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MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

(MMUST)

SCHOOL OF NURSING MIDWIFERY AND PARAMEDICAL SCIENCES

2023/2024 ACADEMIC YEAR UNIVERSITY EXAMINATION

FIRST YEAR SECOND TRIMESTER FOR THE DEGREE OF BACHELOR OF SCIENCE IN NURSING

MAIN EXAM

PROGRAMME: ODEL UPGRADER

COURSE CODE: NCD 122

COURSE TITLE: MEDICAL PHYSIOLOGY III: (resp/endocrine)

DATE: 9TH APRIL 2024

TIME: 8:00AM-11:00AM

INSTRUCTIONS TO CANDIDATES

All questions are compulsory

DURATION: 3 Hours

MMUST observes ZERO tolerance to examination cheating

This paper consists of 5 (Five) printed pages. Please turn over.

SECTION A: MULTIPLE CHOICE QUESTIONS (60MARKS)

1. The O₂-hemoglobin dissociation curve is shifted to the right by
 - a) a decrease in acidity
 - b) an increase in Pco₂
 - c) a decrease in temperature
 - d) a decrease in 2,3-DPG
2. CO₂ is transported in the blood approximately
 - a) 60% as bicarbonate, 30% as carbamino compounds and 10% dissolved
 - b) 60% as bicarbonate, 20% as carbamino compounds and 20% dissolved
 - c) 50% as bicarbonate, 40% as carbamino compounds and 10% dissolved
 - d) 50% as bicarbonate, 35% as carbamino compounds and 15% dissolved
3. Hyperventilation
 - a) is rapid breathing during exercise
 - b) reduces the arterial Pco₂ and increases arterial Po₂ substantially
 - c) can lead to light-headedness, visual disturbances and tetanus
 - d) can be caused by pain, hysteria and strong emotion
4. The receptors that are located on the alveolar and bronchial walls close to the capillaries are called
 - a) pulmonary stretch receptors
 - b) irritant receptors
 - c) proprioceptors
 - d) juxtapulmonary receptors
5. The central chemoreceptor
 - a) is a collection of neurons near the ventrolateral surface of the pons
 - b) responds to changes in both blood Pco₂ and Po₂
 - c) responds to a rise in H⁺ in the CSF and leads to an increase in ventilation
 - d) is responsible for only 20% of the response to CO₂ in humans
6. With regard to endocrine control
 - a) The endocrine system provides a rapid, precise but short term control of cellular function
 - b) Paracrine cells release their hormones into the bloodstream so that they reach all parts of the body
 - c) Autocrine cells release hormones that control their own function
 - d) Hormones are secreted from either classical glandular tissues or whole organs and not from other tissues
7. A tumor that produces large amounts of catecholamines can be detected by examining the urine for:
 - a) K⁺
 - b) Uric acid
 - c) Choline

d) VMA

8. The following hormone is secreted by the anterior pituitary gland:

- a) Cortisol
- b) TRH
- c) CRH
- d) Vasopressine
- e) TSH e)

9. A ten year old boy has high levels of the growth hormone. He is likely to develop:

- a) Acromegaly
- b) Hyperglycemia
- c) Mental retardation c)
- d) Muscle atrophy

10. Stimuli for aldosterone regulation includes:

- a) High sodium in the distal renal tubule
- b) High serum potassium b)
- c) Hypervolaemia
- d) ACTH as a potent stimulator

11. External respiration includes all of these processes EXCEPT _____.

- a) release of carbon dioxide by tissue cells
- b) gas diffusion across respiratory membrane
- c) breathing
- d) gas transport

12. Which class of sensory receptor can modify respiratory reflexes?

- a) nociceptors
- b) chemoreceptors
- c) stretch receptors
- d) All of these sensory receptors can modify respiratory reflexes.

13. All of the following are changes we can expect to see in respiratory performances as we age EXCEPT a (an) _____.

- a) increase in lung compliance
- b) decrease in the movement of the rib cage
- c) decrease in the elasticity of the lung tissue
- d) increase in emphysema

14. In order for the respiratory system to maintain homeostatic tissue levels of oxygen and carbon dioxide, it must coordinate constantly with the _____ system.

- a) cardiovascular
- b) integumentary
- c) digestive
- d) urinary

15. Which of the following statements correctly contrasts the dorsal respiratory group (DRG) and the ventral respiratory group (VRG)?

- a) The DRG is mainly active during inspiration, while the VRG is primarily active during expiration.
- b) The DRG only becomes active when there is a need for increased breathing activity, while the VRG is active during every respiratory cycle.
- c) The VRG receives input from cerebrospinal fluid chemoreceptors, while the DRG receives input from chemoreceptors in the bloodstream.
- d) The VRG has inspiratory and expiratory centers that are active during every breathing cycle, while the DRG is only active during expiration.

16. Which of the following variables is NOT monitored by the medullary breathing centers?

- a) air humidity
- b) amount of stretch in the lungs
- c) partial pressure of CO
- d) blood acidity

17. Which breathing center promotes inhalation by stimulating the DRG?

- a) VRG
- b) apneustic center
- c) pneumotaxic center
- d) hypothalamus

18. The structure of the respiratory epithelium changes along the respiratory tract. In addition to mucous cells, what other type of cells are found lining the nasal cavity, nasopharynx, and the superior portion (trachea and bronchi) of the lower respiratory system?

