ca^{2+} release

   B. Na^+ influx

   C. K^+ efflux

   D. Na^+/K^+ pump activity

5. Sound intensity is encoded by _____.

   A. movement of the optic nerve

   B. size of the cochlea

   C. frequency of action potentials

   D. number of hair cells activated

6. Olfactory receptors respond to _____.

   A. light waves

   B. sound waves

   C. mechanical forces

   D. chemical molecules

7. The organs of static equilibrium are located within the _____ and employ shifting _____to set up nerve impulses.

   A. cochlea; fluid

   B. vestibule; otoliths

   C. vestibule; crista ampullaris

   D. semicircular canal; gelatinous material

8. High levels of circulating thyroid hormones suppress the release of thyroid-stimulating hormone (TSH). This phenomenon is primarily an example of _____.

   A. negative feedback

   B. hormone amplification

   C. positive feedback

   D. feed-forward control

9. During prolonged fasting, which hormonal pattern would most likely be observed to maintain blood glucose levels?

   A. Increased glucagon, increased cortisol

   B. Increased insulin, decreased glucagon

   C. Increased insulin, increased thyroid hormone

   D. Decreased glucagon, decreased growth hormone

10. Which event directly triggers the release of calcium ions from the sarcoplasmic reticulum in skeletal muscle?

   A. Opening of voltage-gated potassium channels.

   B. Depolarization of the T-tubule membrane.

   C. Hydrolysis of ATP by myosin.

   D. Binding of acetylcholine to nicotinic receptors.

11. Which factor primarily determines the strength of a whole muscle contraction?

   A. Number of motor units recruited.

   B. Frequency of stimulation only.

   C. Size of individual muscle fibers.

   D. Speed of action potential propagation.

12. Which variable remains constant during an isotonic contraction?

   A. Muscle length

   B. ATP consumption

   C. Muscle tension

   D. Sarcomere overlap

13. A toxin prevents acetylcholine release at the neuromuscular junction. Which outcome is expected?

    A. Sustained muscle contraction.

    B. Delayed muscle relaxation.

    C. Increased muscle tone.

    D. Failure of muscle action potential generation.

14. Which type of muscle fiber is expected to be in high proportion in an endurance-trained athlete?

    A. Slow oxidative

    B. Fast oxidative

    C. Fast glycolytic

    D. Fast oxidative-glycolytic

15. Capillary exchange of nutrients is most efficient in the capillary beds due to the _____.

    A. high intravascular pressure

    B. thick vessel walls

    C. high blood velocity

    D. large total cross-sectional area

16. Which ion is primarily responsible for the plateau phase of the ventricular action potential?

    A. Chloride

    B. Sodium

    C. Calcium

    D. Potassium

17. Which component of the electrocardiogram (ECG) corresponds to ventricular depolarization?

    A. P wave

    B. T wave

    C. PR interval

    D. QRS complex

18. Which factor most directly increases venous return?

    A. Reduced respiratory rate.

    B. Decreased blood volume.

    C. Increased arterial resistance.

    D. Skeletal muscle pump activation.

19. Which blood vessel primarily serves as a blood reservoir?

    A. Capillaries

    B. Veins

    C. Arterioles

    D. Arteries

20. Which structure normally initiates the electrical impulse in the heart?

    A. Bundle of His

    B. Sinoatrial (SA) node

    C. Purkinje fibers

    D. Atrioventricular (AV) node

21. Which pressure difference drives airflow into the lungs during inspiration?

A. Intrapleural pressure - intrapulmonary pressure.

B. Atmospheric pressure - intrapleural pressure.

C. Intrapulmonary pressure - intrapleural pressure.

D. Atmospheric pressure - intrapulmonary pressure.

22. Which physiological mechanism helps prevent alveolar collapse at low lung volumes?

A. Increased airway resistance.

B. Decreased lung compliance.

C. Increased surface tension.

D. Surfactant action.

23. Which muscle is the main driver of quiet inspiration?

A. Sternocleidomastoid

B. External oblique

C. Diaphragm

D. Internal intercostals

24. A decrease in lung compliance will result in _____.

A. increased tidal volume

B. decreased airway resistance

C. easier lung expansion

D. increased work of breathing

25. The oxygen–hemoglobin dissociation curve will shift to the right in response to the _____.

A. decreased CO_2 concentration

B. decreased temperature

C. increased blood pH

D. increased hydrogen ion concentration

26. At high altitude, increased ventilation primarily occurs in response to _____.

A. increased $PaCO_2$

B. decreased PaO_2

