National University of Lesotho

Faculty of Health Sciences

Department of Pharmacy

FHS 2301: Human Anatomy and Physiology II

Supplementary Exam

Date: August 2023 Time: 3hrs Marks:100

Instructions:

Answer all questions in **section A** by selecting the letter corresponding to the correct answer(s)

Answer all questions in **section B** by indicating whether a given statement is true or false

Section A
Renal Physiology

1. Which of the following stimulates secretion of renin?
   a. Low blood potassium
   b. Low blood sodium
   c. Low blood volume
   d. Low blood pressure

2. Which of the following is the role of angiotensin converting enzyme?
   a. Conversion of renin to angiotensin
   b. Conversion of angiotensin I to angiotensin II
   c. Conversion of aldosterone to active aldosterone
   d. Conversion of angiotensin to renin

3. Which of the following determine the glomerular filtration rate?
   a. Net filtration pressure
   b. Permeability of the corpuscular membrane
   c. Surface area available for filtration
   d. All the above

4. What is urinary incontinence?
   a. Failure of the urethra to control urine
   b. Failure of the bladder to hold urine
   c. Failure of the gallbladder to function
   d. Failure of the kidneys to form urine

5. The principal effect of aldosterone is to increase reabsorption of which of the following?
   a. Potassium
   b. Sodium
   c. Calcium
   d. Urea

6. Which of the following is/are not a function of kidneys?
   a. Regulation of water and inorganic ion balance
   b. Gluconeogenesis
   c. Hormone synthesis
   d. None of the above

7. Which of the following is the function of antidiuretic drugs?
   a. Retention of water in kidneys
   b. Increase volume excreted urine
   c. Lowering blood pressure
   d. None of the above

8. The release of renin is caused by which of the following?
   a. Increase in systemic arterial pressure
   b. Reduction of arteriolar pressure
   c. Activation of angiotensin converting enzyme
   d. All the above

9. Which of the following hormones affect Na^+ and water reabsorption by the renal tubules?
    a. Aldosterone
    b. Antidiuretic hormone
    c. Thyroxine
    d. Calcitonin

10. Which of the following is true for the glomerulus?
    a. Has both afferent and efferent arterioles
    b. Has capillaries which are at higher pressure than the peritubular capillaries
    c. Contains vasopressin-secreting cells
    d. Is in the Bowman's capsule

11. What is the main driving force for water reabsorption by the proximal tubule?
    a. Active reabsorption of amino acids and glucose
    b. Active reabsorption of sodium
    c. Active reabsorption of water
    d. The water reabsorption does not need a driving force

12. Which of the following best describes osmotic diuresis?
    a. Increase in urine flow due to excretion of an osmotically active solute
    b. Filtration through a membrane with fine pores
    c. An energy demanding process that sets up solute gradient
    d. All the above

13. Which of the following is/are possible causes of diabetes insipidus?
    a. Failure of posterior pituitary gland to produce vasopressin
    b. Failure of the islets of Langerhans to secrete insulin
    c. Diminishing sensitivity of insulin receptors
    d. Failure of the kidney to respond to vasopressin

14. How does vasopressin act to produce concentrated urine?
    a. Has no effect
    b. Moves aquaporins to cell membrane of collecting ducts to cause reabsorption of water
    c. Increases Na^+ reabsorption in the thick ascending limb of loop of Henle
    d. Decreases the reabsorption of Na^+

15. On which of the following does aldosterone exert most effect?
    a. Glomerulus
    b. Proximal tubule
    c. Distal tubule
    d. Thick portion of loop of Henle

16. Which of the following best describes glomerular filtration rate?
    a. Volume of fluid filtered from glomeruli into Bowman's space per unit time
    b. Volume of solute filtered through loop of Henle
    c. Volume of water reabsorbed per unit time
    d. Volume of Na^+ lost in the urine per unit time

Endocrine Physiology

17. Which of the following results from insulin deficiency?
    a. Abnormally high plasma glucose
    b. Respiratory acidosis
    c. Increased rate of glucose uptake by the brain
    d. All the above

18. Which endocrine gland is closely associated with the larynx?
    a. The pancreas
    b. The thymus gland
    c. The pineal gland
    d. The thyroid gland

19. Which of the following causes goitre?
    a. Increased levels of thyroid hormones
    b. Use of too much iodated salt
    c. Lack of iodine
    d. All the above

20. Which of the following is stimulated by growth hormone?
    a. Absorption of calcium
    b. Storage of fats
    c. Division of body cells
    d. Protein synthesis

