60/153 x 50

= 19.6

THE COPPERBELT UNIVERSITY

MCS SCHOOL OF MEDICINE

SESSIONAL EXAMINATIONS - OCTOBER 2019

MBS 210 - PHYSIOLOGY

STUDENT NUMBER: 17111719

PROGRAMME: MBChB **TIME ALLOWED: 3 HOURS**

INSTRUCTIONS:

1. Do not write your name, phone number or anything that discloses your identity on any other page apart from this page. Defaulters will have their evaluation nullified.
2. Write your computer number on every other page
3. Answer ALL questions in all **SECTIONS (A, B & C)**

SECTION A: MULTIPLE CHOICE QUESTIONS. *UNLESS OTHERWISE SPECIFIED,* CHOOSE THE SINGLE BEST ANSWER. ANSWER ALL *QUESTIONS.*

1. If the V/Q ratio of a lung region decreases, the alveoli in that region will have a:
   a) Higher PO_2 and higher PCO_2.
   b) Lower PO_2 and lower PCO_2.
   c) Higher PO_2 and lower PCO_2.
   d) Lower PO_2 and higher PCO_2.
   e) Lower PO_2 and unchanged PCO_2.

The following information applies to Questions 2 and 3:

F_{IO_2}	0.5
P_B	760 mm Hg
P_{aO_2}	50 mm Hg
P_{aCO_2}	30 mm Hg
Respiratory exchange quotient	0.8
Solubility of O_2 in blood	0.003 ml O_2/100 ml blood/mm Hg
Solubility of CO_2 in blood	0.07 ml CO_2/100 ml blood/mm Hg

2. The patient's A - a gradient is closest to:
   a) Zero
   b) 20 mm Hg
   c) 60 mm Hg
   d) 270 mm Hg
   e) 280 mm Hg

3. If all values remain identical except that FIO_2 is lowered to 0.21, the A - a gradient will be:
   a) Increased
   b) Decreased
   c) Unchanged
   d) None of the above
   e) All of the above

4. Pulmonary capillary blood from which lung unit has the lowest PO_2?
   a) V = 2 L/min; Q = 0.2 L/min
   b) V = 2 L/min; Q = 2 L/min
   c) V = 0.2 L/min; Q = 2 L/min
   d) V = 0; Q = 2 L/min
   e) None of the above

17111719

5. A patient with a right-to-left cardiac shunt who is breathing room air at sea level has the following values:

P_{AO_2}	100 mm Hg
P_{aO_2}	50 mm Hg
P_{vO_2}	30 mm Hg
Cardiac output	5 L/min
O_2-binding capacity of blood	20.1 ml O_2/100 ml blood
Solubility of O_2 in blood	0.003 ml O_2/100 ml blood

$A\text{-}a = P_{AO_2} - P_{aO_2}$

$= 100\text{mm Hg} - 50\text{mm Hg}$

$= 50$

What percentage of the cardiac output is the shunt?

a) Zero
b) 38%
c) 50%
d) 62%
e) 100%

6. Which person is expected to have an increased A-a gradient?

a) Left-to-right cardiac shunt
b) Hypoventilation
c) High altitude
d) Pulmonary fibrosis
e) Asthma

7. Which cause of hypoxia is corrected best with supplemental O_2?

a) High altitude
b) Right-to-left intrapulmonary shunt
c) Right-to-left cardiac shunt
d) Anemia
e) Decreased cardiac output

8. Compared to the apex of the lung, at the base of the lung:

a) Blood flow is lowest
b) Ventilation is lowest
c) V/Q is highest
d) Alveolar PCO_2 is highest
e) Alveolar PO_2 is highest

The following information applies to Questions 9, 10 and 11.

Tidal volume	=	450 ml
Breaths/minute	=	14/minute
Arterial P_{CO2}	=	45 mm Hg
Arterial P_{O2}	=	55 mm Hg
Alveolar P_{O2}	=	100 mm Hg
Expired P_{CO2}	=	25 mm Hg
Cardiac output	=	5.0 L/minute

9. Calculate alveolar ventilation for this person:
   a) 6.3 L/min
   b) 4.8 L/min
   c) 3.5 L/min
   d) 2.5 L/min
   e) 2.0 L/min

10. What fraction of each tidal volume is physiologic dead space, and how does this value compare to normal?
   a) 0.06; decreased
   b) 0.3; decreased
   c) 0.3; normal
   d) 0.44; decreased
   e) 0.44; increased