C. decreased metabolic rate

D. increased blood pH

27. Most digestive enzymes are secreted in inactive forms to _____.

A. regulate intestinal motility

B. improve absorption efficiency

C. prevent premature digestion of food

D. protect digestive glands from autodigestion

28. Which condition would most likely slow gastric emptying?

A. Increased gastric volume.

B. Increased vagal stimulation.

C. Low-fat meal.

D. Presence of fat in the duodenum.

29. Damage to intestinal villi, as seen in celiac disease, would most directly impair _____.

A. enzyme secretion

B. hormone release

C. nutrient absorption

D. peristaltic movement

30. Which nutrient requires bile salts for efficient digestion and absorption?

A. Glucose

B. Amino acids

C. Fatty acids

D. Water-soluble vitamins

31. Which cell type in the stomach secretes hydrochloric acid?

A. Parietal cells

B. G cells

C. Chief cells

D. Mucous cells

32. During dehydration, _____ is expected in the kidney.

A. increased urine volume

B. decreased plasma osmolarity

C. increased water reabsorption in collecting ducts

D. increased glomerular filtration rate (GFR)

33. Which renal mechanism plays the greatest role in long-term regulation of blood pressure?

A. Tubuloglomerular feedback

B. Neural regulation

C. Myogenic response

D. Renin–angiotensin–aldosterone system

34. Which nephron segment is most permeable to water?

A. Distal convoluted tubule

B. Ascending limb of loop of Henle

C. Proximal convoluted tubule

D. Descending limb of loop of Henle

35. Which substance is almost completely reabsorbed under normal physiological conditions?

A. Glucose

B. Sodium

C. Creatinine

D. Urea

36. A decrease in glomerular filtration rate (GFR) would most directly result in _____.

A. increased plasma osmolarity regulation

B. increased tubular secretion

C. increased urine output

D. reduced clearance of metabolic wastes

37. Which physiological mechanism best explains negative feedback regulation of the hypothalamic–pituitary–gonadal axis?

A. Progesterone increases oxytocin secretion.

B. Estrogen stimulates the release of gonadotropin-releasing hormone (GnRH).

C. Follicle-stimulating hormone (FSH) stimulates inhibin release from Sertoli cells.

D. Testosterone suppresses luteinizing hormone (LH) secretion.

38. A blockage of the vas deferens would most directly affect _____.

A. seminal fluid production

B. testosterone secretion

C. sperm transportation

D. spermatogenesis

39. Which hormone is primarily responsible for follicular maturation in the ovary?

A. Estrogen

B. Progesterone

C. Luteinizing hormone (LH)

D. Follicle-stimulating hormone (FSH)

40. _____ in the testes is responsible for testosterone production and secretion.

A. Spermatogonia

B. Sertoli cells

C. Leydig cells

D. Peritubular myoid cells

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Hormonal regulation plays a crucial role in preserving homeostasis within the urinary and reproductive systems.

(a) Explain the secretion and effects of hormones that regulate the female reproductive cycles.

(10 marks)

(b) Explain the extrinsic mechanism of systemic blood pressure regulation via the renin-angiotensin-aldosterone system (RAAS).

(10 marks)

Question 2

The digestive system performs four main functions, including motility, secretion, digestion, and absorption.

(a) Describe the roles of the pancreatic endocrine and exocrine glands in facilitating the functions of the digestive system.

(10 marks)

(b) Describe the factors that affect gastric emptying.

(10 marks)

Question 3

The heart is a muscular organ that pumps blood throughout the body via an extensive vascular network.

(a) Explain how the anatomical structures of the right and left heart chambers differ in supporting their specific roles in circulating blood.

(10 marks)

(b) Discuss the cardiovascular responses that lead to an elevated cardiac output during strenuous physical activity to meet the increased metabolic demands of the body.

(10 marks)

Question 4

Breathing depends on coordinated contractions of skeletal muscles that alter thoracic volume, creating pressure gradients for airflow.

(a) Explain how the skeletal muscles of respiration (inspiratory and expiratory muscles) contribute to the mechanics of breathing.

(10 marks)

(b) Referring to the figure, explain the factors that promote the hemoglobin dissociation from oxygen at the tissue level.

Refer Below - Figure1 : Oxygen-hemoglobin dissociation curve. .

(10 marks)

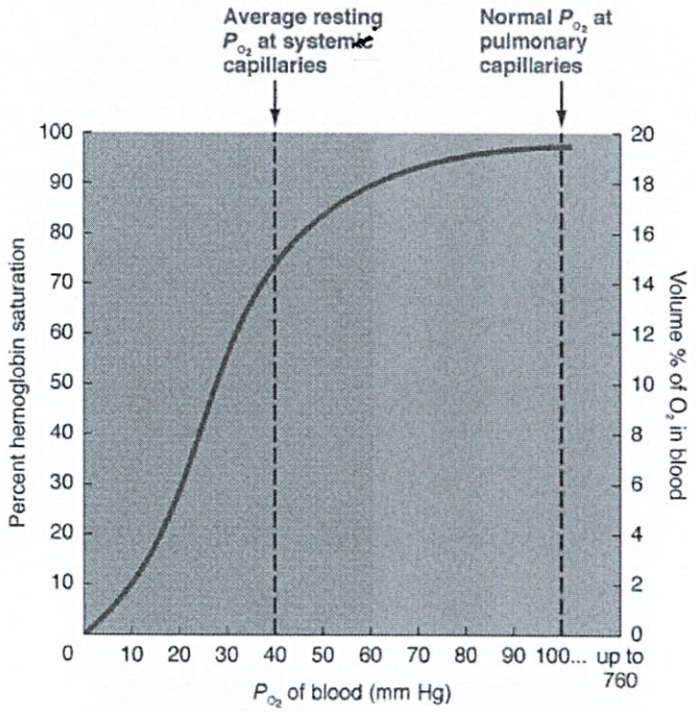

Figure 1: Oxygen-hemoglobin dissociation curve.

END OF EXAMINATION PAPER