

# ANSWER KEY

## Science Olympiad 2014 Anatomy and Physiology Exam (Nervous, Immune, Integumentary)

### True or False

2) The skin can regenerate.

True

3) A bald person will get colder faster than a person with a full head of hair.

True

5) Squinting or frowning a lot can form wrinkles.

True

7) Tanning from a tanning bed is less dangerous than sun tanning.

False

8) Females have a thicker hypodermis than males.

True

9) The hypodermis is considered a separate layer of the skin.

True

### Multiple Choice

2) Recently, reports in the United States and Europe have shown vitamin D deficiencies and rickets-like symptoms in children. Why?

a) Poor nutrition

b) Childhood vaccination

**c) Too much time indoors and usage of strong sunscreens**

d) Lack of exercise

3) Which of the following is not a cell found in the epidermis?

a) Epithelial cells

b) Melanocytes

c) Keratinocytes

**d) Fibroblasts**

4) Which is NOT a function of hair in humans?

a) Sensation

**b) Major mechanism to maintain body cooling**

c) Protection from the sun's UV radiation

d) Helps keep harmful particles out of the body

5) Which of the following is not a cause of hair loss?

- a) Hormonal changes
- b) Sensitivity to DHT
- c) Melanin changes**
- d) Dietary changes

6) Which of the following connects the epidermis to the dermis?

- a) Stratum Granulosum
- b) Stratum Spinosum
- c) Stratum Corneum
- d) Stratum Basale**

7) Which direction is the epidermis from the rest of the body?

- a) Dorsal
- b) Deep
- c) Superficial**
- d) Ventral

10) Cell division in skin take place in

- a) Stratum Granulosum
- b) Stratum Spinosum
- c) Stratum Corneum
- d) Stratum Basale**

### **Labeling**

Name the part and function

1. Frontal Lobe

2. Motor Cortex

3. Cerebellum

4. Medulla Oblongata

5. Pons

6. Somatosensory Cortex

7. Parietal Lobe

8. Temporal Lobe

9. Occipital Lobe

**Short Answer:**

1. Do 2 neurons touch at a synapse? Describe in detail what occurs if your answer is “yes” or “no.”

No, they do not touch at the synapse. A neurotransmitter from one neuron is released from vesicles via exocytosis into the space between neurons called the synaptic space. Here, the neurotransmitter binds with receptors on the other neuron thus activating it and continuing the movement of the signal.

2. Describe how the function of a dendrite differs from an axon with regards to impulse transport.

Dendrites carry the impulse towards the cell body and axons carry the impulse away from the cell body.

3. Explain the importance of the myelinated axons and the Nodes of Ranvier with regards to signal transport.

Myelinated axons and the nodes of ranvier allow the impulse to travel faster along the neuron.

4. Describe the Sodium-Potassium Pump.

*(Hint: Must include the following= the number of ions entering and leaving during Resting Membrane Potential, where this occurs on the neuron, what occurs numerically to the membrane potential, and what happens when the neuron receives an action potential)*

The sodium-potassium pump is an active transport pump on the neuronal membrane on the axon that uses ATP to release and take in sodium and potassium ions. During resting membrane potential, the ratio of sodium to potassium ions are= for 10 sodium out, 1 comes in, for 10 potassium out, 1 comes in, and for 3 sodium out, 2 potassium come in. When a neuron is at resting membrane potential, the membrane potential is -70 mV. When an action potential is received and the neuron needs to transmit a signal, the neuron depolarizes, allows an influx of sodium ions, and the membrane potential rises to +30 mV. Then, when the neuron wishes to return to resting membrane potential, sodium channels close and potassium channels open for potassium to leave the neuron AND chlorine channels open for chlorine ions to enter. This causes hyperpolarization and the membrane potential drops below -70 mV, but then it returns to resting membrane potential of -70 mV.

BONUS= Which ion causes hyperpolarization of the membrane potential?

Chlorine ions ( $\text{Cl}^-$ )

### **Matching**

- |                          |   |
|--------------------------|---|
| 1. H___Leukocytes        | A. kills harming cells with antibody instruction          |
| 2. E___Plasma Cells      | B. attacks cancer and infected cells                      |
| 3. F___Macrophages       | C. activates B and cytotoxic T cells                      |
| 4. G___Mast Cells        | D. recognizes foreign antigens ( <i>aka memory cell</i> ) |
| 5. D___B cells           | E. makes and secretes antibodies                          |
| 6. B___Cytotoxic T cells | F. engulfs invading particles                             |
| 7. C___Helper T cells    | G. triggers inflammatory response                         |
| 8. A___NK cells          | H. white blood cells                                      |

### **Short Answer**

1. What are the immune system's 3 lines of defense? (*Hint: I'm not looking for what's secreted or a specific cell's name. I want the general action that the body performs at each line of defense.*)

1<sup>st</sup> line=block entry

2<sup>nd</sup> line=fight local infections

3<sup>rd</sup> line=combat major infections

2. What does asthma cause at the pulmonary level and what other symptoms does it lead to?

an obstructive pulmonary disorder characterized by recurring spasms of muscles in bronchial walls accompanied by edema and mucus production which make breathing difficult

it causes the airways of the lungs to swell and narrow, leading to wheezing, shortness of breath, chest tightness, and coughing

BONUS=What is the anatomical term for the clumping of red blood cells?

Agglutination