11. What is the average value for V/Q in this person?
   a) 1.3
   b) 1.3 L
   c) 0.7
   d) 0.7 L
   e) 0.8 L

12. The energy of muscle contraction is derived from the following except:
   a) ATP
   b) Muscle glycogen.
   c) Lactic acid.
   d) Creatine phosphate
   e) None of the above

13. The frequency needed to produce tetanus:
   a) Is increased by cooling.
   b) Is decreased in red muscles.
   c) Is increased in fatigue.
   d) Is decreased in the pale muscles.
   e) Unchanged

17111719

14. Depolarization:
    a) Is associated with increase in membrane permeability to Na^+.
    b) Is terminated with closure of voltage activated K^+ channels.
    c) Is followed by muscle relaxation.
    d) Is caused by K^+ efflux.
    e) None of the above

15. Action potential:
    a) Is a graded potential.
    b) Is produced by sub-threshold stimulus.
    c) Starts with repolarization caused by outward movement of Cl^-.
    d) Is conducted slower in thin nerve fibers.
    e) All of the above

16. Resting membrane potential of a nerve:
    a) Is caused by equal distribution of ions along both sides of the membrane.
    b) Is caused by selective permeability of the membrane to the ions.
    c) Na^+ - K^+ pump has no role in RMP.
    d) Is caused mainly by inward movement of Na^+ ions.
    e) All of the above

17. As regard conduction of action potential in a nerve:
    a) In thick myelinated nerve fibers can reach up to 120 meter / second.
    b) Can be increased by increase in calcium.
    c) Can be increased by cooling.
    d) Is conducted with decrement.
    e) Conduction is normally from axon to cell body

18. Pale (fast) fiber:
    a) Contains much blood capillaries.
    b) Doesn't show fatigue.
    c) Contains low concentration of myoglobin.
    d) Depends on aerobic oxidation.
    e) None of the above

19. About cellular sheath (sheath of Schwann):
    a) It acts as an electric insulator around the nerve fiber.
    b) It surrounds the axons of all neurons inside and outside the CNS.
    c) It is responsible for the color of the white matter of the spinal cord.
    d) It is essential for regeneration of the damaged nerve fibers.
    e) Conducts impulses faster than nerve cells

17111719

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    e) Conducts impulses faster than nerve cells

20. Myelin sheath:
   a) Present in the myelinated and unmyelinated nerve fibers.
   b) Formed of lipoprotein complex and acts as electric insulator
   c) It is formed of successive wrappings of the membrane of Schwann cells.
   d) It is the cause of decreased conduction of nerve impulse.
   e) Is made up of complex carbohydrate

21. Chronaxie:
   a) Is the minimal stimulus, which produces response after relatively long time.
   b) Is the minimal time needed by the strong stimulus to produce response.
   c) Is the time required to stimulate the nerve by a minimal stimulus.
   d) Is the time required to stimulate the nerve by a stimulus, which is double rheobase.
   e) Is only applicable to neurons

22. During depolarization:
   a) Voltage activated Na^+ channels open
   b) The membrane becomes impermeable to Na^+.
   c) When membrane potential reaches -55 mV Na^+& K^+ fluxes occur at the same time.
   d) K^+ ions diffuse outside.
   e) It's too complex to say

23. The resting membrane potential is caused by:
   a) Diffusion of K^+ ions outside the nerve fibers
   b) Diffusion of Na^+ ions inside the nerve fibers.
   c) Opening of the chemically activated ion channels.
   d) Opening of the voltage activated ion channels.
   e) Opening of calcium channels

24. Repolarization:
   a) Occurs at first gradual then becomes fast.
   b) Results from closure of sodium gates and opening of potassium gates.
   c) Is represented by the ascending limb of the spike.
   d) Is followed by appearance of response.
   e) All of the above

25. Continuous conduction:
   a) Occurs in myelinated nerve fibers.
   b) Occurs by jumping of charges from one node of Ranvier to another.
   c) Is relatively slow 0.5-2.0 meter/ second.
   d) Occurs in the neuro-muscular junction.
   e) Is the fastest form of conduction

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26. Saltatory conduction:
   a) Occurs in unmyelinated nerve fibers.
   b) May reach up to 120 meter/ second.
   c) Occurs by jumping from one neuron to another.
   d) Decreases gradually with distance till it disappears.
   e) All of the above

27. In all or none rule:
   a) A minimal stimulus produces a maximal response.
   b) The response in a single nerve fiber increases with increase intensity of stimulus.
   c) The nerve trunk either responds maximally or not responds at all.
   d) Minimal stimulus produces minimal response.
   e) All of the above