- a) simple squamous epithelial cells
- b) stratified squamous epithelial cells
- c) cuboidal ciliated epithelial cells
- d) pseudostratified ciliated columnar epithelial cells

19. Thyroid hormone actions include:

- a) Augmentation of sympathetic effect on GI motility
- b) Release of insulin
- c) Lipogenesis
- d) Increasing the numbers of Beta adrenergic receptors

20. the most sensitive regulatory mechanism of ADH secretion is dependent on:

- a) The volume receptors
- b) Renin-angiotensin system
- c) Hypothalamic osmoreceptors
- d) Renal glomerulotubular feedback

21. Clinical uses of Oxytocin include:

- a) Stimulation of milk ejection in breastfeeding women
- b) Stimulation of ejaculation in infertile men

- c) Stimulation of uterine contraction in pregnant women c)
 - d) Induction of breast development in adolescent girls
22. The actions of ACTH include the following except:
- a) Stimulation of melanocytes a)
 - b) Increased secretion of aldosterone
 - c) Induction of growth of the adrenal gland
 - d) Induction of secretion of adrenomedullins
23. A most effective method of treating type I diabetes mellitus is:
- a) The patient should not eat any carbohydrates
 - b) Exercise
 - c) Drugs to stimulate the B cells of the pancreas
 - d) Daily injections of insulin e)
24. The following are actions of insulin, except:
- a) Inhibition of protein degradation
 - b) Inhibition of gluconeogenesis
 - c) Reduction of extracellular K^+
 - d) Increased renal tubular absorption of glucose e)
25. The following factors have a direct marked effect on the adrenal cortex to stimulate the secretion of aldosterone except:
- a) Angiotensin III
 - b) Angiotensin II
 - c) Hyperkalemia
 - d) Hyponatremia
26. A major regulator of bone growth is:
- a) Parathyroid hormone
 - b) Calcitonin
 - c) Growth hormone
 - d) Prolactin
27. Primary hyperaldosteronism leads to:
- a) Moderate hyperglycemia
 - b) Sodium natriuresis
 - c) Oedema
 - d) Alkalosis d)
28. Which of the following is a manifestation of Addison's disease:
- a) Hypopigmentation
 - b) Good appetite
 - c) Hypoglycemia
 - d) Obesity
29. Excess cortisol in Cushing's syndrome is associated with:
- a) Hypotension

- b) Protein depletion
 - c) Hypoglycemia
 - d) Dry thick skin
30. Insulin secretion is inhibited by:
- a) Alpha adrenergic receptor stimulation
 - b) Vagal stimulation
 - c) Amino acids
 - d) GIP
31. Calcitonin:
- a) Increases serum calcium by stimulation of osteoclasts
 - b) Prevents postprandial hypercalcemia
 - c) Is important in long-term regulation of serum ionized calcium
 - d) Is stimulated by a hypothalamic releasing hormone
32. A ten year old boy has high levels of growth hormone. He is likely to develop:
- a) Acromegaly
 - b) Hyperglycemia
 - c) Mental retardation
 - d) Muscle atrophy
33. At high altitudes all of the following things occur in an effort to acclimatise EXCEPT
- a) Hypoventilation
 - b) Polycythaemia
 - c) Increased numbers of capillaries per unit volume in peripheral tissues
 - d) O₂ dissociation curve shifts to right
34. With respect to regional gas exchange in the upright lung
- a) Ventilation is greater at the top of the lungs
 - b) Perfusion is much greater at the top of the lungs compared with the bases
 - c) Ventilation/perfusion ratio is abnormally high at the top of the lungs
 - d) PO₂ is highest at the bases of the lungs
35. Regarding oxygen transport
- a) The predominant way oxygen is transported in the blood is as dissolved oxygen
 - b) 1 gram of pure Hb can combine with 1.34 - 1.39 ml of oxygen
 - c) An anaemic patient has a lowered arterial pO₂ because the Hb is low
 - d) CO₂ is 200 times more soluble than oxygen
36. The primary chemical stimulus for breathing is the concentration of
- a) carbon monoxide in the blood
 - b) carbon dioxide in the blood

- c) oxygen in the blood
- d) carbonic acid in the blood

37. Products of the anterior pituitary gland include:

- a) Melatonin
- b) Acetylcholine
- c) Beta endorphin
- d) Inhibin

38. Ionized calcium:

- a) Forms 60% of total blood calcium
- b) Cannot be filtered by the kidneys
- c) Low levels stimulate calcitonin secretion
- d) Levels in blood are increased by increase in H⁺

39. Insulin can be described as:

- a) Gluconeogenic
- b) Ketogenic
- c) Protein anabolic
- d) Diuretic

40. The main effect of somatostatin secreted by the D cells of the islets of Langerhans appears to be:

- a) secretion of growth hormone
- b) Inhibition of the stimulation of glucagon secretion
- c) Inhibition of gastric acid secretion
- d) Inhibition of insulin secretion

