SIMON MAZORODZE SCHOOL OF MEDICAL & HEALTH SCIENCES

DEPARTMENT OF BIOMEDICAL SCIENCES: PHYSIOLOGY UNIT

Surname..... **Name(s)**..... **Question Paper No**.....

Student Reg No..... **Title of Test**..... **Date**.....

Module Narration.....**Module Code**.....**Degree Program**.....**Level**.....

1. a	T	F	2. a	T	F	3. a	T	F	4. a	T	F	5. a	T	F	6. a	T	F	7. a	T	F	8. a	T	F
b	T	F	b	T	F	b	T	F	b	T	F	b	T	F	b	T	F	b	T	F	b	T	F
c	T	F	c	T	F	c	T	F	c	T	F	c	T	F	c	T	F	c	T	F	c	T	F
d	T	F	d	T	F	d	T	F	d	T	F	d	T	F	d	T	F	d	T	F	d	T	F
e	T	F	e	T	F	e	T	F	e	T	F	e	T	F	e	T	F	e	T	F	e	T	F

9. a	T	F	10. a	T	F	11. a	T	F	12. a	T	F	13. a	T	F	14. a	T	F	15. a	T	F	16. a	T	F
b	T	F	b	T	F	b	T	F	b	T	F	b	T	F	b	T	F	b	T	F	b	T	F
c	T	F	c	T	F	c	T	F	c	T	F	c	T	F	c	T	F	c	T	F	c	T	F
d	T	F	d	T	F	d	T	F	d	T	F	d	T	F	d	T	F	d	T	F	d	T	F
e	T	F	e	T	F	e	T	F	e	T	F	e	T	F	e	T	F	e	T	F	e	T	F

17. a	T	F	18. a	T	F	19. a	T	F	20. a	T	F												
b	T	F	b	T	F	b	T	F	b	T	F												
c	T	F	c	T	F	c	T	F	c	T	F												
d	T	F	d	T	F	d	T	F	d	T	F												
e	T	F	e	T	F	e	T	F	e	T	F												

STUDENT#: .....

STUDENT SURNAME: .....

STUDENT NAME(S): .....

QUESTION PAPER # .....

DATE: .....

GREAT ZIMBABWE UNIVERSITY

SIMON MAZORODZE SCHOOL OF MEDICAL AND HEALTH SCIENCES

DEPARTMENT OF BIOMEDICAL SCIENCES

PHYSIOLOGY UNIT

TOTAL MARK

OFFICIAL USE

.....%

RESPIRATORY PHYSIOLOGY – END OF COURSE TEST (29 NOV 2024)
1 HOUR 15 MINUTES

Instructions to Candidates:

1. Answer all questions
2. For the multiple choice questions (MCQ), answer true (**T**) or false (**F**) in the box provided on the question paper at the end of each question.
3. There is a negative marking for multiple-choice questions. You are awarded one mark for a correct answer and one mark shall be deducted for every wrong answer.
4. There is no negative marking for the short answer or essay questions. Section B shall comprise Problem Solving Exercises (**PSE**), Applied Practical Questions (**APQ**), or General Descriptive Questions (**GDQ**).
5. Section A shall contribute 75% and Section B shall contribute 25% of the total marks for the test.
6. **Answer all questions on the examination question paper**. The space provided is adequate for the expected answers.
7. This test shall contribute to the Continuous Assessment at the Preclinical level.

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SECTION A - MULTIPLE CHOICE QUESTIONS (100 MARKS: 1 HOUR)

1. **The lung:**
   A. Removes/inactivates serotonin (5HT)
   B. Activates bradykinin
   C. Converts angiotensin II to I
   D. Inactivates aldosterone
   E. Takes up noradrenaline

2. **Physiological dead space is increased with:**
   A. Age
   B. Pleural effusion
   C. Supine position
   D. Atelectasis
   E. Hypotension

3. **Possible mechanisms that would increase the rate of pleural fluid formation include:**
   A. Increased permeability of the pleural capillaries
   B. Decreased hydrostatic pressure in the pleural capillaries
   C. Low colloid osmotic (oncotic) pressure in the pleural capillaries
   D. Obstruction of the pulmonary lymphatic channels
   E. protein deficiency (as seen in Kwashiokor).

4. **Alveolar pressure during quiet breathing:**
   A. 5 cmsH2O negative at inhalation
   B. 5 cmsH2O positive at expiration
   C. Follows intrapleural pressure closely
   D. Is atmospheric between inhalation & exhalation
   E. is 0cm H2O at mid expiration

5. **Reduction of the pulmonary diffusing capacity to one-fourth of its normal value would be expected to have what effect on systemic arterial oxygen and carbon dioxide partial pressures (compared to normal)?**
   A. decrease $P_{a\text{-}O2}$ and decrease $P_{a\text{-}CO2}$
   B. decrease $P_{a\text{-}O2}$ and increase $P_{a\text{-}CO2}$
   C. increase $P_{a\text{-}O2}$ and decrease $P_{a\text{-}CO2}$
   D. increase $P_{a\text{-}O2}$ and increase $P_{a\text{-}CO2}$
   E. decrease $P_{a\text{-}O2}$ but no change in $P_{a\text{-}CO2}$

6. **Factors that favour formation of carbamino-haemoglobin include:**
   A. Carbonic anhydrase
   B. A decrease in oxygen tension
   C. An increase in oxygen tension
   D. A decrease in pH
   E. increase 2,3 DPG