28. Muscle fatigue is due to:
   a) Inability of the action potential to spread over the muscle.
   b) Failure of transmission in the motor nerve.
   c) Failure of neuro-muscular transmission.
   d) Depletion of energy stores.
   e) Muscles do not fatigue

29. An electrotonus:
   a) Is a localized area of depolarization.
   b) Results from stimulation by effective galvanic current.
   c) Is associated with decreased excitability.
   d) Used to stimulate the nerve fibers
   e) All of the above

30. Which of the following has the lowest conduction velocity:
   a) Aα fibers.
   b) Aβ fibers.
   c) B fibers.
   d) C fibers.
   e) Motor fibers

31. The function of tropomyosin in skeletal muscle include:
   a) Binding to myosin during contraction
   b) Acting as a relaxing protein at rest by covering the binding sites on actin.
   c) Sliding on actin to produce shortening.
   d) Releasing Ca^{++} after propagation of action potential.
   e) Functions same as Troponin C

32. Contraction of skeletal muscles:
   a) Produces more work when the muscle contracts isometrically than when the muscle contracts isotonically.
   b) Depends on external Ca^{++}.
   c) Decrease in magnitude with rapid repeated stimulation.
   d) Does not depend on action potential.
   e) Has a longer duration than the cardiac muscle

33. Red (slow) fibers are characterized by the following except:
   a) Contains much blood capillaries.
   b) Glycogen stores is low.
   c) Contains high concentration of myoglobin.
   d) Depends on anaerobic oxidation.
   e) All of the above

34. Excitation and contraction of skeletal muscle are coupled by:
   a) ATP
   b) Myosin
   c) release of calcium into sarcoplasm
   d) calmodulin
   e) All of the above

35. Rigor mortis is due to:
   a) Damage to actin and myosin
   b) Rapid sequestration of Ca^{2+} in ER
   c) Increased myosin-ATPase
   d) ATP depletion
   e) Hypoglycemia

36. Which of the following proteins is **absent** from smooth muscle?
   a) Actin
   b) Myosin
   c) Troponin
   d) Tropomyosin
   e) None of the above

37. The activity of which contractile protein is altered to regulate smooth muscle contraction
   a) Actin
   b) Myosin
   c) Calmodulin
   d) Tropomyosin
   e) Titin

17111719

38. Which of the following statements about visceral smooth muscle is incorrect?
a) Neighboring cells are electrically coupled by means of gap junctions.
b) Contraction can occur in the absence of extrinsic neural innervation.
c) Twitch duration is typically longer when compared to skeletal muscle.
d) Force is graded by varying intracellular calcium.
e) Stretch of smooth muscle consistently increases active tension.

39. An example for multi-unit *(nonsyncytial)* smooth muscle is:
a) Stomach
b) Uterine myometrium
c) Iris
d) Ureters
e) Diaphragm

40. In a healthy individual breathing spontaneously, which of the following pressures is positive with reference to atmospheric pressure?
a) Alveolar pressure during inspiration
b) Alveolar pressure during expiration
c) Intrapleural pressure during inspiration
d) Intrapleural pressure during expiration
e) None of the above

