

KISII UNIVERSITY

DEPARTMENT OF MEDICAL PHYSIOLOGY

END OF FIRST YEAR EXAMINATION TOWARDS THE DEGREE OF
BACHELOR OF MEDICINE AND BACHELOR OF SURGERY (M.B.Ch.B)
(2021/22)

MEDS 111: MEDICAL PHYSIOLOGY I (Paper 1)

DATE: September, 2022

TIME: 3HRS

Section A: Multiple Choice Questions (120 Marks)

1. True regarding Na^+ ion:
 - a. Responsible for Donnan effect
 - b. Responsible for Resting membrane potential
 - c. Responsible for Depolarization
 - d. Does not help other ions in trans port
2. Volume of ICF in body:
 - a. $0.2 \times$ body wt.
 - b. $0.4 \times$ body wt
 - c. $0.6 \times$ body wt.
 - d. $0.8 \times$ body wt
3. Plasma protein contributes only ~ 1 mosm/litre in plasma osmolality because of:
 - a. High concentration, Low molecular weight
 - b. Low concentration, High molecular weight
 - c. Low concentration, Low molecular weight
 - d. High concentration, High molecular weight
4. Bound potassium is mainly found in the following except:
 - a. Brain
 - b. Bones
 - c. RBC's
 - d. Platelets
5. One person has ingested 1500 ml of water. Calculate the amount that will be present in ISF after equilibrium:
 - a. 1000 ml
 - b. 500 ml
 - c. 375 ml
 - d. 125 ml

6. A 60 kg patient has a hematocrit reading of 40 and a plasma volume of 3 liters. What is his total blood volume?
 - a. 4.0 liters
 - b. 5.0 liters
 - c. 6.0 liters
 - d. 7.0 liters
7. What is the calculated osmolarity of a solution containing 12 mmol NaCl, 4 mmol KCl and 2 millimolar CaCl₂ (mOsmol/L)?
 - a. 16
 - b. 26
 - c. 38
 - d. 32
8. Peripheral cell membrane proteins are:
 - a. Pumps
 - b. Channels
 - c. Adhesion molecule
 - d. Enzyme receptor
9. Cell membrane integrity is maintained by:
 - a. Heat stress
 - b. Na⁺-K⁺-ATPase
 - c. Ankyrin
 - d. Spectrin
10. Cell Protein: Lipid ratio in erythrocyte is:
 - a. 3.00
 - b. 2.33
 - c. 1.50
 - d. 1.14
11. Substances help in linking cytoskeleton of the cell to plasma membrane:
 - a. Tubulin
 - b. Spectrin
 - c. Laminin
 - d. Ankyrin
12. The transmembrane region of protein is likely to have:
 - a. A stretch of hydrophilic amino acids
 - b. A stretch of hydrophobic amino acids
 - c. A disulphide loop
 - d. Alternating hydrophilic and hydrophobic amino acids
13. True about lipid bilayer of cell wall:
 - a. Asymmetrical arrangement of cell membrane component
 - b. Lateral diffusion of ions
 - c. Symmetrical arrangement of cell membrane components

- d. Not made up of amphipathic lipids
14. Which of the following is used in exocytosis?
- a. Ca^{++}
 - b. Mg^{++}
 - c. Na^+
 - d. K^+
15. Fick's law gives the rate of transport in case of:
- a. Simple diffusion
 - b. Facilitated diffusion
 - c. Non-ionic diffusion
 - d. Secondary active transport
16. All are true about Na-K⁻ pump except:
- a. Needs ATP for its functioning
 - b. Is inactive at 40 degrees centigrade
 - c. It is electrogenic
 - d. Needed for generation of action potential
17. Active transport across the cell membrane is mediated by:
- a. G-proteins
 - b. $\text{Na}^+ - \text{K}^+$ ATPase
 - c. Carrier protein
 - d. Channel protein
18. All of the following transport process follows 'saturation kinetics' except:
- a. Facilitated diffusion
 - b. $\text{Na}^+ - \text{Ca}^{2+}$ exchanger
 - c. Simple diffusion
 - d. Na^+ coupled active transport
19. Which sets of hormones have nuclear receptor?
- a. Estrogen, thyroxin and glucagon
 - b. Estrogen, thyroxin and TSH
 - c. Estrogen, TSH and gonadotropin releasing hormone (GnRH)
 - d. Testosterone, cortisol and estrogen
20. Steroid hormone receptors have attachment site for all except:
- a. Steroid hormone
 - b. Transcription repressors
 - c. Hormone responsive element
 - d. Transcription activators
21. All are second messengers except:
- a. Guanylyl cyclase
 - b. cAMP
 - c. IP3
 - d. DAG

