DIRECTIONS: **Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the ONE that is BEST in each case and blacken the appropriate space on the answer sheet.**

1. Which of the following statements about the body fluid compartments and ion concentrations is correct?

(A) Most of the total body water (TBW) is found in the plasma
(B) Sodium is found in higher concentration in the intracellular fluid compared to the extracellular fluid
(C) The intracellular fluid contains the smallest amount of the total body water
(D) There is more potassium inside the cell compared to outside
(E) The extracellular fluid compartment is made up of the intracellular fluid plus the interstitial fluid

2. Which of the following is true concerning the cell membrane?

(A) It consists almost entirely of protein molecules
(B) It is permeable to lipid (fat) soluble molecules
(C) It consists entirely of non-polar molecules
(D) It is freely permeable to large proteins
(E) It consists of a single layer of phospholipids

3. An unknown molecule, call it X, is found to move across the cell membrane. The transport of this molecule across the membrane requires a carrier protein, shows chemical specificity and saturation kinetics, but does not require ATP. Molecule X could be

(A) Sodium (Na^+)
(B) Potassium (K^+)
(C) Glucose
(D) water (H_2O)
(E) Oxygen (O_2)

4. The hyperpolarizing phase of the action potential in a nerve is **MAINLY** caused by which of the following events?

(A) diffusion of negative charge into the cell
(B) the opening of chloride (Cl-) channels
(C) the diffusion of calcium (Ca++) into the cell
(D) the diffusion of potassium (K+) out of the cell
(E) the diffusion of sodium (Na+) into the cell

5. The afferent nerve activity that is responsible for the knee-jerk (stretch) reflex originates in

(A) pain receptors
(B) cutaneous bare nerve endings
(C) Golgi tendon organs
(D) muscle spindles
(E) joint receptors

6. Disruption of speech and language function due to damage to Wernike's area is called

(A) anorexia
(B) aphagia
(C) amnesia
(D) aphasia
(E) ataxia

7. The sensation of pain is mediated to the thalamus

(A) ipsilaterally through the dorsal column system
(B) contralaterally through the lateral spinothalamic tract
(C) ipsilaterally through the ventral spinothalamic tract
(D) contralaterally through the ventral spinothalamic tract
(E) contralaterally through the lateral corticospinal tract

8. Activation of neurons in the post-central gyrus is likely to evoke

(A) aggressive behaviour
(B) decreased speech
(C) feeling of sensations
(D) movement in the contralateral limbs
(E) a lose of balance

9. Emotional behaviour is most likely associated with changes in the

(A) posterior pituitary gland
(B) pre-central gyrus
(C) limbic system
(D) ventrobasal complex of the thalamus
(E) paraventricular hypothalamic nucleus

10. At normal room temperature (21 °C) and humidity, and with little air movement, a clothed person would lose heat mainly by

(A) vaporization
(B) conduction
(C) convection
(D) increased respiration
(E) radiation

11. Muscle spindles

(A) are found in series with extrafusal muscle fibers
(B) are made up of at least three pairs of extrafusal muscle fibers
(C) convey information to the brain about the change in length of the muscle
(D) contribute to most of the tension felt in the muscle
(E) relay their information to the brain through 1b afferent fibers

12. The feeding center of the brain is thought to be the

(A) suprachiasmatic nucleus
(B) supraoptic nucleus
(C) ventromedial hypothalamus
(D) basal medial hypothalamus
(E) lateral hypothalamus

13. The following are characteristics of the sympathetic nervous system EXCEPT

(A) acetylcholine is released by preganglionic neurons
(B) preganglionic neurons synapse on postganglionic neurons in ganglia in the target visceral organ
(C) postganglionic neurons innervate the adrenal medulla
(D) postganglionic neurons release noradrenaline
(E) cause vasoconstriction

14. Preganglionic sympathetic neurons originate in the

(A) ventral horn
(B) sacral spinal cord
(C) thoracic spinal cord
(D) medulla oblongata
(E) dorsal root ganglia

