



**KISII UNIVERSITY**  
**UNIVERSITY EXAMINATIONS**

**END OF FIRST YEAR EXAMINATION FOR THE AWARD OF THE DEGREE**  
**OF BACHELOR OF MEDICINE AND SURGERY [MBCHB]**  
**THIRD SEMESTER 2021/2022**  
**[JUNE-SEPTEMBER, 2022]**

**MEDS 111: MEDICAL PHYSIOLOGY I**

**STREAM: Y1S3**

**TIME: 3 HOURS**

**DAY: MONDAY, 9:00 –12:00 PM**

**DATE: 05/09/2022**

**INSTRUCTIONS**

- 1. Do not write anything on this question paper.***

**Section A: Multiple Choice Questions (120 Marks)**

- True regarding Na<sup>+</sup> ion:
  - Responsible for Donnan effect
  - Responsible for Resting membrane potential
  - Responsible for Depolarization
  - Does not help other ions in trans port
- Volume of ICF in body:
  - 0.2 × body wt.
  - 0.4 × body wt
  - 0.6 × body wt.
  - 0.8 × body wt
- Plasma protein contributes only ~1 mosm/litre in plasma osmolality because of:
  - High concentration, Low molecular weight
  - Low concentration, High molecular weight
  - Low concentration, Low molecular weight
  - High concentration, High molecular weight
- Bound potassium is mainly found in the following except:
  - Brain
  - Bones
  - 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 CaCl<sub>2</sub> (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<sup>+</sup>-K<sup>+</sup>-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 disulphideloop
  - 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.  $\text{Ca}^{++}$
  - b.  $\text{Mg}^{++}$
  - c.  $\text{Na}^+$
  - d.  $\text{K}^+$
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<sup>-</sup> 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.  $\text{Na}^+$  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:
- a. G protein bind to hormones on the cell surface
  - b. All the three subunits alpha, beta and gamma should bind to each other for G protein to act
  - c. G protein acts as inhibitory and excitatory because of difference in alpha subunit
  - d. 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:
- a. Receptors
  - b. Enzymatic composition
  - c. Nuclei
  - d. Membrane lipid
24. Secretion of all the following hormones are decreased in section of pituitary stalk except:
- a. Prolactin
  - b. GH
  - c. Vasopressin
  - d. FSH
25. Vasopressin is secreted by:
- a. Supraoptic
  - b. Preoptic
  - c. Paraventricular
  - d. Posterior nucleus
26. When NaCl is injected in the internal carotid artery, it causes release of ADH by acting on?
- a. Paramedian nucleus
  - b. Anterior pituitary
  - c. Paraventricular nucleus
  - d. Supraoptic nucleus
27. Which is not an effect of T3 hormone?
- a. It increases the heart rate
  - b. It increases the stroke volume
  - c. It decreases the peripheral vascular resistance
  - d. Decreases protein breakdown
28. Excessive production of aldosterone results in:
- a. Metabolic acidosis
  - b. Severe hypotension
  - c. Potassium retention

- d. 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 A<sub>2</sub>
  - 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
  - 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.  $\text{Ca}^{2+}$
  - b. Vessel wall damage
  - c. Von Willebrand factor
  - d.  $\text{Na}^+$
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.  $\text{H}^+$  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)?
- Somatostatin
  - Atrial natriuretic factor
  - Angiotensin II
  - Antidiuretic hormone (ADH)
62. Total body water differences between male and female is not seen at the age of:
- Above 60 years
  - 40-60 years
  - 10-18 years
  - 18-25 years
63. Transition temperature of lipid bilayers of cell membrane is increased by:
- Cholesterol
  - Saturated fatty acids
  - Hydrocarbons
  - Unsaturated fatty acids
64. Not a cell adhesion molecule:
- Integrin
  - Selectin
  - Cadherin
  - Spectrin
65. Clathrin is used in:
- Receptor mediated endocytosis
  - Exocytosis
  - Cell to cell adhesion
  - Plasma membrane
66. The following is an example of 'Regulated pathway':
- Constitutive exocytosis
  - Receptor mediated endocytosis
  - Constitutive endocytosis
  - Non-constitutive exocytosis
67. Equilibrium potential for an ion is calculated using:
- Gibbs-Donnan equation
  - Nernst equation
  - Goldman equation
  - Donnan equation
68. Action of  $\alpha$ -subunit of G protein is:
- Breakdown of GTP to GDP
  - Conversion of GDP to GTP
  - Internalization of receptors
  - Binding of agonist
69. Which is not a peptide hormone?
- 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?
- a. Endothelins are produced by structurally intact vascular endothelium
  - b. Endothelins are vasoactive
  - c. Growth hormone increased lipolysis
  - d. Growth hormones increase blood glucose
77. The setpoint of the body's temperature is monitored and regulated at which location of sensory receptors?
- a. Anterior hypothalamus
  - b. Posterior hypothalamus
  - c. Spinal cord

- d. Skin
78. Somatomedin mediates:
- a. Deposition of chondroitin sulfate
  - b. Lipolysis
  - c. Gluconeogenesis
  - d. Decreased rate of glucose uptake by cell
79. A person with blood group B
- a. Has anti-B antibody in the plasma
  - b. May have the genotype AB
  - c. May have both parents with blood group O
  - d. Whose partner is also blood group B must have children of blood group B
80. The blood cells known as monocytes
- a. Originate from precursor cells in lymph nodes
  - b. Manufacture immunoglobulin M
  - c. Migrate from the tissues into blood to mature
  - d. Can transform into tissue macrophages
81. Which of the following does not occur during formation of erythropoiesis?
- a. Increase in size of the cell
  - b. Removal of nucleus
  - c. Packing of hemoglobin
  - d. Extrusion of endoplasmic reticulum and Golgi apparatus
82. Which of the following is not found on a biological membrane
- a. G proteins
  - b. Steroid receptors
  - c. Lipids
  - d. Proteins
83. Sweating during exercise is an example of
- a. Positive feedback control
  - b. Feed forward control
  - c. Adaptive control
  - d. 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?
- a. Transcellular
  - b. Interstitial
  - c. Extracellular
  - d. Intravascular
101. Which category of hypersensitivity best describes hemolytic disease of the newborn caused by Rh incompatibility
- a) Atopic or anaphylactic
  - b) Cytotoxic
  - c) Immune complex
  - d) Delayed
102. Which of the following statements regarding thyroid hormone synthesis is correct?
- a. Thyroid hormone is actively transported from the thyrocyte (thyroid follicular epithelial cell) to the circulation by a specific transport protein.

- b. The synthesis of thyroxine ( $T_4$ ) occurs within the thyrocyte.
  - c. 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.
  - d. 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. A defect in 11-hydroxysteroid dehydrogenase
  - b. A defect in 21-hydroxylase
  - c. A defect in 18-hydroxylation
  - d. A defect in 5-alpha-reductase
104. Which of the following statement is true?
- a.  $T_3$  is converted to  $T_4$  in the periphery
  - b.  $T_4$  is more metabolically active than  $T_3$
  - c. Thyroglobulin is synthesized in thyroid cells
  - d.  $T_3$  &  $T_4$  are synthesized in thyroid cells
105. Action of 1,25 vitamin D include:
- a. Inhibits PTH
  - b. Increased intestinal calcium absorption via  $Ca/H^+$  ATPase
  - c. Increased  $Ca^{++}$  reabsorption in proximal & distal tubules
  - d. All of the above
106. Which one of these haemostatic mechanisms is elicited via neurogenic response?
- a. Fibrinolysis
  - b. 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