 Registration Number.....

UNIVERSITY OF NAIROBI

UNIVERSITY EXAMINATIONS – 2016/2017 ACADEMIC YEAR

END OF FIRST YEAR EXAMINATIONS FOR THE DEGREE OF BACHELOR OF MEDICINE AND SURGERY (MBChB), BACHELOR OF PHARMACY (B.PHARM) AND BACHELOR OF DENTAL SURGERY (BDS)

HMP 100/UPC 103/VMP 100 : MEDICAL PHYSIOLOGY

DATE: Wednesday, 6th July, 2016 **TIME: 09.00 am – 12 Noon**

INSTRUCTIONS:

1. Do **not** write **your name** anywhere on the examination papers.
2. Indicate your **registration** number in the specified spaces.
3. It is your responsibility to keep your examination papers strictly confidential.
4. Communication with other candidates during the examination is **strictly prohibited.**
5. You must seek permission when you want to go outside the examination venue. However, this is **NOT** permitted during the first and last half hour of the examination period.
6. Check and ensure that **all** the three sections (A, B and C) of the paper are complete.
7. Do **not** separate any part of your question paper.

SECTION A

1. This exam consists of **Forty (40) multiple choice questions (MCQs).**
2. Each question consists of a common stem that gives rise to five choices
3. For each Question, select **ONLY ONE** correct or best choice and **shade** completely the corresponding circle.
4. Each correct response earns one (1) mark, an incorrect response zero (**0**) mark.
5. **DO NOT USE TICKS, CROSSES,** or LETTERS in you selection.
6. To change your selection or choice clearly **X** out the incorrect response.
7. Examples are shown on the answer sheet.

SECTION B

1. This consists of **Twelve (12) short answer questions, answer ALL**
2. Write your answer in the space provided

SECTION C

1. This consists of **FIVE (5)** essay questions. Answer only **ONE (1)** in the booklet provided

Mobile phones are not permitted inside the examination room.

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SECTION A – MULTIPLE CHOICE QUESTIONS (MCQs)

1. Type I skeletal muscle fibers:
   a) Contain less myoglobin than type II fibers
   b) Are found in the largest motor units
   c) Contain more mitochondria than type II fibers
   d) Generate more actin-myosin bonds per second than type II fibers
   e) Are invariably recruited late in graded muscle responses

2. Excitation contraction in skeletal l muscles involves ALL of the following **EXCEPT**:-
   a) Release of Ca^{2+} from troponin
   b) Cross bridge formation
   c) Hydrolysis of ATP
   d) Spread of depolarization along the transverse tubules
   e) Interaction between the ryanadine receptors and dihydropyridine receptors

3. The function of tropomyosin in skeletal muscle includes:-
   a) Binding to myosin during contraction
   b) Acting as relaxing protein at rest by covering the binding sites on actin
   c) Sliding on actin to produce shortening
   d) Releasing of Ca^{2+} after prolongation of action potential
   e) Binding to Ca^{2+} during the process of contraction

4. The primary somatosensory cortex is located at the:-
   a) Pre-central gyrus
   b) Post-central gyrus
   c) Superior temporal gyrus
   d) Calcarine fissure
   e) Frontal gyrus

5. Which of the following is **not** a lobe of the cerebral hemispheres:-
   a) Temporal lobe
   b) Occipital lobe
   c) Frontal lobe
   d) Parietal lobe
   e) Saggital lobe

6. The main output of the nerve cell is:-
   a) Dendrites
   b) Cell body
   c) Synapse
   d) Dendritic spines
   e) Axons

7. The magnitude of abnormality is sickle cell anemia is in this numbers of amino acids:-
   a) 1:144
   b) 1:146
   c) 1:287
   d) 1:292
   e) 1:564

8. Normocytic – normochromic anaemia is found in the following conditions **EXCEPT**:-
   a) Hypothyroidism
   b) Sickle cell disease
   c) Tuberculosis
   d) Renal failure
   e) Acute bleeding

9. Which of the following is true of "secretors" in the ABO blood grouping system:-
   a) Gene se
   b) Gene Se
   c) Active only in heterozygotes
   d) Active only in homozygotes
   e) Found in 80% of population

10. Sideroblastic anaemias include:
   a) Pernicious anaemia
   b) Thalassaemia
   c) Folate deficiency
   d) SCA
   e) Anaemia of defective heme synthesis

11. Non propagated potential in a nerve fibre membrane:-
   a) Are the same as the equilibrium potentials
   b) Can be elicited only by chemical stimulation
   c) When elicited can be recorded from the stimulation point up and down the whole length of the fibre
   d) Dimish on their own at the site of the stimuli
   e) Have a duration which is not dependent on the initial voltage of each potential

