

**Zoology 121, Human Physiology: EXAM III**

**110 Points Total. Please read each question carefully. Exam has 7 pages (2-sided).**

Name 2002 exam

Lab Section (circle) T8:30-11:20 T2:30-5:20 Th11:30-2:20 Th2:30-5:20

**Part I. Multiple Choice, 2 points each (24 points total). Only one answer is correct for each question.**

1. In skeletal muscle, Ca<sup>++</sup> entry into the cytosol from the sarcoplasmic reticulum initiates contraction by
  - A Preventing lactic acid formation
  - B Starting an action potential
  - C Binding to troponin, causing tropomyosin to move aside and allow myosin to interact with actin
  - D Ca<sup>++</sup> is not involved in skeletal muscle contraction
  
2. Whole muscle tension is influenced by the # of muscle fibers contracting and
  - A The tension in each fiber
  - B The stretch of associated tendons
  - C The diameter of the motor neurons
  - D There is no other influence on whole muscle tension
  
3. Which of the following best describes length-tension relationships in skeletal muscle?
  - A As length of muscle (at onset of contraction) increases, tension increases
  - B As length of muscle (at onset of contraction) increases, tension decreases
  - C There is an optimum length of muscle for resulting in maximum tension; anything shorter or longer will result in less tension
  
4. Which of the following best describes length-tension relationships in cardiac muscle?
  - A As length of muscle (or volume of blood held by ventricle) increases, tension (force), increases
  - B As length of muscle (or volume of blood held by ventricle) increases, tension (force) decreases
  - C There is an optimum length of muscle (or volume of blood) for resulting in maximum force; anything shorter or longer will result in less force

5. Which of the following best describes the pathway of the action potential through cardiac autorhythmic cells?
- A AV node, SA node, bundle of His, Purkinje fibers
  - B SA node, AV node, Purkinje fibers, bundle of His
  - C SA node, AV node, bundle of His, Purkinje fibers
  - D AV node, SA node, Purkinje fibers, bundle of His
6. What is a typical stroke volume for the left ventricle?
- A 140 ml
  - B 5 L
  - C 500 ml
  - D 70 ml
7. Which of the following is NOT a symptom of hypothyroidism?
- A Sensitive to cold
  - B Overweight
  - C Anxious
  - D Get tired easily
8. Which of the following has the greatest influence on resistance, and therefore on blood flow to the tissue?
- A Difference in pressures
  - B Radius of the blood vessel
  - C Length of the blood vessel
  - D Blood viscosity
9. Assuming no change in pressure generated by the heart, if the radius of a blood vessel decreases by 50%, flow through that vessel will decrease:
- A By less than 50%
  - B By 50%
  - C By greater than 50%
  - D Cannot determine from the information provided

- 10 Which of the following will result in a decrease in blood flow through an arteriole?
- A Decrease in blood oxygen content
  - B Decrease in blood carbon dioxide content
  - C Decrease in blood pH (= increase in blood acidity)
  - D Increase in blood K<sup>+</sup> content
- 11 The partial pressure of oxygen (P<sub>O<sub>2</sub></sub>) in the air at sea level is 160 mm Hg while the partial pressure of oxygen in your lungs is about 100 mm Hg. Which of the following is NOT a reason why lung P<sub>O<sub>2</sub></sub> is less than (outside) air P<sub>O<sub>2</sub></sub>?
- A Water contributes to the gaseous composition of the air in the lungs more than it does to outside air
  - B Carbon dioxide contributes to the gaseous composition of the air in the lungs more than it does to outside air
  - C Incoming air containing 160 mm Hg oxygen is mixed with air that has already had oxygen removed by the blood
  - D The temperature of the lungs is generally higher than that of outside air
- 12 Identify the incorrect statement about blood platelets:
- A Platelets are involved in carrying oxygen in the blood
  - B Platelets are involved in forming blood clots
  - C Platelets are cell fragments originating from large precursor cells
  - D Platelets release chemical factors associated with recovery from injury