22. True about G protein coupled receptors is:
- G protein bind to hormones on the cell surface
 - All the three subunits alpha, beta and gamma should bind to each other for G protein to act
 - G protein acts as inhibitory and excitatory because of difference in alpha subunit
 - G protein is bound to GTP in resting state
23. Various cells respond differentially to a second messenger (such as increased cAMP) because they have different:
- Receptors
 - Enzymatic composition
 - Nuclei
 - Membrane lipid
24. Secretion of all the following hormones are decreased in section of pituitary stalk except:
- Prolactin
 - GH
 - Vasopressin
 - FSH
25. Vasopressin is secreted by:
- Supraoptic
 - Preoptic
 - Paraventricular
 - Posterior nucleus
26. When NaCl is injected in the internal carotid artery, it causes release of ADH by acting on?
- Paramedian nucleus
 - Anterior pituitary
 - Paraventricular nucleus
 - Supraoptic nucleus
27. Which is not an effect of T3 hormone?
- It increases the heart rate
 - It increases the stroke volume
 - It decreases the peripheral vascular resistance
 - Decreases protein breakdown
28. Excessive production of aldosterone results in:
- Metabolic acidosis
 - Severe hypotension
 - Potassium retention
 - Depressed plasma renin
29. What is effect of cortisol on metabolism?

- a. Neoglucogenesis
 - b. Lipogenesis
 - c. Proteolysis
 - d. Protein anabolism in liver
 - e. Glycolysis
30. Anti-inflammatory action of steroids are due to:
- a. Inhibition of phospholipase A₂
 - b. Inhibition of cyclooxygenase
 - c. Increased activity of lipolipase
 - d. Inhibition of lipoxygenase
31. ACTH level is highest during:
- a. Early morning
 - b. Evening
 - c. Afternoon
 - d. Night
32. Epinephrine action in liver is:
- a. Glycogenolysis
 - b. Gluconeogenesis
 - c. Glycolysis
 - d. Lipolysis
33. Reason of diurnal variation in eosinophil count:
- a. Variation in environmental temperature
 - b. Variation in cortisol levels
 - c. Bone marrow depression during sleep/night
 - d. Increased physical activity
34. Sperm acquires motility in the:
- a. Seminal vesicle
 - b. Testes
 - c. Epididymis
 - d. Ejaculatory duct
35. Spermatogenesis is mostly controlled by:
- a. Inhibin
 - b. FSH
 - c. LH
 - d. GnRH
36. Which cell type migrates into inflammatory sites to clean up necrotic tissue and direct tissue remodeling?
- a. Neutrophil
 - b. Macrophage
 - c. Dendritic cell
 - d. Eosinophil

37. Presentation of antigen on major histocompatibility complex (MHC)-I by a cell will result in which of the following?
- Generation of antibodies
 - Activation of cytotoxic T cells
 - Increase in phagocytosis
 - Release of histamine by mast cells
38. A 2-year-old boy bleeds excessively from minor injuries and has previously had bleeding gums. The maternal grandfather has a bleeding disorder. The child's physical examination shows slight tenderness of his knee with fluid accumulation in the knee joint. You suspect this patient is deficient in which coagulation factor?
- Prothrombin activator
 - Factor II
 - Factor VIII
 - Factor X
39. Which phagocytes can extrude digestion products and continue to survive and function for many months?
- Neutrophils
 - Basophils
 - Macrophages
 - Eosinophils
40. During the second trimester of pregnancy, where is the predominant site of RBC production?
- Yolk sac
 - Bone marrow
 - Lymph nodes
 - Liver
41. Bulk flow:
- Is related to concentration gradient – No, this is diffusion
 - Is related to permeability coefficient – Not entirely (see below)
 - Depends on hydrostatic and oncotic pressure
 - Is active transport
42. Rapid infusion of 2 litres of normal saline causes:
- Increased ECF, increased ICF, decreased $[Na^+]$
 - Increased ECF, unchanged ICF, increased $[Na^+]$
 - Unchanged ECF, increased ICF, increased $[Na^+]$
 - Increased ECF, unchanged ICF, unchanged $[Na^+]$
43. Gibbs-Donnan effect leads to:
- Non-diffusible ions between 2 sides will be equal
 - Diffusible ions between 2 sides will be equal
 - Equal concentrations of ions on both sides