15. When room temperature exceeds skin temperature, body heat is lost mainly by

(A) radiation, but gained by convection
(B) evaporation, but gained by radiation
(C) respiration, but gained conduction
(D) radiation and conduction
(E) none of the above

16. A patient was observed to have disturbed heat regulation following a stroke damaged neural tissue in

(A) occipital lobe
(B) medial cerebellum
(C) substantia nigra
(D) anterior hypothalamus
(E) suprachiasmatic nucleus

17. The gamma motor neuron system directly

(A) monitors the extrafusal muscle fiber tension
(B) helps to maintain the sensitivity of muscle spindles
(C) regulates the output of Golgi tendon organs
(D) activates alpha motor neurons
(E) relays afferent information to the brain through 1a fibers

18. Which of the following is associated with the term "adaptation"

(A) all sensory nerves
(B) motor neurons
(C) sensory receptors
(D) synapses
(E) posterior pituitary gland

19. As a result of a head injury, a patient adopts a fixed posture and makes no s movements. Which of the following brain areas may have been damaged.

(A) substantia nigra
(B) cerebellum
(C) post central gyrus
(D) Broca's area
(E) temporal lobe

Arrange the following steps to describe the proper sequence of events in a muscle contraction beginning with the action potential in the motor nerve.

U - Tropomyosin roles off myosin binding sites – cross bridges form
V - Acetylcholine released and attaches to motor endplate
W - Action potential triggers Ca++ release from sarcoplasmic reticulum
X - Na+ flows into cell
Y - Ca++ binds to troponin
Z - Ca++ flows into presynaptic nerve

(A) V, W, Z, Y, X, U
(B) Z, V, Y, W, U, X
(C) Z, W, Y, V, U, X
(D) Z, V, X, W, Y, U
(E) V, Z, W, X, Y, U

Which of the following events will occur during a muscle contraction?

(A) When myosin binds to tropomyosin a power stroke takes place
(B) The action potential on the muscle cell membrane directly produces an end plate potential
(C) Ca^{++} is actively pumped back into the sarcoplasmic reticulum
(D) ATP is split by calcium (Ca++) to form ADP and P_i
(E) ATP binds to actin just before the power stroke occurs

Which of the following will produce an increase in the force of a muscle contraction?

(A) An increase in the number of muscle fibers activated during the contraction
(B) An decrease in the frequency of action potentials in the motor nerve causing summation of muscle twitches
(C) An decrease in the amount of ATP in the muscle
(D) A decrease in the amount of Ca++ in the muscle
(E) Both A and B are correct

23. The function of ATP in a muscle involves all the following **EXCEPT** (choose the incorrect answer(s))

(A) the active uptake of Ca^{++} into the sarcoplasmic reticulum
(B) the release of the actin-myosin cross bridges
(C) the energizing of the myosin head units
(D) the active release of Ca^{++} from the sarcoplasmic reticulum
(E) both A and D are incorrect

24. Rigor mortis occurs **primarily** because

(A) Ca^{++} can no longer be pumped back into the sarcoplasmic reticulum
(B) myosin cannot be released from actin when the muscle cell runs out of ATP
(C) acetylcholine is no longer released from the motor nerve
(D) action potentials no longer travel down the transverse (T) tubules
(E) none of the above are correct

25. Blood from the left ventricle flows directly into the

(A) pulmonary vein
(B) pulmonary artery
(C) right atrium
(D) aorta
(E) inferior vena cava

26. The largest drop in blood pressure throughout the systemic circulation occurs in the

(A) aorta
(B) large arteries
(C) arterioles
(D) capillaries
(E) veins

27. Which of the following will cause a decrease in blood flow?

(A) A decrease in the blood pressure gradient
(B) A decrease in the radius of the blood vessel through which the blood is flowing
(C) A decrease in the viscosity (thickness) of the blood
(D) An increase in cardiac output
(E) both A and B are correct