**Part II. Short Answer. 3 Points Each (60 points total)**

- 13 Fill in the missing information (1 pt for each blank)

	Skeletal Muscle	Cardiac Muscle	Smooth Muscle
Troponin (yes or no)	Yes	_____	_____
Striated (yes or no)	Yes	_____	_____
Initiation of contraction (neuronal or autorhythmic)	_____	_____	_____
Gap junctions (yes or no)	No	_____	_____

14 What is a motor unit?

\_\_\_\_\_

15 Fill in the missing information (1 pt for each blank)

	Slow Oxidative	Fast Oxidative	Fast Glycolytic
Color	_____	_____	_____
Myoglobin	Lots	_____	Little
Mitochondria	_____	_____	_____
Myosin ATPase activity	Slow	_____	_____

16 According to the diagram, does the walking gait use more or less energy/minute than running, when moving at high speeds? \_\_\_\_\_



17 Fill in the missing information about the ionic basis of the action potential in cardiac contractile cells (1 pt for each blank)

	Type of ion moving	Direction of movement (in/out)
	1. _____	_____
	2. _____	_____
	3. _____	_____

18 Cardiac Output = \_\_\_\_\_ X \_\_\_\_\_

19 Mean arterial blood pressure = \_\_\_\_\_ X \_\_\_\_\_

20 The \_\_\_\_\_ side of the heart is less muscular than the \_\_\_\_\_ side of the heart.

21 Fenestrations refer to \_\_\_\_\_ in capillaries

22 The velocity of blood flow in a capillary is \_\_\_\_\_ (much slower/about the same/much faster) relative to flow through other blood vessels in the body.

23-25 Assume a hemorrhage (loss of blood) has occurred in a person:

Blood pressure will rapidly \_\_\_\_\_ (increase/stay the same/decrease).

This drop in blood pressure will \_\_\_\_\_ (increase/not change/decrease) the activity of sympathetic neurons innervating the heart.

This change in sympathetic activity will result in a(n) \_\_\_\_\_ (increase/not change/decrease) in heart rate.

26-27 The primary chemical factor which controls the rate of ventilation in healthy individuals under normal circumstances is \_\_\_\_\_

The primary site of action of this chemical factor in controlling ventilation rate is where in the body? \_\_\_\_\_

**Part III. Describe/Illustrate. 8-9 points each (26 points total).**

- 28 9 points. Answer one of the following (please circle your choice).
- A Describe excitation-contraction coupling in skeletal muscle (begin with acetylcholine release from the motor neuron and end with cross-bridge cycling, though you do not need to describe cross-bridge cycling).
  - B Describe cross-bridge cycling in skeletal muscle (use an illustration), and indicate the conditions under which the rigor complex will form.
- 29 9 points. No Choice. Draw an EKG, indicating P, QRS and T, and what these parts of the EKG represent. Show where heart sounds occur (use lub and dup), and show the duration of atrial systole, ventricular systole, and ventricular diastole.

- 30 8 points. Answer one of the following (A or B please circle your choice).
- A An open cup contains a fluid. Will a specific gas (gas X) in the atmosphere above the cup diffuse into the fluid under the following conditions; why/why not/can you even tell?
- 1 The concentration of gas X in the atmosphere above the cup is 100 ml gas X/liter of atmosphere, while the concentration of gas X in the fluid is 7 ml gas X/liter fluid.
  - 2 The partial pressure of gas X in the atmosphere above the cup is 100 mm Hg; the partial pressure of gas X in the fluid is 90 mm Hg.
- B Under what circumstances is our blood particularly impressive/effective in delivering oxygen to our (non-lung) tissues? Explain your answer in terms of the blood oxygen equilibrium curve (oxygen-hemoglobin dissociation curve) and the Bohr effect.

Extra Credit. Acetazolamide is a toxin that strongly inhibits the enzyme carbonic anhydrase. Explain what would be the consequences of this poison on gas transport.