WESTERN UNIVERSTIY
DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY

PHYSIOLOGY 1021

MIDTERM 1

1 Hour Exam

DIRECTIONS FOR MULTIPLE CHOICE EXAMS:

- AN **HB PENCIL MUST** BE USED TO FILL IN THE OVALS ON THE MARKS SHEET.
- **COMPLETELY** FILL THE CORRECT OVAL. A DOT IN THE MIDDLE OF THE OVAL OR A LINE THROUGH THE OVAL WILL NOT BE READ BY THE SCANNER.
- A **WHITE NYLON ERASER** MUST BE USED TO MAKE ANY **CHANGES.** ERASE COMPLETELY AND CAREFULLY.

DIRECTIONS FOR FILLING THE TOP HALF OF THE ANSWER SHEET:

1. PRINT YOUR NAME, THE COURSE NAME AND THE COURSE NUMBER.
2. A PEN MUST BE USED FOR YOUR SIGNATURE.
3. **a**. RECORD **ALL** nine (9) digits of your student number under the heading **STUDENT NUMBER.** Fill in the ovals **completely** and **accurately**. Remember that the scanner will read the ovals so if you fill in an incorrect oval, your student number will appear incorrectly on the computer printout.

   b. **SECTION** digits must be filled in. The section digits to be used for this exam is **021**

   c. Fill in the **EXAM** CODE number below in the CODE section on the Scantron sheet **111**

Please make sure that this booklet contains 35 questions.
Hand in this booklet, along with the answer sheet, when you have completed the test. Fill in the information requested below.

NAME: _____

Teaching Assistant: _____

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

1. When you were in grade 7, you attended a sleepover where you ate a whole bag of salt and vinegar chips to yourself. You did not consume any water at the time, and woke up the next morning with a bad headache. While you were consuming the chips, what were you doing to the osmolarity of your body fluids?

A. You were increasing the osmolarity of your interstitial fluid
B. You were decreasing the osmolarity of your intracellular fluid
C. You were decreasing the osmolarity of your extracellular fluid
D. You were increasing the osmolarity of your intracellular fluid

2. Which cell membrane component is **CORRECTLY** matched with its description?

A. Transmembrane protein - only found on one side of the membrane
B. Phospholipid - has a hydrophilic phosphate head
C. Peripheral protein - can act as an ion channel
D. Cholesterol - increases the water solubility of the membrane

3. Which type of local communication is **INCORRECTLY** matched with its description?

A. Gap Junctions - important in local communication in the heart
B. Autocrine Signaling - when a hormone released by a cell works on the same cell that released the hormone
C. Contact Dependent Signals - when a surface molecule from one cell interacts with a membrane protein from another cell
D. Paracrine Signaling - when a chemical signal released by a cell works on its neighbour

4. Which of the following would **INCREASE** the rate of diffusion of a lipid-soluble molecule?

A. Decreasing the surface area of the plasma membrane
B. Increasing the number of transporters in the membrane
C. Increasing the concentration gradient
D. Increasing the water solubility of the molecule

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5. You are talking to your friend about the sodium-potassium pump (Na+/K+ ATPase) and its role in the maintenance of body homeostasis. You are shocked when you hear your friend say the following **FALSE** claim about the pump:

A. "The sodium-potassium pump moves 3 Na+ out of the cell"
B. "The sodium-potassium pump generates the resting membrane potential"
C. "The sodium-potassium pump is found within all cells in the body"
D. "The sodium-potassium pump moves 2K+ into the cell"

6. A red blood cell is placed in a solution of 150mM $BaCl_2$. What will happen to the red blood cell?

A. The red blood cell will stay the same volume; the solution is isotonic
B. The red blood cell will swell; the solution is hypotonic
C. The red blood cell will shrink; the solution is hypertonic
D. The red blood cell will swell; the solution is hypertonic

7. Two compartments are separated by a semi-permeable membrane. Compartment A has 200 mM KCl. Compartment B has 200mM NaCl. The membrane is only permeable to sodium. After electrochemical equilibrium has been reached, which of the following statements is **TRUE**?