12. The sodium-potassium ATPase pump:-
   a) Is found only on selected nerve cells and their axons
   b) Is not involved in the maintenance of the concentrane of sodium and potassium across the intercellular and extracellular fluid compartment
   c) Is electrogenic
   d) Pumps equal amounts of sodium and potassium across the nerve fibre membrane
   e) Plays no role in the maintenance of normal cell volumes

13. Voltage-gated calcium channels:-
   a) Are found in the heart but only in pacemaker cells
   b) Are the only channels that cause depolarization in cardiac cells
   c) Replace voltage gated sodium channels in some nerve cells
   d) Stabilize the sodium activation gates in nerves
   e) Are absent in gut smooth muscles

14. The ionic movements during the resting and the action potential occur as follows:-
    a) The leak channels of potassium, sodium and chloride mainly responsible for the resting potential
    b) The sodium leak channels contribute more to the resting membrane potential
    c) The sodium voltage-gated channels allow sodium to rush out of the cell during depolarisation
    d) Potassium ions move into the cell during repolarization
    e) Potassium ions move from the cell into the extracellular fluid during helper polarisation and stop moving at the point of full restoration of the resting membrane potential

15. During the inflammatory process:-
    a) Enhanced granulopoeisis occurs within 8 hours of onset
    b) Macrophages transform into monocytes on tissue entry
    c) Expression of selectins on endothelial cells occur
    d) Margination of B lymphocytes begins
    e) Cytokine production only arises from injured cells

16. Activation of B lymphocytes:-
    a) Is rarely accompanied by cytokine production
    b) Results in clonal expansion
    c) Marks the differentiation along the myeloid lineage
    d) Accompanied by somatic rearrangement
    e) Only occurs on contact with activated T lymphocytes

17. In the synthesis of a neurotransmitter the following is false:-
    a) Energy is sometimes used
    b) Substances are sometimes found in the cytosol
    c) Substances are sometimes found in the extracellular fluid compartment
    d) Enzymes are involved
    e) The process is essential in electrical synaptic transmission

18. The following is true of excitatory post-synaptic potentials **EXCEPT**:-
    a) Decline exponentially with a time constant
    b) Can be propagated
    c) Are caused by Ca^{2+} influx
    d) It is a Na^{+} influx
    e) They cause partial depolarization of the post synaptic membrane

19. The basic purpose of all sense organs is to convert stimulus energy (for examples, sound or light) into action potentials. Anything that converts one energy form into another like this is called a(n):-
    a) Adapter
    b) Transducer
    c) Generator
    d) Encoder
    e) Transmitter

20. Perception of the conscious awareness of the sensation produced by a receptor occurs:-
    a) At the level where the sensory neuron is stimulated
    b) At the level of the posterior root (sensor) ganglion
    c) As the afferent activity proceeds along an nerve tract
    d) In the cortex of the brain
    e) At the spinal cord level

21. Receptors that respond when a stimulus is first applied, but quickly stop responding to continual stimulation, are the:-
    a) Phasic receptors
    b) Nociceptors
    c) Exteroceptors
    d) Tonic receptors
    e) Proprioceptors

22. As regards the organization of the body :-
    a) Sub-cellular life processes include movement
    b) Cells are the basic units that posses all life characteristics
    c) Tissue is collection of cells with similar form of function
    d) Some organs are not essential for life
    e) Organ systems have function for overall body homeostasis

23. A 'controlled system':-
    a) Is an assembly of process or processes
    b) Is distinct from its external environment
    c) Produces an output termed as the 'controlled variance'
    d) Refers to organ system only
    e) Refers to the whole body only

24. With regard to the lungs as pH buffering system:-
    a) A rise in ventilation reduces pH on blood
    b) A fall in ventilation is a response to high blood pH
    c) A fall in pH of arterial blood may be as a result of hypoxia
    d) A fall in pH of arterial blood results in hyperventilation
    e) A rise in blood pH maybe as a result of hypoventilation