- d. Osmotic gradient
44. Which immunoglobulin would exist as a monomer in tears, saliva & mucus?
- a. IgA
 - b. IgG
 - c. IgM
 - d. IgE
45. Erythropoietin:
- a. leads to Red cell maturation 24 to 72 hours
 - b. Inactivated by Kupffer cells
 - c. Metabolized in liver
 - d. Half-life is 5 minutes
46. Antithrombin III inactivates which coagulation factor?
- a. XIIa .
 - b. Xa
 - c. IIa
 - d. all the above
47. Post-translational modification:
- a. Removal of introns
 - b. Modification of amino acid residues in proteins
 - c. Self-splicing
 - d. tRNA involved
48. During Haemoglobin breakdown:
- a. Fe is excreted by the kidney
 - b. Haem is broken down directly to bilirubin
 - c. Haem is converted to bilirubin and transported to liver bound to albumin
 - d. none of the above
49. Platelet activation will NOT occur without:
- a. Ca^{2+}
 - b. Vessel wall damage
 - c. Von Willebrand factor
 - d. Na^+
50. Glycoprotein CD4 is expressed on:
- a. Cytotoxic T cells
 - b. Suppressor T cells
 - c. Helper T cells
 - d. Plasma cells
51. Complement activation requires the following except
- a. Antigen antibody complex
 - b. Opsonisation of bacteria
 - c. Previous exposure to antigen

- d. Plasma proteins
52. Tissue Bound Macrophages
- a. Derived from megakaryocytes
 - b. Not found in the lung & liver
 - c. Stimulated by lymphokines
 - d. Digest bacteria using lymphokines
53. Thrombin inhibits
- a. Factor Xa
 - b. Protein C
 - c. Platelets
 - d. None of the above
54. Blood viscosity:
- a. Is independent of the white cell count
 - b. Falls as haematocrit rises
 - c. Is independent of vessel diameter
 - d. Falls as flow rate rises
55. Effects of a 24 hour fast:
- a. Glycogenolysis
 - b. Protein catabolism
 - c. Acidosis
 - d. Ketone production from protein
56. The mechanism for shivering is via:
- a. Anterior horn motor neurones set up oscillating signals to muscle
 - b. Rapid signaling from sensory neurons to muscle spindles
 - c. Rapid continuous signaling of motor neurons to extrafusal muscle fibers
 - d. Uncontrolled lower motor neuron activity
57. Heat production at rest is mostly due to:
- a. Skeletal muscle activity
 - b. $\text{Na}^+ - \text{K}^+$ ATPase pump
 - c. Dynamic action of food
 - d. H^+ pump
58. Which of the pairs about vasopressin receptors is incorrect
- a. V1-smooth muscles
 - b. V2-collecting duct
 - c. V3-anterior pituitary
 - d. V4-CNS
59. cAMP acts as a second messenger of:
- a. FSH
 - b. Thyroxine
 - c. Growth hormone