A. Compartment A will have a negative charge relative to compartment B
B. The electrical gradient will be acting from B → A
C. Potassium will not carry a charge in this example
D. Compartment A will have increased in osmolarity

8. Which component of the neuron is **INCORRECTLY** matched with its function/description?

A. Soma - releases neurotransmitters
B. Myelin - insulates axon
C. Axon - propagates action potential
D. Node of Ranvier - contains voltage-gated channels

9. Which of the following is a characteristic shared by both graded potentials and action potentials?

A. Can be caused by the movement of sodium
B. Only occur in the soma
C. Will always be the same amplitude
D. Can vary in duration

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 Scantron sheet.

10. Which statement best describes the status of the sodium voltage-gated channel during repolarization?

A. The activation gate will be closed and the inactivation gate will be open
B. The activation gate and the inactivation gate will both be closed
C. The activation gate and the inactivation gate will both be open
D. The activation gate will be open and the inactivation gate will be closed

11. Myelinated axons propagate action potentials faster than non-myelinated axons because:

A. Myelinated axons have larger diameters
B. Myelinated axons are shorter than non-myelinated axons
C. Non-myelinated axons have fewer voltage-gated channels
D. Myelinated axons are insulated from current leak

12. Which of the following statements concerning inner hair cells is **CORRECT**?

A. they are auditory receptor cells in the inner ear that amplify the response of outer hair cells
B. they are auditory receptor cells in the inner ear that are primarily responsible for auditory transduction and the perception of pitch
C. they possess a motile response – a response to sound in which the cells move
D. they are more numerous than outer hair cells

13. Which of the following statements concerning the major divisions of the central nervous systems is **CORRECT**?

A. the cerebrum is concerned with ipsilateral sensation and movement
B. the cerebellum is concerned with contralateral motor control
C. the brain stem is concerned with the control of voluntary functions
D. the spinal cord is the major conduit of information to and from the brain

14. Axons from which cell type form the auditory portion of the vestibulocochlear nerve?

A. inner hair cell
B. outer hair cell
C. amacrine cell
D. spiral ganglion cell

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

15. Which of the following statements concerning the arachnoid layer of the meninges is **CORRECT**?

A. it is the layer closest to the cerebral cortex
B. it is the layer closest to the skull
C. it produces cerebrospinal fluid
D. cerebrospinal fluid is contained in the subarachnoid space

16. The postcentral gyrus is the site of which type of primary sensory cortex?

A. visual
B. somatosensory
C. auditory
D. olfactory

17. Neurons in all of the following structures receive input from both ears, **EXCEPT**:

A. inferior colliculus
B. cochlear nucleus
C. medial geniculate nucleus
D. superior olive (superior olivary nucleus)

18. Which of the following statements concerning the eye is **CORRECT**?

A. nasal retina is lateral to temporal retina
B. the iris is posterior to the lens
C. the cornea is anterior to the iris
D. the optic disk is found in temporal retina

19. Which region of the skin surface is likely to have the lowest or smallest two-point discriminations threshold?

A. thigh
B. shoulder
C. forehead
D. cheek

20. The cell bodies of bipolar cells can be found in which layer of the retina?

A. inner plexiform layer
B. inner nuclear layer
C. outer plexiform layer
D. outer nuclear layer

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

21. Mechanoreceptors can be distinguished from one another based upon adaptation rates and receptive field sizes. Which of the following mechanoreceptors is slowly adapting and possesses small receptive fields?