21. T_4 is the abbreviation of which hormone?
    a. Thyroglobulin
    b. Thyroxine
    c. Triiodothyronine
    d. Thyroid stimulating hormone

22. Which is the most abundant hormone secreted by the anterior pituitary gland?
    a. Growth hormone
    b. Thyroid stimulating hormone
    c. Adrenocorticotropic hormone
    d. Prolactin

23. Which of the following is not a water-soluble hormone?
    a. Steroid hormones
    b. Peptide hormones
    c. Amine hormones
    d. Proteins

24. Which of the following is true for aldosterone?
    a. Generates maximal renal response within a short time
    b. Secretion is regulated by adrenocorticotropic hormone
    c. Usually increases sodium plasma concentration significantly
    d. All the above

25. Which of the following disorders arises from the downregulation of insulin receptors?
    a. Gigantism
    b. Diabetes mellitus
    c. Congenital hypothyroidism
    d. Diabetes insipidus

26. Which gland controls the basal metabolic rate (BMR)?
    a. Thyroid gland
    b. Parathyroid gland
    c. Testes
    d. Pancreas

27. Which of the following hormones are responsible for the "fight-or-flight" response?
    a. Epinephrine and norepinephrine
    b. Insulin and glucagon
    c. Oestrogen and progesterone
    d. Thyroxin and melatonin

28. Calcitonin is a hormone of which of following glands?
    a. Adrenal cortex
    b. Thyroid gland
    c. Pituitary gland
    d. Thymus gland

29. How do hormones from thyroid and parathyroid glands regulate calcium concentration in the blood?
    a. Calcitonin lowers blood calcium: parathyroid hormone raises calcium
    b. Parathyroid hormone lowers calcium: calcitonin raises blood calcium
    c. Thyroxine and Triiodothyronine together regulate calcium level as per need
    d. Both parathyroid hormone and three thyroid hormones regulate calcium in blood

30. Which is the most abundant hormone secreted by the anterior pituitary?
    a. Growth hormone
    b. Thyroid stimulating hormone
    c. Prolactin
    d. Cortisol

31. Circadian rhythm means regular fluctuations in hormone levels over which of the following periods?
    a. An hour
    b. 24hours
    c. One week
    d. One month

32. Which of the following is the role of cortisol?
    a. Promotion of Na^+ reabsorption
    b. Promotes ACTH release from the anterior pituitary gland
    c. Promotes response to stress
    d. Normally has high levels in the body during sleep

Respiratory Physiology

33. Which of the following is true for asthma but not for emphysema?
    a. Strong contraction of smooth muscle in airways
    b. Excessive mucus production
    c. Inflammation of the small airways
    d. All the above

34. Which of the following is true for compliance in lungs?
    a. The magnitude of change in lung volume
    b. Very low in the normal healthy lung
    c. Increased when surfactant levels are low
    d. It is another term for elasticity

35. Which one of the following is a function of cartilage in the upper respiratory tract?
    a. To humidify and warm the air as it is inhaled
    b. To prevent the collapse of the air passages
    c. To sweep mucus away from the lungs
    d. To keep the oesophagus open

36. Which of the following is the function of cilia in the upper respiratory tract?
    a. Cilia sweeps debris and microbes away from the airways
    b. Cilia moistens and warms inhaled air
    c. Cilia keeps the upper respiratory tract open
    d. Cilia is not present in the upper respiratory tract

37. What is the role of mucus in the respiratory tract?
    a. Mucus keeps inspired air warmed and humidified
    b. Traps the particulate matter entering the upper respiratory tract
    c. To keep the airways open all the time
    d. All the above

38. Which of the following airways has the smallest diameter?
    a. Respiratory bronchioles
    b. Trachea
    c. Diaphragm
    d. Tertiary bronchus

39. Which of the following are determinants of lung compliance?
    a. Ability of lung tissue to stretch
    b. Surface tension in the alveoli
    c. Presence of surfactant
    d. All the above

40. For normal gas exchange in the lung, which of the following is true?
    a. O_2 moves into the alveoli because PO_2 is higher in the blood than in the alveoli
    b. O_2 moves out of the alveoli because PO_2 is higher in the alveoli than in the blood
    c. O_2 moves into the alveoli because PO_2 is higher in the alveoli than in the blood
    d. O_2 moves out of the alveoli because PO_2 is higher in the blood than in the alveoli

41. Which of the following best describes ventilation perfusion mismatch?
    a. When supply of oxygen does not match blood supply in the lungs and vice versa
    b. When oxygen supply does not equal carbon dioxide expulsion
    c. When carbon dioxide uptake supersedes oxygen delivery in the tissues
    d. All the above