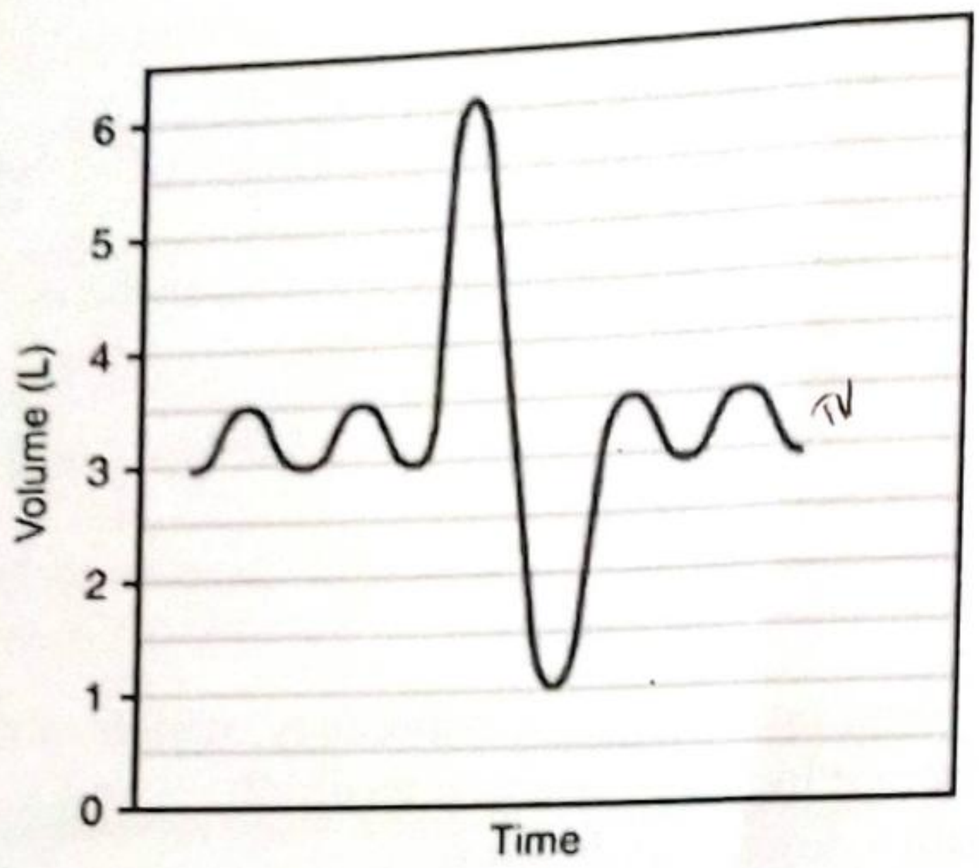
41. A patient has a dead space of 150ml, functional residual capacity of 3L, tidal volume of 650ml, expiratory reserve volume of 1.5L, total lung capacity of 8L, and respiratory rate of 15 breaths/min. What is the residual volume?
a) 500ml
b) 1000ml
c) 1500ml
d) 2500ml
e) 6500ml

D.S = 150ml
FRC = 3L
V_T = 650ml
ERV = 1.5L

Total Volume = V_T + IRV + ERV + RV
8L = 0.63L + 1.5L +

RR = 15 breaths/minute

42. A 27-year-old man is breathing quietly. He then inhales as much air as possible and exhales as much air as he can, producing the spirogram shown in the figure below.



FxP=

What is his expiratory reserve volume (in liters)?

a) 2.0
b) 2.5
c) 3.0
d) 3.5
e) 4.0

43. A 22-year-old woman inhales as much air as possible and exhales as much air as she can, producing the spirogram shown in the figure above. A residual volume of 1.0 L was determined using the helium dilution technique. What is her functional residual capacity (in liters)?

a) 2.0
b) 2.5
c) 3.0
d) 3.5
e) 4.0

FRV_1 =

44. What type of epithelium would you expect to find lining the lumen of the nasal cavity?

a) Squamous ciliated epithelium without goblet cells
b) Transitional epithelium with goblet cells
c) Stratified squamous epithelium
d) Pseudostratified epithelium
e) None of the above

45. What test measures the amount of gas expelled when one takes a deep breath and exhales maximally and rapidly?
a) Forced expiratory volume test
b) Forced vital capacity test
c) Forced residual capacity test
d) Forced internal thoracic volume assessment
e) None of the above

46. The largest volume of gas that can be moved into and out of the lungs in one minute by voluntary effort is called:
a) Respiratory minute volume
b) Minute ventilation
c) Maximal voluntary ventilation
d) Vital capacity
e) Total lung capacity

47. Constriction of bronchial smooth muscle is mediated by activation of:
a) α_1 receptors
b) α_2 receptors
c) M_1 receptors
d) β_2 adrenoceptors
e) M_2 receptors

48. Which of the following produces bronchoconstriction? Tick all that apply
a) VIP
b) Substance P
c) Leukotriene B_4
d) Epinephrine
e) Acetylcholine

49. Type I alveolar cells:
a) Form the wall of the alveoli.
b) Secrete pulmonary surfactant.
c) Contract during expiration to force air out of the alveoli.
d) Both (a) and (b).
e) (a), (b) and (c)

50. Which of the following is not a function of the respiratory system?
a) Transports O_2 to the tissues.
b) Contributes to maintenance of normal acid-base balance.
c) Provides a route for heat and water elimination.
d) Enables speech, singing, and other vocalization.
e) Removes, modifies, activates, or inactivates various materials passing through the pulmonary circulation.