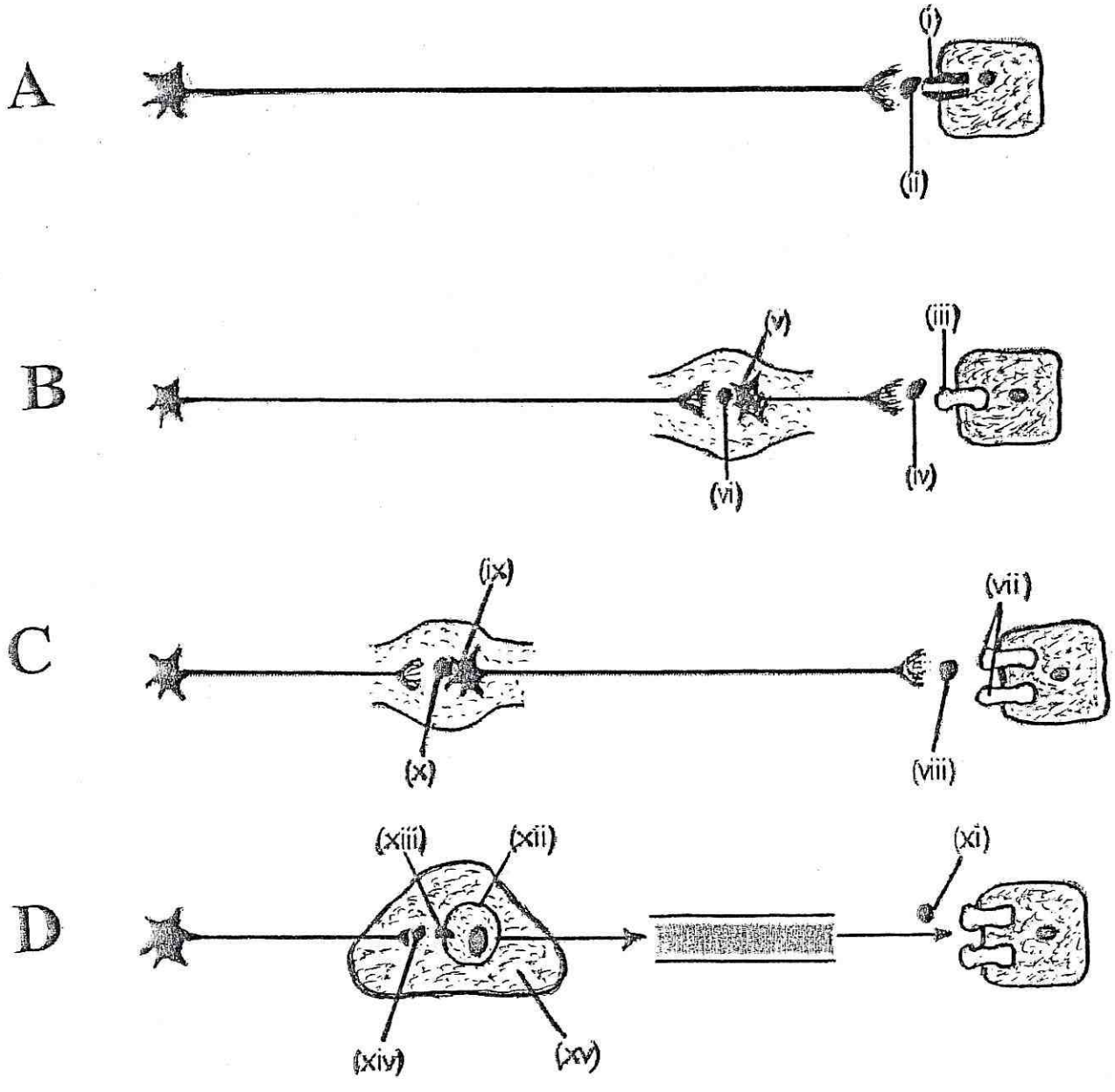
25. In the renin angiotensin. aldosterone system:-
    a) The stimulus to renin secretion is arise in renal perfusion
    b) Renin results in converting of angiotensin I to II
    c) Angiotensin II results in a fall in total peripheral resistance
    d) Angiotensin II results in a fall in aldosterone secretion
    e) The mechanism needs minutes to be fully active

26. As regards the control of cardiac output:-
    a) A rise in venous return results in a rise in contractility
    b) A fall in venous return results in an immediate rise in heart rate
    c) A rise in heart rate results in a fall in contractility
    d) A fall in urine volume occurs in hypertrophied level
    e) A rise in blood pressure may be due to a fall in cardiac output

27. Which of the following is not a mechanism for receptor regulation?
    a) Reducing target cell responsiveness
    b) Up-regulation
    c) Disruption of subunit interactions
    d) Synthesis
    e) Degradation

28. Which of the following hormones does not increase cAMP?
    a) Adrenaline
    b) Adrenocorticotrophic hormone
    c) Glucagon
    d) Cortisol
    e) Antidiuretic hormone

FIGURE 1 Illustrate the organization of the peripheral nervous system. Study the diagram carefully and identify the one correct or best statement in the following multiple choice questions (29- 33).