Cardiovascular and blood Physiology

42. What is the function of valves in blood vessels?
    a. To keep the blood flowing in one direction
    b. To support the blood vessel walls
    c. To shut off blood flow to a damaged blood vessel
    d. There are no valves in blood vessels

43. Which of the following tissues are common across all blood vessels?
    a. Muscle
    b. Adipose
    c. Endothelial
    d. Connective

44. What is the reason for veins having thinner walls than arteries?
    a. They are vessels where gas and nutrient exchange takes place
    b. They carry blood at higher pressure than arteries
    c. They carry less blood than arteries
    d. They carry blood at lower pressure than arteries

45. At which point in the cardiac cycle are the walls of the aorta most stretched?
    a. During diastole
    b. When the atrioventricular valves open
    c. During the first heart sound
    d. During cardiac diastole

46. Which of the following lists three effects that will all increase heart rate?
    a. Sympathetic activation; fear; reduced exercise
    b. Sympathetic activation; epinephrine release; increased exercise
    c. Parasympathetic stimulation; fall in blood pressure; thyroxine release
    d. Epinephrine release; fall in blood pressure; decreased exercise

47. Blood pressure is usually expressed as which of the following?
    a. Diastolic pressure over systolic pressure
    b. Systolic pressure of diastolic pressure
    c. Pulse pressure over diastolic pressure
    d. Systolic pressure over pulse pressure

48. What is the characteristic sound of the heartbeat through a stethoscope placed over the chest due to?
    a. Movement of blood through the large vessels entering and leaving the heart
    b. Contraction of the myocardium
    c. Rubbing the heart against the ribs
    d. Closing of the valves inside the heart

49. Why do the atrioventricular valves close during ventricular contraction?
    a. The pressure in the aorta is higher than the pressure in the ventricles
    b. The pressure in the ventricles in higher than the pressure in the atria
    c. The pressure in the atria is higher than pressure in the pulmonary arteries
    d. The pressure in the aorta is higher than the pressure in the atria

50. In which part of the cardiovascular system do valves ensure flow of blood in one direction besides the heart?
    a. Capillaries
    b. Arterioles
    c. Veins
    d. Coronary arteries

51. Where do the coronary arteries arise?
    a. The aortic arch
    b. The descending aorta
    c. The ascending aorta
    d. The root of the aorta

52. Which of the following is true for blood clotting?
    a. Requires calcium ions
    b. Is promoted by platelet plugging
    c. Defects usually prolong the bleeding time
    d. Does not require calcium ions

53. Which of the following best describes haematocrit?
    a. Number of red blood cells in the body
    b. Percentage of blood occupied by red blood cells
    c. Number of white blood cells in blood
    d. Volume of Platelets in blood

54. What are the two main factors determining blood pressure?
    a. Cardiac output and peripheral resistance
    b. Peripheral resistance and blood volume
    c. Blood volume and pulse pressure
    d. Pulse pressure and cardiac output

55. Which valve connects the right atrium to the right ventricle?
    a. Pulmonary valve
    b. Tricuspid valve
    c. Inferior vena cava
    d. Mitral valve

56. Which of the following best describes pulse pressure?
    a. Difference in pressure between the right and left ventricles
    b. Pressure in the aortic valve
    c. Pressure in the varicose veins
    d. Difference between systolic and diastolic pressure

57. Which of the following sets of factors are important determining the pulse pressure?
    a. Stroke volume, speed of ejection of the stroke volume and arterial compliance
    b. Stroke volume, cardiac output, and venous compliance
    c. Cardiac output, valve efficiency, ventricular pressure difference
    d. Valves in veins, skeletal pump, pressure in thoracic cavity

58. Which of the following airways has the largest radius?
    a. Respiratory bronchiole
    b. Primary bronchus
    c. Trachea
    d. Tertiary bronchus

59. Which of the following is true for elasticity of lungs?
    a. It is very high in normal healthy lungs
    b. It is the ability of lungs to stretch
    c. It is important in determining airways resistance
    d. All the above

60. Which of the following plasma protein is involved in blood clotting?
    a. Thyroglobulin
    b. Immunoglobulin
    c. Fibrinogen
    d. Albumin

61. What is the role of elastic tissue in the upper respiratory tract?
    a. To collapse the oesophagus
    b. To sweep the mucus away from the lungs
    c. To warm and humidify inspired air
    d. To allow the oesophagus to expand during swallowing