51. T-lymphocytes gain immunocompetence in the:
   a) Thymus
   b) Thymus for T-helper cells and bone marrow for T-killer cells
   c) Thymus for T-killer cells and bone marrow for T-helper cells
   d) Bone marrow
   e) Thymus and bone marrow

52. Antigen challenge usually occurs in the:
   a) Spleen and thymus
   b) Spleen and bone marrow
   c) Lymph nodes and thymus
   d) Spleen and lymph nodes
   e) Lymph nodes and bone marrow

53. Vaccinations are an example of:
   a) Naturally-acquired active immunity
   b) Artificially-acquired active immunity
   c) Naturally-acquired passive immunity
   d) Artificially-acquired passive immunity
   e) All of the above

54. Only _____ and _____ are able to activate complement
   a) IgG and IgA
   b) IgE abd IgG
   c) IgG and IgM
   d) IgG and IgD
   e) All of the above

55. _____ are activated by antigen fragments complexed with MHC-1 proteins
   a) CD_8 T cells
   b) CD_4 T cells
   c) CD_8 B cells
   d) CD_4 B cells
   e) CD memory cells

56. An endocardial cell from the mitrial valve of the heart would be expected to exhibit:
   a) Class I MHC proteins
   b) Class II MHC proteins
   c) Class III MHC proteins
   d) All of the above
   e) None of the above

57. Which of the following antibodies is able to confer natural passive immunity?
    a) IgD
    b) IgE
    c) IgG
    d) IgM
    e) IgA

58. Macrophages are examples of:
    a) Antibody-secreting T lymphocytes
    b) Antigen-presenting cells
    c) Activated plasma cells
    d) All of the above
    e) None of the above

59. Which of the following are involved in B cell activation? Tick all that apply
    a) Antigen
    b) T-helper cell
    c) Cytokine
    d) All of the above
    e) None of the above

60. Which of the following is true of cytotoxic T cells?
    a) They release a chemical similar to those released by NK cells
    b) They can release tumor necrosis factor
    c) In order to function, they require co-stimulation
    d) All of the above
    e) 'a' and 'b'

SECTION B: ANSWER TRUE OR FALSE AGAINST EACH OPTION (DO NOT WRITE T FOR TRUE OR F FOR FALSE)

1. Plasmin
   a) Is a proteolytic enzyme True.
   b) Is formed from plasminogen True
   c) Digests fibrin True.
   d) Digests fibrinogen into thrombin False.

2. With respect to iron metabolism
   a) The body contains about 40g of iron
   b) Most of the iron in the body is contained in ferritin True.
   c) Iron is transported in plasma as ferritin True
   d) Haemosiderin is the main form in which iron is stored in tissues

3. Blood coagulation
   a) Through the intrinsic and extrinsic pathways results in activation of factor X True.
   b) Results from the conversion of thrombin to prothrombin false.
   c) Results from the conversion of fibrinogen to fibrin True.
   d) Can occur in the absence of calcium False

4. With respect to iron metabolism
   a) Antacids reduce iron absorption F
   b) Heme iron is better absorbed than non-heme iron True
   c) Ferrous iron is better absorbed than ferric iron false
   d) The majority of iron absorption occurs in the terminal ileum True.

5. With respect to Rhesus blood group
   a) Transfusion of Rhesus incompatible blood into a non-sensitized individual causes an immediate transfusion reaction
   b) The first pregnancy is never affected by Rhesus disease True
   c) The child of a Rhesus positive father and a Rhesus negative mother must be Rhesus positive True.
   d) The child of a Rhesus negative father and a Rhesus negative mother cannot be Rhesus positive True.

6. The functional residual capacity:
   a) Is increased in the obese True.
   b) Is the residual volume plus the inspiratory reserve volume True.
   c) Falls with general anaesthesia True.
   d) Is not affected by posture False
   e) Falls with increasing age

7. Respiratory dead space
   a) Saturates inspired air with water vapor before it reaches the alveoli
   b) Removes all particles from inspired air before it reaches the alveoli True.

c) Decreases when blood catecholamine levels rise True
d) Decreases during a deep inspiration True.
e) Decreases during a cough True

8. Vital capacity is
   a) The volume of air expired from full inspiration to full expiration. True.
   b) Reduces as one grows older. T
   c) Greater in men than in women of the same age and height True
   d) Related more to total body mass than to lean body mass
   e) The sum of the inspiratory and expiratory reserve volumes False.