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7. **Suppose a person has a genetic defect causing him to continue to produce fetal hemoglobin (rather than normal hemoglobin) throughout adult life. What would be the expected systemic arterial oxygen partial pressure and saturation (compared to a normal person)?**
   A. higher $P_{a\text{-}O2}$ and higher Hb O_2 saturation
   B. higher $P_{a\text{-}O2}$ but lower Hb O_2 saturation
   C. lower $P_{a\text{-}O2}$ but higher Hb O_2 saturation
   D. lower $P_{a\text{-}O2}$ and lower Hb O_2 saturation
   E. normal $P_{a\text{-}O2}$ but higher Hb O_2 saturation

8. **In a person standing upright, which region of the lungs has the highest ventilation rate and which region has the highest circulatory perfusion rate?**
   A. highest ventilation: Apex; highest perfusion: Apex
   B. highest ventilation: Apex; highest perfusion: Base
   C. highest ventilation: Base; highest perfusion: Apex
   D. highest ventilation: Base; highest perfusion: Base
   E. there is no "highest" region as the apex and base have equal ventilation and perfusion rates

9. **A patient has a normal oxygen partial pressure and content in pulmonary venous blood but his systemic arterial blood shows a significantly lower than normal oxygen partial pressure and content. This is diagnostic of:**
   A. diffusion limitation
   B. right-to-left shunt
   C. pulmonary ventilation/perfusion nonuniformity
   D. stagnant hypoxia (low cardiac output)
   E. Polycythemia

10. **The important afferent (sensory) receptors for the respiratory response to systemic arterial carbon dioxide ($P_{a\text{-}CO2}$) are the:**
   A. CO_2 receptors of the aortic and carotid bodies
   B. H^+ receptors of the aortic and carotid bodies.
   C. CO_2 receptors in the medulla of the brain
   D. H^+ receptors in the medulla of the brain
   E. CO_2 receptors in the airways and lungs

11. **Control (inspiratory) of the diaphragm originates in:**
   A. Pneumotactic centre
   B. Apneustic centre in pons
   C. Dorsal medullary (neurons of) respiratory centre
   D. Ventral medullary (neurons of) respiratory centre
   E. Pre-Botzinger nuclei

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12. Arterial Blood Gases: pH 7.48, PCO2 24 (or 26), HCO3 19 BE 15 is consistent with:

A. Mixed metabolic and respiratory acidosis
B. Acute respiratory alkalosis
C. Metabolic acidosis with compensated respiratory alkalosis
D. Chronic respiratory disease
E. Hyperventilating consistent with acclimatisation to altitude

13. Pulmonary vascular resistance is increased in :

A. Increase in pulmonary arterial pressure
B. Hypocarbia
C. Alkalosis
D. Increased left atrial pressure
E. Pulmonary edema

14. The following causes increase in (physiological) dead space would be expected with:

A. Pulmonary embolism
B. Atelectasis (or: collapse of one lung)
C. Pneumothorax
D. Bronchoconstriction
E. Obesity

15. Distribution of ventilation & perfusion:

A. Gradient of change in ventilation is greater than that for perfusion
B. Ventilation increases as go up the lung
C. Perfusion increases as go up the lung
D. V:Q ratio at apex is greater than at base
E. Compliance is more at base than apex

16. With constant FIO2, CO and VO2, an increase in mixed venous O2 content would be seen with:

A. Hypothermia
B. Increased paCO2
C. Decreased 2,3 DPG
D. Alkalosis
E. Acidocis

17. With acute acclimitisation to altitude:

A. Hypoventilation
B. Decreased cardiac output
C. Pulmonary oedema
D. Polycythaemia
E. Increase in 2,3 DPG

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18. The peripheral chemoreceptors:

A. Have a nonlinear response to paO2 changes
B. Stimulated by cyanide
C. Respond to a fall in PaCO2
D. Respond to alkalaemia
E. Are in the carotid sinus

19. Which of the following findings/risk factors has/have been associated with obstructive sleep apnea?

A. Large tonsils seen on physical exam
B. Elevated blood pressure
C. Neck size greater than 16 inches in a female and 16.5 inches in a male
D. Presence of diabetes mellitus
E. Congestive heart failure

20. A 68 year old man enters the hospital for acute worsening of chronic shortness of breath and a nonproductive cough. He is a lifelong nonsmoker, though he did work in the jewelry industry. He has no cardiac risk factors other than age and male sex. His primary physician saw him in the office earlier and noted an oxygen saturation of 83% on room air, a respiratory rate of 28, fine "Velcro" crackles at the lung bases without wheezing, and clubbing. A chest X-ray shows a "reticulonodular pattern" that is most prominent at the lung bases. A CT angiogram obtained in the ER shows no evidence of pulmonary embolism; a high resolution CT scan the following day shows subpleural honeycomb changes mostly at the lung bases, some traction bronchiectasis, and thickened interlobular septa. You would predict the following:

A. He has reduced lung compliance with normal chest wall compliance, resulting in a reduction in FRC, TLC, and normal to increased expiratory flows
B. He has reduced lung and chest wall compliance, leading to reductions in TLC, FRC, and RV
C. He has increased recoil forces of his chest wall, resulting in a restrictive pattern
D. His FRC should be elevated due to gas trapping from airway closure
E. He has low levels of surfactant.

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SECTION B – APPLIED PRACTICAL QUESTION (25 MARKS)

1. List any SIX (6) metabolic function of the lung. (3)

2. Briefly, describe the law of Laplace as it relates to pulmonary function. (3)

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3. Write short notes on the;

a) Bohr effect (2)

b) Haldane effect (2)

c) Hering-Breuer reflex (2)

d) Cheyne-Stokes respiration (1)

e) pre-Bötzinger complex (2)

f) Pneumotaxic center (2)

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g) Apneustic center (2)

h) Ondine's curse? (2)

i) pathophysiology of asthma. (2)

j) pathophysiology of COVID-19. (2)

All the best.

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END OF QUESTION PAPER