28. Given the following data from a blood vessel:

Pressure at point 1 = 125 mmHg
Pressure at point 2 = 75 mmHg
Blood flow in the vessel = 225 ml/min

The resistance in this vessel is:

(A) 0.11
(B) 0.22
(C) 2.25
(D) 4.5
(E) 9

29. Which of the following is found in both a skeletal muscle cell and a cardiac muscle contractile cell?

(A) pacemaker potentials
(B) gap junctions
(C) intercalated disks
(D) motor nerves
(E) actin and myosin

30. Which of the following contributes to the **pacemaker potential**in the SA node of the heart?

(A) a small amount of Na+ leaking into the pacemaker cells
(B) an increase in K+ leaking into the pacemaker cells
(C) a small amount of chloride ions (Cl-) leaking into the pacemaker cells
(D) an increase in the amount of Ca++ leaving the cells in the SA node
(E) both A and D are correct

31. Which of the following statements about the conducting system in the heart is correct?

(A) Purkinje fibers conduct the action potential at the fastest rate compared to all other regions of the heart.
(B) After travelling through the AV node, the action potential is conducted to the atria
(C) The bundle of His conducts the action potential between the atria and the AV node.
(D) The conduction of the action potential in the bundle of His is slower than the conduction of the action potential in the SA node
(E) Both A and B are correct

32. In the cardiac cycle, which event **most closely follows** the T wave of the electrocardiogram?

(A) closing of the atrio-ventricular valves
(B) ventricular relaxation (diastole)
(C) opening of the aortic valve
(D) small increase in ventricular volume just before ventricular contraction
(E) isovolumetric contraction

33. Which of the following does **NOT** occur during the early ventricular diastole (also called the isovolumetric relaxation phase) of the cardiac cycle?

(A) The volume of blood in the left ventricle is increasing
(B) The aortic valve is closed
(C) The pressure in the ventricle is greater than the pressure in the atria
(D) The left atrioventricular valve (bicuspid valve) is closed
(E) The pressure in the aorta is greater than the pressure in the left ventricle

34. Most of the blood (70%) enters the ventricles during which of the following events?

(A) Directly after the atria contracts
(B) During the QRS complex
(C) During the isovolumetric relaxation phase
(D) Between the T wave and the following P wave
(E) Directly after the opening of the aortic valve

35. Which of the following will increase cardiac output?

(A) increasing the activity of the parasympathetic nervous system to the heart
(B) decreasing the afterload on the heart
(C) decreasing the end diastolic volume in the heart
(D) decreasing the activity of the sympathetic nervous system
(E) decreasing the slope of the pacemaker potential

36. You are monitoring the cardiovascular system of an exercising patient and acquire the following data:

heart rate	200 beat per minute
end diastolic volume	250 ml
cardiac output	43 L/min
systolic pressure	140 mmHg
diastolic pressure	80 mmHg

This person's is end systolic volume is

(A) 28 ml
(B) 35 ml
(C) 50 ml
(D) 85 ml
(E) cannot be calculated from this data

37. You are conducting an experiment on a human being, you first measure the end diastolic volume (EDV) of your subject at rest (control situation). You then manipulate your subject and noticed that their end diastolic volume (EDV) **increased** compared to the resting situation. This **manipulation** could have been

(A) a stimulation of the parasympathetic nervous system
(B) making the subject repeatedly contract and relax their leg muscles
(C) giving the subject a drug which vasoconstricted the veins
(D) both B and C are correct
(E) all of the above are correct

38. Which of the following statements about arterioles is correct?

(A) They are the main site of gas exchange between blood and the interstitial fluid
(B) They carry blood from capillaries to veins
(C) They are the principle site of resistance in the circulatory system
(D) They contain the largest amount of elastic tissue
(E) They have the smallest drop in blood pressure