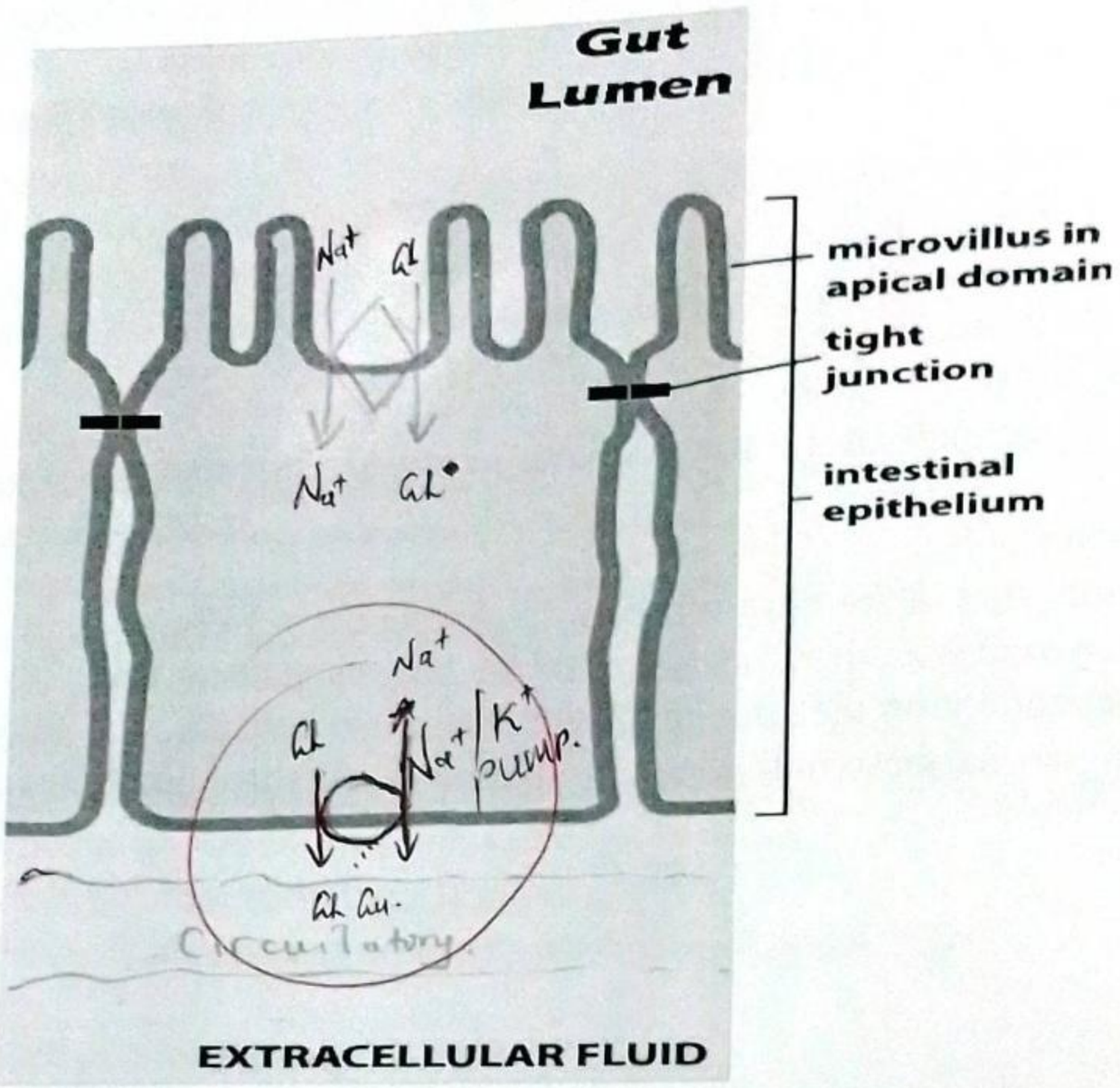
9. Loss of pulmonary elastic tissue in 'emphysema' reduces
   a) Physiological dead space True.
   b) Anatomical dead space True
   c) Residual volume True.
   d) Vital capacity True.
   e) The percentage of the vital capacity expired in one second. True.

10. Vital capacity
   a) Is increased in the third trimester of pregnancy False.
   b) Is dependent on the compliance of the lungs and chest wall True.
   c) Is dependent on the strength of the respiratory muscle True.
   d) Is higher in obese individuals compared to tall slim individuals. True.

23

SECTION C: SHORT ESSAY

1. Add the membrane transporters and other components/metabolites to this diagram needed to show how glucose is transported from the intestinal lumen through endothelial cells to the circulatory system. Explain the roles of active and passive transport steps in the transport process. (5 marks)



01

Active transport and Passive transport both require energy. But ~~at~~ the here P

~~Active~~

Role of active Transport:- ~~the role of active~~

To transport glucose into the circulatory endothelial, glucose undergoes Secondary active transport where it is coupled With Na^+ ~~other~~ through a Symport (Co-transport).