29. Which one of the following neural pathways represents the somatic nervous system?
    a) D
    b) C
    c) B
    d) A
    e) C and D

30. Which one of the following postsynaptic membrane receptors is labelled (i)?
    a) M_3 cholinoceptors
    b) N_2 cholinoceptors
    c) β_1 adrenoceptors
    d) N_1 cholinoceptors
    e) α_1 adrenoceptors

31. Which one of the following transmitters is labelled (xi)?
    a) Acetylcholine or adrenaline
    b) Dopamine or adrenaline
    c) VIP or ATP
    d) Adrenaline or noradrenaline
    e) Noradrenaline or acetylcholine

32. Which one of the following postsynaptic membrane receptors is labelled (xiii)?
    a) M_3 cholinoceptors
    b) β_1 adrenoceptors
    c) N_2 cholinoceptors
    d) α_1 adrenoceptors
    e) N_1 cholinoceptors

33. Which one of the following endocrine glands is labelled (xv)?
    a) Thyroid gland
    b) Endocrine pancreas
    c) Parathyroid gland
    d) Exocrine pancreas
    e) Adrenal gland

34. Which of the following domains is not present on intracellular receptor?
    a) Membrane anchor
    b) Regulatory
    c) DNA binding
    d) Ligand binding
    e) Hinge section

35. The total human genome comprises of:-
    a) 1 x trillion nucleic base pairs
    b) Stored messages coded in bridges between adenine and uracil as pairs and cytosine and thymine only
    c) 30,000 different genes
    d) 500,000 genes
    e) Same number of genes as those found in the nucleus of E. coli

36. Pick out the cell organelle that is wrongly matched with its role in the cell:-
    a) Nucleolus ---------- synthesis of lysosomes
    b) Rough endoplasmic reticulum---------- cell membrane proteins
    c) Smooth Endoplasmic reticulum----------steroid synthesis
    d) Golgi Apparatus----------Glycosylation of proteins
    e) Centrioles ----------mitotic spindle formation

37. The mitochondrial disorder associated with deficiency of muscle creatinine phosphorylase is:-
    a) Nieman Pick's disease
    b) Myasthenia gravis
    c) McArdles disease
    d) Duchenes muscular dystrophy
    e) Fabry's disease

38. Mitochondria perform all the following functions **EXCEPT**:-
    a) ATP synthesis and ATP hydrolysing
    b) Directing apoptosis
    c) Hydrolysing alcohol in the liver
    d) Hydrolysing fatty acid chains
    e) Breaking down Tryptophan and catecholamines

39. The second heart sound is caused by:-
    a) Closure of aortic and pulmonary valves
    b) Vibrations of the ventricular walls during systole
    c) Venticular filling
    d) Closure of mitial and tricuspid valves
    e) Retrograde flow in the vena cava

40. Which of the following is **NOT** a correct comparison of cardiac myocytes to other muscle cell types?
    a) Like smooth muscles, some myocytes have pacemaker potential
    b) Like some smooth muscle, cardiac myocytes are electrically coupled
    c) Like smooth muscles, actin and myosin are organized into sarcomeres
    d) Like skeletal muscle, contraction of cardiac muscle is under autonomic nervous control
    e) Like smooth muscles, cardiac muscle is under hormonal control

SECTION B - SHORT ANSWER QUESTIONS

1. Describe the role of acetylcholine in autonomic nervous system.

2. Briefly, describe the advantages and disadvantages of a negative feedback control system.

3. Describe and explain the 'Frank and Starlings' law of the heart.

4. List the stages of chemical synaptic transmission.

5. Distinguish between monosynaptic and polysynaptic spinal reflexes.

6. Distinguish between T and B lymphocytes development. (5 marks)

7. Distinguish between blood grouping and cross-matching.

8. Name five (5) causes of normocytic-normochromic anemia.

9. Describe nerve impulse transmission in myelinated nerves.

10. List the main divisions of the peripheral nervous system and the function of each division

DIVISION	FUNCTION

11. List 5 different types of modification that proteins undergo after translation.

12. Describe the Starling's forces in oedema formation.

SECTION C - ESSAYS

1. Discuss Neurocommunication under the following sub-headings:
   a) Variations in the voltage and frequency of nerve action potentials in afferent nerves and their effects on the nerve cells they send signals to.

   b) The cycle of events that occur in a synapse from the arrival of the presynaptic nerve impule to the excitation of the post synaptic membrane

2. Explain the roles the following areas play in sensory physiology:
   i) Cortex
   ii) Thalamus
   iii) Reticular activation system
   iv) Spinal cord

3. Write an essay on erythropoiesis

4. Write an essay on homeostasis under the following headings: (5 marks each)
   a) Definition and explanation of homeostasis and homeodynamism
   b) The concept of 'normal' in physiology
   c) The theoretical physiological control model
   d) An example of negative feed back control
   e) An example of positive feed back control
   f) An examples of adaptive control

5. Write an essay under the following subheadings:
   a) Chemical composition of the cell membrane (10 marks)
   b) Functions of membrane proteins. (10 marks)
   c) Modes of cell communication. (10 marks)