A. merkel's disks
B. meissner's corpuscles
C. ruffini's endings
D. pacinian corpuscles

22. Destruction of the right primary visual cortex would result in which functional deficit?

A. loss of vision in the right monocular crescent
B. loss of vision in the right hemifield
C. loss of vision in the left monocular crescent
D. loss of vision in the left hemifield

23. Which statement is **ACCURATE** about hormones?

A. they mostly act through autocrine signaling
B. they only have effects on target cells with a receptor to that hormone
C. they circulate in the blood, just as neurotransmitters do
D. they are only released by glands in the body

24. Cholesterol is an important molecule for endocrine physiology. Which one of the statements below is **CORRECT**?

A. cholesterol is required to make the hormone cortisol
B. hormones made from cholesterol are hydrophilic
C. hormones made from cholesterol always act on plasma membrane receptors
D. cholesterol is the precursor of all hypothalamic hormones

25. Which of the following pairs of hormones are **NOT CORRECT**?

A. Thyroid stimulating hormone causes the production of T_3 and T_4
B. Adrenocorticotropic hormone causes the release of cortisol
C. Corticotropin releasing hormone causes ACTH to be released
D. GnRH causes the release of growth hormone

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

26. Which would be **CORRECT** about thyroxine?

A. two DIT's must be coupled together to make this hormone
B. iodide is made by follicular cells in order to produce thyroxine
C. we cannot store thyroid hormone in the thyroid, so we make it on demand
D. thyroglobulin is moved across the follicular cell using a transporter and facilitated diffusion

27. Your friend complains she is gaining weight all over her body, is cold, has a slow heart rate, and seems to be always tired. You ask her to see the doctor because you think she has what condition?

A. Too little T_3 and T_4 being released
B. Cushing's disease
C. Hyperthyroidism
D. Diabetes insipidus

28. Which one of the following statements **CORRECTLY** describes negative feedback for thyroid hormone?

A. when thyroid hormone levels rise, a hormone released by the hypothalamus is decreased, but the anterior pituitary is not affected
B. when thyroid hormone levels decrease, negative feedback is no longer happening
C. when thyroid hormone levels rise, the amount of TRH released increases
D. when thyroid hormone levels decrease, less trophic hormone is released into the blood

29. A person has too much circulating cortisol. Which statement is **ACCURATE** about this situation?

A. they would have very low blood glucose
B. they would die from any type of stress
C. they must have high levels of TSH
D. they would have weak muscles with muscle atrophy

30. Which statement is **CORRECT** about a glucocorticoid?

A. these hormones act on plasma membrane receptors
B. this is a class of amine hormones
C. this class of hormones is made in the zona glomerulosa
D. this hormone is released when ACTH is circulating in the blood

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

31. Blood glucose levels are tightly regulated. Which one of the following is **TRUE** about blood glucose regulation?

A. epinephrine (adrenaline) acts to lower blood glucose
B. alpha cells of the pancreas release glucagon, which affects blood glucose
C. insulin is released to increase blood glucose
D. cortisol and insulin both use intracellular receptors to signal cells and regulate blood glucose

Directions: **For each of the incomplete statements/questions below, ONE or MORE of the completions/answers given is/are 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

32. Which lesion(s) of the visual pathway would result in a loss of visual perception in the contralateral visual field?

1) lesion of the optic nerve
2) lesion of the optic tract
3) lesion of the optic chiasm
4) lesion of the optic radiation

33. Which statements(s) concerning the dorsal processing stream in extrastriate visual cortex is/are **CORRECT**?

1) it is involved in spatial analysis
2) it terminates in parietal cortex
3) it is involved in the visual control of movement
4) it is involved in the perception of motion

34. In which of the following scenarios could a goitre develop?

1) If TRH levels were very low
2) If TSH levels were very high
3) If a person had hyperthyroidism but not hypothyroidism
4) If a person's body made a protein (antibody) that turned on the TSH receptor continuously

35. What is TRUE regarding phototransduction?

1) ganglion cells convert light to a graded potential
2) when pigment epithelial cells reach threshold, an action potential is generated
3) the fovea has no neurons so it is also called the blind spot
4) light that is detected by the retina must pass through many neuron layers