Role of Passive Transport: ~~the movement of Na^+ into the~~

~~cell is by active~~

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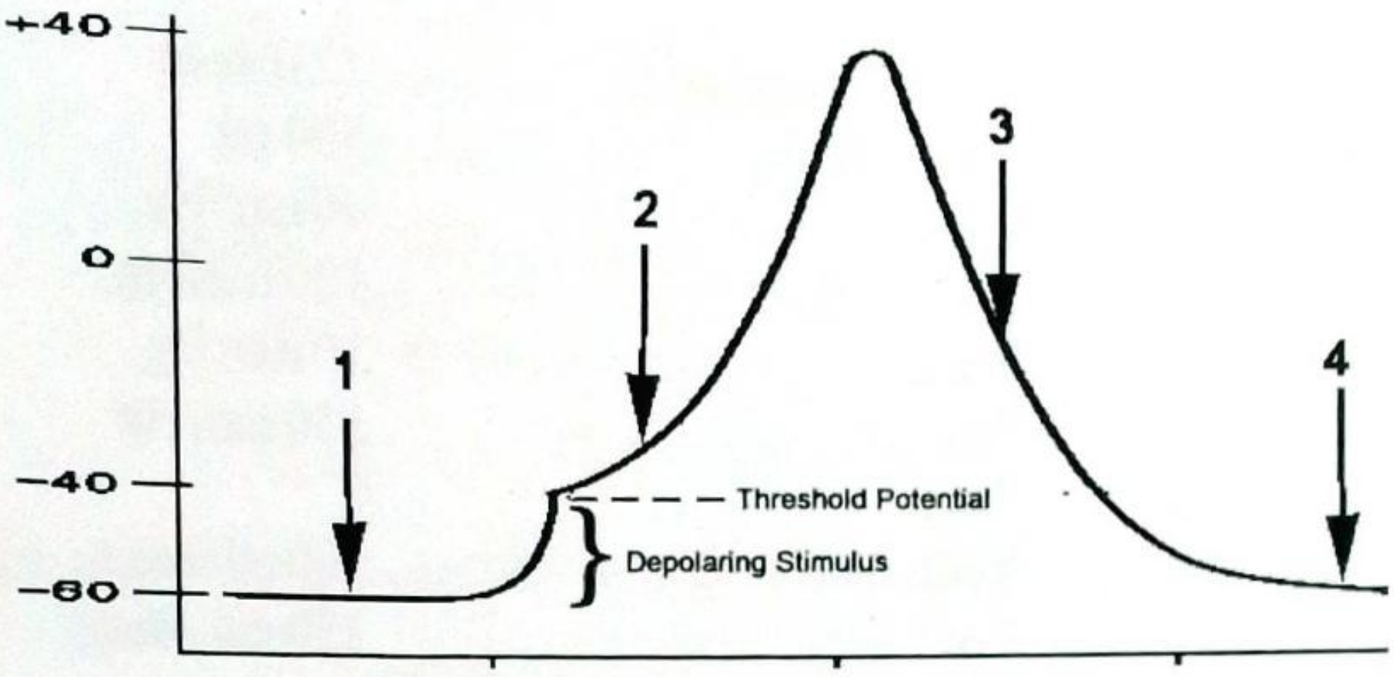
2. This diagram shows the formation of an action potential upon sensing an initial depolarizing stimulus. (8 marks)



Identify and specify the states of the Na^+ and K^+ voltage-gated channels (opened, closed, inactivated) at each of the points marked along the recording.

(1) ~~@~~ Na^+ Voltage-gates ~~are~~ channels are ~~fixed~~ opened ~~to~~ but inactive, while K^+ channels are closed.

(2) Na^+ channels are open.
K^+ channels are closed and inactivated.

(3) Na^+ channels ~~are~~ closed and inactivated.
K^+ channels are opened.

(4) Na^+ channels are closed
K^+ Channels closed and inactivated.