39. Given the following data:

Capillary hydrostatic pressure of plasma	20 mmHg
Plasma osmotic pressure	24 mmHg
Interstitial osmotic pressure	6 mmHg
Interstitial fluid hydrostatic pressure	-8 mmHg
Assume $K_f = 1$	

The pressure and direction of the net fluid movement within the capillary bed is:

(A) 12 mmHg favouring reabsorption
(B) 8 mmHg favouring filtration
(C) 2 mmHg favouring reabsorption
(D) 10 mmHg favouring filtration
(E) 18 mmHg favouring reabsorption

40. Which of the following is true about the myogenic theory of autoregulation?

(A) If a sudden increase in blood pressure occurs, arterioles will constrict to reduce blood pressure and flow to the vital organ
(B) Chemicals are released by arterioles which will be detected by baroreceptors to decrease blood pressure
(C) Stretch of the ventricular wall will increase blood pressure in the arteries
(D) Stretch of the walls of the aorta will cause a decrease in heart rate
(E) None of the above are correct

According to the metabolic theory of autoregulation, which of the following will cause a **increase** in blood flow through an organ?

(A) Increase in oxygen levels in the blood
(B) A decrease in lactic acid levels in the blood
(C) A decrease in temperature in the organ or tissue
(D) An increase in carbon dioxide levels in the blood
(E) A, B and C are correct

A sudden decrease in blood pressure will be detected by sensors in the circulatory system which will initiate the baroreceptor reflex. Changes will then occur throughout the cardiovascular system which may include which of the following?

(A) vasodilation of blood vessels
(B) decreased heart rate
(C) increased release of norepinephrine onto the cells of the SA node
(D) decrease cardiac output
(E) both A and C are correct

DIRECTIONS: **For each of the incomplete statements below, ONE or MORE of the completions given is correct. Answer**

(A) if only 1, 2 and 3 are correct
(B) if only 1 and 3 are correct
(C) if only 2 and 4 are correct
(D) if only 4 is correct
(E) if ALL are correct

43. The presence of oligodendrocytes around axons

1. increases the axon diameter
2. increases the conduction velocity along peripheral nerve axons
3. lowers the resistance around the axon
4. allows for saltatory conduction

44. Action potentials differ from receptor (generator) potentials in that they

1. have no threshold
2. are of constant amplitude and duration when conducted along axons
3. are graded responses
4. initiated at the axon hillock in central neurons

45. A patient that becomes obese as a result of overeating may have

1. an increased release of the transmitter orexin in the lateral hypothalamus
2. a tumour of the preoptic area
3. damage to the ventromedial hypothalamus
4. an over excited posterior hypothalamus

46. The adrenal medulla is primarily under the control of

1. the anterior hypothalamus
2. posterior and dorsomedial hypothalamus
3. supraoptic nucleus
4. sympathetic nervous system

A	B	C	D	E
1,2,3	**1,3**	**2,4**	**4 only**	**all are correct**

47. Contraction of skeletal muscles can be initiated by the activation of

1. gamma motor neurons
2. muscle spindles
3. monosynaptic stretch reflex
4. alpha motor neurons

48. Pyrogens can produce fever by

1. directly activating neurons in the hypothalamus to change the temperature set-point
2. causing white blood cells to produce interleukin I
3. acting on blood vessels to cause them to constrict and hold body heat
4. indirectly having an effect on neurons in the organum vasculosum of the lamina terminalis (OVLT)

49. The limbic system and hypothalamus work together to

1. provide central representation of the autonomic nervous system
2. to control ingestive behaviours
3. control sexual function
4. provide conscious control of movement

50. Proprioceptive information is integrated by

1. basal ganglia
2. ventrobasal complex of the thalamus
3. substantia nigra
4. dorsal column nuclei

51. A reflex arc can include

1. an effector organ
2. a receptor
3. an afferent neuron
4. a gland

A	B	C	D	E
1,2,3	**1,3**	**2,4**	**4 only**	**all are correct**

52. Damage to the cerebellum is associated with

1. resting tremor
2. dysmetria
3. rigidity
4. dysarthria

53. Cerebrospinal fluid

1. is made in the choroid plexus
2. isotonic with blood
3. contains high concentration of sodium ion
4. is higher in glucose concentration than plasma