- d. Insulin
60. True about intracellular receptors:
- a. Mainly on nuclear surface
 - b. Steroids act on them
 - c. Estrogen does not act on it
 - d. GH act on it
61. cGMP is second messenger for which hormone(s)?
- a. Somatostatin
 - b. Atrial natriuretic factor
 - c. Angiotensin II
 - d. Antidiuretic hormone (ADH)
62. Total body water differences between male and female is not seen at the age of:
- a. Above 60 years
 - b. 40-60 years
 - c. 10-18 years
 - d. 18-25 years
63. Transition temperature of lipid bilayers of cell membrane is increased by:
- a. Cholesterol
 - b. Saturated fatty acids
 - c. Hydrocarbons
 - d. Unsaturated fatty acids
64. Not a cell adhesion molecule:
- a. Integrin
 - b. Selectin
 - c. Cadherin
 - d. Spectrin
65. Clathrin is used in:
- a. Receptor mediated endocytosis
 - b. Exocytosis
 - c. Cell to cell adhesion
 - d. Plasma membrane
66. The following is an example of 'Regulated pathway':
- a. Constitutive exocytosis
 - b. Receptor mediated endocytosis
 - c. Constitutive endocytosis
 - d. Non-constitutive exocytosis
67. Equilibrium potential for an ion is calculated using:
- a. Gibbs-Donnan equation
 - b. Nernst equation
 - c. Goldman equation

- d. Donnan equation
68. Action of α -subunit of G protein is:
- a. Breakdown of GTP to GDP
 - b. Conversion of GDP to GTP
 - c. Internalization of receptors
 - d. Binding of agonist
69. Which is not a peptide hormone?
- a. Somatostatin
 - b. Serotonin
 - c. Neuropeptide
 - d. Enkephalin
70. Half life of insulin is:
- a. 1-2 min
 - b. 4-6 min
 - c. 0-12 min
 - d. 12-16 min
71. Insulin is essential for glucose entry in:
- a. Muscle
 - b. Cortical neurons
 - c. Renal tubular cells
 - d. Beta cells of pancreas
72. Insulin is secreted along with the following molecule in a 1:1 ratio:
- a. Pancreatic polypeptide
 - b. Glucagon
 - c. Somatostatin
 - d. C peptide
73. Insulin acts on glucose metabolism by:
- a. Increasing permeability of glucose across cell membrane
 - b. Increasing permeability across cell membrane against glucose gradient
 - c. Increasing permeability of renal cells
 - d. Increasing glucose transport to brain
74. Oxytocin causes:
- a. Decrease in systolic blood pressure
 - b. Water intoxication
 - c. Increase in cardiac output
 - d. Increase in systolic blood pressure
75. Regarding G protein coupled receptors, all of the following are true EXCEPT:
- a. Seven transmembrane components
 - b. Hydrophobic links
 - c. Extracellular portion for phosphorylation
 - d. G protein has intrinsic GTPase activity

76. Which statement is incorrect?
- Endothelins are produced by structurally intact vascular endothelium
 - Endothelins are vasoactive
 - Growth hormone increased lipolysis
 - Growth hormones increase blood glucose
77. The setpoint of the body's temperature is monitored and regulated at which location of sensory receptors?
- Anterior hypothalamus
 - Posterior hypothalamus
 - Spinal cord
 - Skin
78. Somatomedin mediates:
- Deposition of chondroitin sulfate
 - Lipolysis
 - Gluconeogenesis
 - Decreased rate of glucose uptake by cell
79. A person with blood group B
- Has anti-B antibody in the plasma
 - May have the genotype AB
 - May have both parents with blood group O
 - Whose partner is also blood group B must have children of blood group B
80. The blood cells known as monocytes
- Originate from precursor cells in lymph nodes
 - Manufacture immunoglobulin M
 - Migrate from the tissues into blood to mature
 - Can transform into tissue macrophages
81. Which of the following does not occur during formation of erythropoiesis?
- Increase in size of the cell
 - Removal of nucleus
 - Packing of hemoglobin
 - Extrusion of endoplasmic reticulum and Golgi apparatus
82. Which of the following is not found on a biological membrane
- G proteins
 - Steroid receptors
 - Lipids
 - Proteins
83. Sweating during exercise is an example of
- Positive feedback control
 - Feed forward control
 - Adaptive control
 - Negative feedback control
84. Which is a function of thyroid peroxidase