62. Which of the following does not represent a mechanism of CO_2 transport in blood?
    a. Bound to haemoglobin
    b. As bicarbonate ions
    c. Dissolved in blood water
    d. As hydrogen ions

63. Which of the following determines the flow of blood along a blood vessel?
    a. Blood viscosity
    b. Blood volume
    c. Blood vessel length
    d. Blood vessel diameter

64. How is the heart muscle supplied with oxygen and nutrients?
    a. From the blood that circulates through the heart chambers
    b. By the coronary arteries which branch from the aorta
    c. By the pulmonary arteries which also supply the lungs
    d. From the cardiac arteries

65. Which of the following drains blood from the heart tissue?
    a. By venous channels that open into the inferior vena cava
    b. Directly into the vena cava
    c. Mainly into the coronary sinus which empties into the right atrium
    d. Directly into the pulmonary artery for oxygenation

66. If a haemoglobin molecule is saturated, which of the following would be true?
    a. All its oxygen binding sites are full
    b. The haemoglobin molecule is carrying its full complement of iron
    c. The molecule is likely to be in the pulmonary artery
    d. All the above

67. Which of the following best describes the function of haemoglobin?
    a. Supply of oxygen to the tissues
    b. To give red blood cells their colour
    c. Iron transport in the blood
    d. Carriage of respiratory gases

68. Which valve connects the left atrium to the left ventricle?
    a. Pulmonary valve
    b. Tricuspid valve
    c. Inferior vena cava
    d. Mitral valve

69. Which of the following is true for a patient with a low level of thyroid hormone and a high level of thyroid stimulating hormone?
    a. Will develop goitre
    b. Is likely to have reduced metabolic rate
    c. Would prefer warm environment
    d. All the above

70. Which of the following is responsible for blood clotting?
    a. Platelets
    b. Red blood cells
    c. White blood cells
    d. All the above

71. Where in the body is oxyhaemoglobin formed?
    a. In the heart
    b. In the lungs
    c. In the kidneys
    d. In the brain

72. How does carbon monoxide affect the affinity of haemoglobin for oxygen?
    a. Reduces affinity of haemoglobin for oxygen
    b. Increases affinity of haemoglobin for oxygen
    c. Does not affect the affinity of haemoglobin for oxygen
    d. It does not shift the oxygen dissociation curve

73. Which of the following is true for the diaphragm during inspiration?
    a. It contracts and flattens
    b. It relaxes and forms a dome shape
    c. It relaxes and flattens
    d. All the above

74. Which of the following happens to the external intercostal muscles during expiration?
    a. They contract
    b. They relax
    c. They increase in length
    d. Nothing happens to them

75. Which of the following is true for the volume of thoracic cavity during expiration?
    a. It becomes smaller
    b. It contracts
    c. It enlarges
    d. It does not change

Section B: 25 marks

Indicate whether the following statements are true or false

1. **T**he loop of Henle absorbs NaCl and water from its ascending limb
2. Glomerular filtration drives fluid into the Bowman's space
3. The glomerulus has both afferent and efferent arterioles
4. The nephron is lined by a single layer of epithelial cells throughout its length
5. The renin-angiotensin system can stimulate vasoconstriction
6. Carbon dioxide is mainly transported in blood in the form of bicarbonate
7. Pulmonary airways humidify inspired air
8. Blood clotting defects usually prolong the bleeding time
9. Oxygen dissociation curve is shifted to the right when O_2 affinity of haemoglobin is increased
10. Renin release directly activates angiotensin converting enzyme
11. Cortisol promotes renal reabsorption of sodium
12. Endocrine control always depends on binding of a hormone to its receptors
13. Insulin deficiency may lead to abnormally high plasma calcium levels after a meal
14. Epinephrine inhibits glucagon secretion
15. A patient with low level of TH and a high level of TSH is likely to have reduced metabolic rate
16. The heart is symmetrical about a plane along the ventricular septum
17. During exercise cardiac output increases mainly because of an increase in stroke volume
18. Arterioles are the most compliant type of blood vessels
19. Pulmonary hypertension can lead to left ventricular hypertrophy
20. Cardiac muscle cells have prolonged action potentials due to voltage-activated Ca^{2+} channels
21. The electrocardiograph is generated by the conduction of action potential across the heart
22. During exercise a decrease in PO_2 could promote O_2 delivery to the tissue
23. The pulmonary and systemic circuits have the same flow per minute
24. Blood from the heart tissue is collected mainly into the coronary sinus which empties into the right atrium
25. Down regulation of growth hormone receptors leads to gigantism