54. Polydipsia in humans may result from increased

1. activity of supraoptic nucleus neurons
2. plasma osmolality
3. secretion of vasopressin
4. salt ingestion

55. Hemiparesis (impairment of voluntary movements on one side of the body) in humans can result from

1. lesions of the ventral corticospinal tract
2. damage to the lateral corticospinal tract
3. damage to the substantia nigra
4. damage to motor nerves

A	B	C	D	E
1,2,3	**1,3**	**2,4**	**4 only**	**all are correct**

56. Treatment for Parkinson's disease may include

1. stimulation of the thalamus
2. neural grafts implanted in basal ganglia
3. lesions of the basal ganglia
4. administration of L-dopa

57. A 18 year female hockey player had a left cervical spinal cord compression after hitting the boards with her head. What symptoms does she show?

1. unable to feel a painful stimulus applied to her right foot
2. is unable to feel the coldness of the ice on her left leg
3. is unable to move her left foot
4. is unable to feel the movement of her right leg

58. Glial cells

1. are supportive cells in both the central and peripheral nervous systems
2. regulate the passage of substances between the cerebral spinal fluid and brain
3. form myelin sheathes around peripheral axons
4. make up about 10% of all nervous tissue

59. A 72 year old male patient suffered a stroke that involved the basal ganglia. The patient was observed to show symptoms of

1. intention tremor
2. chorea
3. hypotonia
4. cog-wheel rigidity

60. Loss of neurons in the substantia nigra results in

1. decreased dopamine release in the basal ganglia
2. loss of balance
3. poverty of movement
4. increased sexual drive

A	B	C	D	E
1,2,3	1,3	2,4	4 only	all are correct

61. Which of the following is true about the nodes of Ranvier?

1. They are found on the dendrites of nerve cells
2. They are located on the axon of unmyelinated neurons
3. Their presence slows the conduction of the action potential down the neuron
4. Na+ and K+ voltage gated channels are located in these regions.

62. In a stressful (fight or flight) situation which of the following would you expect to occur in the heart?

1. Increased Na+ entry into the pacemaker cells compared to normal (before the growling sound).
2. Hyperpolarization of the pacemaker cells.
3. Decreased K+ leaving the pacemaker cells compared to normal.
4. A longer and less steep pacemaker potential compared to normal.

63. Which of the following will **increase** cardiac output?

1. The release of norepinephrine onto the cells of the SA node
2. Increasing the amount of Ca++ entering the cells of the SA node
3. Increasing the preload on the heart
4. Decreasing the amount of blood returning to the heart (venous return)

64. Which of the following will **decrease** stroke volume?

1. increasing end diastolic volume (EDV)
2. increasing end systolic volume (ESV)
3. activating sympathetic nervous system
4. release of acetylcholine onto ventricular muscle

65. The baroreceptor reflex involves which of the following structures:

1. Baroreceptors in the aortic arch
2. Baroreceptors in the carotid sinus
3. Sympathetic nerves
4. Cardiovascular regulatory centre in the brain stem

Term 1 Exam
Question Answers

1	D
2	B
3	C
4	D
5	D
6	D
7	B
8	C
9	C
10	E
11	C
12	E
13	B
14	C
15	B
16	D
17	B
18	C
19	A
20	D
21	C
22	A
23	D
24	B
25	D
26	C
27	E
28	B
29	E
30	A
31	A
32	B
33	A
34	D
35	B
36	B
37	D
38	C
39	D
40	A
41	D
42	C
43	D
44	C
45	B
46	C/D
47	E
48	C
49	A
50	C
51	E
52	C
53	A
54	*
55	C
56	E
57	B
58	A
59	C
60	B
61	D
62	B
63	A
64	C
65	E

* Question eliminated