- a. Secretion of thyroid hormones
 - b. Reiodination of thyroid hormones
 - c. Iodination of thyroglobulin
 - d. Active uptake of iodide
85. The hormone oxytocin
- a. Is a powerful uterine muscle relaxant
 - b. Is involved in a positive feedback cycle during child birth
 - c. Is synthesized in the anterior pituitary gland
 - d. Is responsible for milk synthesis in the breast
86. The following organs are correctly matched with the hormone they produce except
- a. Pineal gland – melatonin
 - b. Bone marrow – erythropoietin
 - c. Intestines – cholecystokinin
 - d. Fat – leptin
87. The major stimulator of parathyroid hormone release is:
- a. Vitamin D
 - b. A fall in plasma ionized calcium
 - c. Calcitonin
 - d. A fall in plasma phosphate concentration
88. Concerning aldosterone
- a. It promotes renal excretion of sodium ions
 - b. Promotes sodium reabsorption in the colon
 - c. Promotes renal reabsorption of potassium
 - d. Greatly stimulates hepatic gluconeogenesis
89. About the formed elements in blood:
- a. Forms 55% of constituents of blood.
 - b. Plasma is included as a formed element
 - c. Forms 45% of the blood
 - d. Takes 20% of the Plasma
90. Innate host defense against parasites is achieved by which cellular component?
- a. Neutrophils
 - b. Monocytes
 - c. Eosinophils
 - d. NK cells
91. The following immunoglobulin is associated with hemolytic disease of the newborn.
- a. IgM
 - b. IgG
 - c. IgE
 - d. IgD
92. The haemostatic component facilitated by platelets and plasma proteins is?
- a. Intravascular

- b. Extravascular
 - c. Vascular
 - d. Fibrinolysis
93. Apical transport of iodide into follicle cavity is dependent on
- a) Sodium iodide symporter
 - b) Chloride iodide exchanger
 - c) Iodide transport channel
 - d) Iodide hydrogen symporter
94. All the following plasma proteins bind thyroid hormones except
- a. Thyroid hormone binding globulin
 - b. Transthyretin
 - c. Albumin
 - d. Thyroid binding fibrinogen
95. Which complement proteins form C3 activation complex in the classical pathway
- a) C4a and C2a
 - b) C4b and C2a
 - c) C4a and C2b
 - d) C4b and C2b
96. Which of the following statements is true about calmodulin
- a. It is a protein which binds calcium ions and activates protein kinases
 - b. It is a protein which binds calcium ions and binds to DNA to activate transcription
 - c. It is a protein which transports calcium ions across the cell membrane
 - d. It is a protein which modifies calcium ion concentration within the cell
97. NADPH is generated by the action of
- a. Glucose 6 Phosphate dehydrogenase
 - b. Glucose I phosphate dehydrogenase
 - c. Glucose 1-6 diphosphate dehydrogenase
 - d. All of the above
98. Which statement concerning body fluid composition is correct?
- a. Intracellular fluid contains a lower concentration of proteins than interstitial fluid.
 - b. Interstitial fluid contains a higher concentration of proteins than plasma.
 - c. Extracellular fluid contains a higher concentration of potassium than intracellular fluid.
 - d. Extracellular fluid contains a higher concentration of sodium than intracellular fluid
99. Which fluid compartment contains about 67% (by volume) of all body water?
- a. Intracellular fluid
 - b. Plasma
 - c. Extracellular fluid
 - d. Interstitial fluid

100. The fluid secreted into the stomach by the stomach lining is part of which fluid compartment?
- Transcellular
 - Interstitial
 - Extracellular
 - Intravascular
101. Which category of hypersensitivity best describes hemolytic disease of the newborn caused by Rh incompatibility
- Atopic or anaphylactic
 - Cytotoxic
 - Immune complex
 - Delayed
102. Which of the following statements regarding thyroid hormone synthesis is correct?
- Thyroid hormone is actively transported from the thyrocyte (thyroid follicular epithelial cell) to the circulation by a specific transport protein.
 - The synthesis of thyroxine (T_4) occurs within the thyrocyte.
 - Thyroid hormone is proteolytically cleaved from thyroglobulin by enzymes acting within the lumen of the thyroid follicle. The released hormone then diffuses from through the thyrocyte and into the circulation.
 - Iodine that is released from proteolytic cleavage of thyroglobulin can be recycled from mono and diiodotyrosines by the action of type I deiodinase enzyme residing in thyroid follicular cells
103. Cortisol synthesis would be diminished by
- A defect in 11-hydroxysteroid dehydrogenase
 - A defect in 21-hydroxylase
 - A defect in 18-hydroxylation
 - A defect in 5-alpha-reductase
104. Which of the following statement is true?
- T_3 is converted to T_4 in the periphery
 - T_4 is more metabolically active than T_3
 - Thyroglobulin is synthesized in thyroid cells
 - T_3 & T_4 are synthesized in thyroid cells
105. Action of 1,25 vitamin D include:
- Inhibits PTH
 - Increased intestinal calcium absorption via Ca/H^+ ATPase
 - Increased Ca^{++} reabsorption in proximal & distal tubules
 - All of the above
106. Which one of these haemostatic mechanisms is elicited via neurogenic response?
- Fibrinolysis
 - Coagulation