K = 863 mm Hg
R = 0.8

3. Use the following information to answer the questions.

Breathing frequency	12/minute
Tidal volume	500 ml
P_{aCO_2}	40 mm Hg
P_{aO_2}	100 mm Hg
P_{ECO_2}	30 mm Hg
P_{IO_2}	150 mm Hg
P_{ICO_2}	0
V_{CO_2}	200 ml/minute
V_{O_2}	250 ml/minute

a) What is the volume of the physiologic dead space? (3 marks)

Dead Space Volu = $TV \times \frac{P_{aCO_2} - P_{ECO_2}}{P_{aCO_2}}$

$= 500ml \times \frac{40mmHg - 30mmHg}{40mmHg}$

$= 500ml \times \frac{10mmHg}{40mmHg}$

$= 125ml$

03

b) What is the value for minute ventilation? (2 marks)

MV = BR x TV (Breathing Frequency x Tidal Volume)

MV = 12/Min. x 500ml

MV = 6000ml/min

02

c) What is the value for alveolar ventilation? (2 marks)

V_A = (TV - Dead Space Volume) BR

V_A = (500ml - 125ml) 12/min.

V_A = 375ml x 12/min / 18

V_A = 4500ml/min.

02

d) What is alveolar PCO_2 ($PACO_2$)? (2 marks)

$$P_{ACO_2} = \frac{V_{CO_2}}{V_A} \times k$$

$$P_{ACO_2} = \frac{Q000ml/min}{4500ml/min.} \times 863mmHg$$

$$P_{ACO_2} = 38.355\,Hg$$

$\therefore P_{ACO_2} = 38.4mmHg$

02

e) What is the value for alveolar PO_2 (PAO_2)? (2 marks)

$$P_{AO_2} = \frac{P_{aCO_2}}{R}$$

$$P_{AO_2} = P_{IO_2} - \frac{P_{aO_2}}{R}$$

$$P_{AO_2} = 150mmHg - \frac{100mmHg}{0.8mmHg}$$

$$P_{AO_2} = 150mmHg - 125mmHg$$

$$P_{AO_2} = 25mmHg$$

$$P_{AO_2} = P_{IO_2} - \frac{P_aCO_2}{R}$$

$$= 150mmHg - \frac{40mmHg}{0.8}$$

$$= 150mmHg - 50mmHg$$

$$= 100mmHg$$

02

4. Ventilation to the apex of the lung is 0.8 L/min and ventilation to the base of the lung is 2.2 L/min. Blood flow to the apex is 0.4 L/min and blood flow to the base is 3.2 L/min. What is the V/Q ratio at the apex and the base of the lung, and what effect would you expect if any differences to have on PO_2 and PCO_2 in those regions? (4 marks)

Apex

$V = 0.8L/min.$

$Q = 0.4L/min.$

Base

$V = 2.2L/min.$

$Q = 3.2L/min.$

V/Q

At the Base

$= V = 2.2L/min$

$Q \quad 3.2L/Min$

$= 0.6875$

$= 0.688$

V/Q at Apex

$= \frac{V}{Q} = \frac{0.8L/min}{0.4L/min}$

$= 2$

02

5. What is minimal air? And what is its importance? (3 marks)

This is the minimal volume of air that remains in the lungs when the chest is open. Approximated to about 150ml. If is used especially at birth of a child, in cases where the child died after birth or before birth, by putting the lungs in water. When they flood it indicates the child was born alive but if it sinks shows that the child was born dead.

6. Describe the hemolytic disease of the new born. (5 marks) 10 Marks..

HDN as called erythroblastosis fetalis - is a blood disorder that occurs when blood types of a mother and baby are incompatible

- The immune system of the mother sees a baby cj RBCs as foreign.
- Antibodies they develop against the baby cj RBCs.
- These antibodies attack the RBCs = the baby cj blood and cause them to break down too early.
- HDN may develop when a mother and her un born baby have different blood group types
- mother RH -ve and baby RH +ve. The father is the baby is RH +ve.
- If the RH -ve mother has be sensitized to RH the blood when they will be a reaction or agglutination

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7. In a tabular form differentiate between heparin and dicoumarol. (5 marks) 8 Marks.

Heparin	Dicoumarol.
Occurs in both Vivo &	
- It is a natural anticoagulant - It is a polysaccharide with a strong negative charge. - Has a rapid onset of IV	- Warfarin - from plants - Longer action. Given orally.

Heparin	Dicumarol
- Occurs both in vivo and Vitro.	- Occurs only in ~~Vivo~~ Vitro.
- Animal origin.	- Plant origin.
- Affects the action of Ca^{2+} which acts as a Cactalyst in Clot formation in both Intrinsic and extrinsic pathway.	- Competes with the activity of Vitamin K by inhibiting the glutathion Conversion which enhances production of factor II ~~VII~~ ~~amongst~~ and VII amongst others.