41. Factors that act on the cells of the adrenal gland to cause secretion of aldosterone include:

- a) Renin
- b) Angiotensinogen
- c) Atrial natriuretic peptide (ANP)
- d) Potassium ions
- e) Aldosterone

42. The following effects can be caused by cortisol except:

- a) Excessive loss of K⁺ in urine
- b) Hypertension
- c) Hyperglycemia
- d) Increased production of CRH by the hypothalamus in cases of Cushing's syndrome

43. Known effects of ACTH include all of the following except:

- a) Increased secretion of adrenal androgens
- b) Increased secretion of aldosterone transiently
- c) Stimulation of growth of zona reticularis of the adrenal cortex
- d) Direct stimulation of surfactant secretion

44. Prolactin secretion:

- a) Has diurnal rhythm
 - b) dopa-Can be inhibited by L
 - c) Is inhibited by chlorpromazine
 - d) Is stimulated by bromocriptine
45. Antidiuretic hormone (ADH) is secreted from the _____ and its main target tissue is the _____
- a) anterior pituitary, kidney
 - b) intermediate pituitary, hypothalamus
 - c) posterior pituitary, kidney
 - d) adrenal cortex, liver and kidney
46. Which hypophyseal structure receives signals from the hypothalamus via the hypophyseal portal vessels?
- a) neurohypophysis
 - b) supraoptic nucleus
 - c) adenohypophysis
 - d) paraventricular nucleus
47. _____ is located between two pleural sacs and is the central compartment of the thoracic cavity?
- a) Hilum
 - b) Pleura
 - c) Mediastinum
 - d) Thoracic cage
48. Which of the following statements is true about involuntary breathing?
- a) It is controlled by the bronchioles
 - b) It is controlled by the pulmonary arterioles
 - c) It is controlled by the alveolar-capillary network
 - d) It is controlled by the neurons, located in the medulla and pons
49. The exchange of gases between the external environment and the lungs _____.
- a) Respiration
 - b) External respiration
 - c) Cellular respiration
 - d) None of the above
50. The maximum volume of air contained in the lung by a full forced inhalation is called _____.
- a) Tidal volume
 - b) Vital capacity
 - c) Ventilation rate
 - d) Total lung capacity
51. Which one of the following is correct regarding larynx?
- a) It houses the vocal cords

- b) It prevents the invading pathogens into the trachea
 - c) It is an organ made of cartilage and connects the pharynx to the trachea
 - d) All of the above.
52. Which of these statements is true about internal respiration?
- a) Production of ATP
 - b) Exchange of gases between the bloodstream and tissue cells
 - c) Exchange of gases between alveoli and the bloodstream
 - d) Breathing between the atmosphere and the alveoli
53. The normal breathing process is controlled by _____.
- a) Lungs
 - b) Ventral respiratory group
 - c) Dorsal respiratory group
 - d) Both (b) and (c)
54. The epithelial tissues present on the inner surface of bronchioles and fallopian tubules are _____
- a) Squamous
 - b) Ciliated
 - c) Glandular
 - d) Cuboidal
55. The actions of ACTH include the following except:
- a) Stimulation of melanocytes
 - b) Increased secretion of aldosterone
 - c) Induction of growth of the adrenal gland
 - d) Induction of secretion of adrenomedullins
56. Hypomagnesaemia is a recognized cause of:
- a) Diabetes mellitus
 - b) Diabetes insipidus
 - c) Hypervitaminosis D
 - d) Tetany
57. The main effect of somatostatin secreted by the D cells of the islets of Langerhans appears to be:
- a) Inhibition of the secretion of growth hormone
 - b) Stimulation of glucagon secretion
 - c) Inhibition of gastric acid secretion
 - d) Inhibition of insulin secretion
58. Factors that act on the cells of the adrenal gland to cause secretion of aldosterone include:
- a) Renin
 - b) Angiotensinogen
 - c) Angiotensin I
 - d) Atrial natriuretic peptide (ANP)

59. During internal and external respiration, gases move by

- a) osmosis
- b) active transport
- c) diffusion
- d) endocytosis

60. Most oxygen in the blood is transported

- a) as gas dissolved in plasma
- b) as oxyhemoglobin
- c) as carboxyhemoglobin
- d) as bicarbonate

SECTION B: SHORT ANSWER QUESTIONS 20 marks)

1. State four function of surfactant factor in the lung?(8marks)
2. State the process in which vasopressin (ADH) cause retention of water in the body?
(6marks)
3. State at least four sites of the brain that participate in the respiratory control mechanism?
(6marks)

SECTION C: LONG ANSWER QUESTION 40 MARKS

1. Mr. K was admitted two days ago following emergency explorative laparotomy, but has failed a spontaneous breathing trial. On chest x-ray, his lungs are hyperinflated with interstitial disease and chest appears barrel shaped.

- a) Describe a normal arterial blood gas (BGA)? (5mrks)
- b) describe the physiology and deference between breathing and ventilation?(5mrks)
- c) Explain the immediate care of Mrs. Kamau? (10mrks)