- c. Local vasoconstriction
 - d. Platelet plug formation
107. About pluripotential haematopoietic stem cells:
- a. Mainly produced in the liver
 - b. They are formed by a committed stem cell
 - c. Has ability to differentiate to mature specialized blood cell
 - d. Has no ability to self-renewal
108. In the regulation of leucopoiesis:
- a. Progenitor cell is an example of a growth inducer
 - b. Interleukin-3 is an example
 - c. Progenitor cells are fewer than the stem cells
 - d. One committed cell is able to produce many different types of mature cells
109. Regarding negative feedback control:
- a. Suckling reflex is an example
 - b. The variable shoots past the set-point
 - c. The response is to resist entropy
 - d. The afferent pathway carries impulses to the effector
110. With reference to tonicity. A hypertonic solution is a solution whose?
- a. Solute concentration is same as that inside the cell; no net water movement across the plasma membrane
 - b. Solute concentration is greater than that inside the cell; cell loses water
 - c. Solute concentration is less than that inside the cell; cell gains water
 - d. Solute concentration causes a cell to gain or lose water
111. Which one is true regarding muscular tissue?
- a. Smooth muscle is mostly under involuntary control
 - b. Skeletal muscle has intercalated discs
 - c. Smooth muscle has striations
 - d. Cardiac muscle is widely distributed in the human body
112. One of the following is not a function of the integumentary system.
Which one?
- a. Perception of pain
 - b. First line body defense
 - c. Synthesis of cholecalciferol
 - d. Excretion
113. Cell cytoplasm:
- a. The clear fluid portion of the cytoplasm is the cytosol
 - b. Cytosol contains only dissolved electrolytes
 - c. Cellular organelles are found out of the cytoplasm
 - d. The cytosol contains only dissolved proteins
114. Muscles get fatigue due to accumulation of?
- a. Lactic acid
 - b. ATP

- c. Phosphate molecules
 - d. Carbon dioxide
115. In immune response, non-specific immune system refers to:
- a. Adaptive immune system
 - b. Innate immune system
 - c. Immune system that starts after a week from time of contact with an allergen
 - d. It is always acquired after immunization with a vaccine
116. The part of the visual pathway where optic nerve fibers from the nasal halves of the retinas cross to the opposite sides is called?
- a. Olfactory bulb
 - b. Optic chiasma
 - c. Geniculate nucleus
 - d. Calcarine fissure
117. Most of the oxygen in blood is:
- a. In the white cells
 - b. Bound to hemoglobin
 - c. Combined with carbon to make carbon dioxide
 - d. Dissolved in the plasma
118. Which neurotransmitter is secreted in the motor end plate?
- a. Adrenaline
 - b. Substance P
 - c. Acetylcholine
 - d. Serotonin
119. Which of the following would you expect to find in a patient whose diet has been low in calcium for 2 months?
- a. Increased formation of 24,25-dihydroxycholecalciferol
 - b. Decreased amounts of calcium-binding protein in intestinal epithelial cells
 - c. Increased parathyroid hormone secretion
 - d. A high plasma calcitonin concentration
120. In the first line of defense, mechanical mechanism includes the following except?
- a. pH defensins
 - b. Tight junctions
 - c. Air/fluid flow
 - d. Ciliary rejection