

# Class/Lab Activity #5 Physiology

## Questions to Consider from the Autonomic Nervous System Lecture:

1. In the PNS, the ANS is responsible for the \_\_\_\_\_ control of three types of effector tissue, they are: \_\_\_\_\_ muscle, \_\_\_\_\_ muscle and \_\_\_\_\_ tissue.
2. The 2 branches of the ANS are: \_\_\_\_\_ and \_\_\_\_\_.
3. Which ANS neurons are myelinated? \_\_\_\_\_.
4. Which ANS neurons are unmyelinated? \_\_\_\_\_.
5. What is a nerve fiber? \_\_\_\_\_.
6. What's a ganglion? \_\_\_\_\_.
7. The **preganglionic** nerve fibers for which division are very long? \_\_\_\_\_.
8. Which division has its ganglion **very close** to the CNS? \_\_\_\_\_.
9. Which division has its ganglion **far away** from the CNS? \_\_\_\_\_.
10. The **postganglionic** nerve fibers for which division are very long? \_\_\_\_\_.
11. What are the **Origins** in the CNS of the **Para** division? \_\_\_\_\_.
12. What are the **Origins** in the CNS of the **Sym** division? \_\_\_\_\_.
13. What Division of the ANS is involved in preparing for eating? \_\_\_\_\_.
14. Which Division of the ANS turns up sweat gland activity? \_\_\_\_\_.
15. How could sweating help you in an "Emergency"? \_\_\_\_\_.
16. What is the pupil exactly?
17. Why control the diameter of the pupil? How do changes in pupil diameter affect vision (focus)?

18. a) If you are sitting on the couch, reading after lunch, what's your heart activity like? \_\_\_\_\_.
- b) What's the activity in your stomach and small intestine right after eating lunch? \_\_\_\_\_.
- c) How's the air flow in the bronchioles, why? \_\_\_\_\_.
- d) If the cat suddenly knocks over a glass, how does the ANS respond? \_\_\_\_\_.
19. What Division of the ANS controls *most* blood vessels? \_\_\_\_\_.
20. What is the Effector Tissue for blood vessels? \_\_\_\_\_.
21. The exception to the rule in Q 19 is that the \_\_\_\_\_ division of the ANS controls blood flow to \_\_\_\_\_.
22. What are the implications of a **Convergent** arrangement of neurons in the Parasympathetic division?
23. What does divergent means? What's the benefit of the Sympathetic division being **Divergent**?

24. Please fill in table below with words regarding how effector tissue responds to the two divisions.

Effector Tissue	<b>PARA</b> Stimulation origin =	<b>SYM</b> Stimulation origin =
Heart		
Bronchioles (lungs)		
Pupil (eye muscles)		
Salivary Gland		
G. I. Tract Activity		
Sweat Glands		
Blood Vessels		
Erectile Tissue ('point')		
Reproductive/Ducts Tracts ('shoot')		

25. List an Effector Tissue not shown in the table above that only Parasympathetic effects, and how so.
26. List an Effector Tissue not shown in the table above that only Sympathetic effects, and how so.

27. What's an interesting important fact about the ANS that was not covered in the class slides?
28. If you were about to give a presentation to the class, list 4 specific physiological changes your body might experience that would be caused by **sympathetic** innervation.
29. If you were lounging at home watching tele and enjoying a slice of lemon meringue pie, list 4 physiological events your body might experience that would be caused by **parasympathetic** innervation
30. From the basic outline drawing below, fill in the details and label all parts with the following

Preganglionic and postganglionic neurons, preganglionic and postganglionic nerve fibers, the ganglion, target tissue (add a specific example), nicotinic and muscarinic receptors, alpha and beta receptors, acetylcholine (ACh), norepinephrine (NE), indicate where the CNS and PNS regions are, and indicate the specific receptor types on the target tissue being acted on.

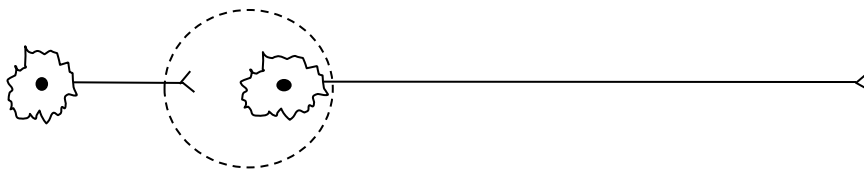
Target tissue

Parasympathetic



Target tissues

Sympathetic



31. The letters below are often used to remember some of the effects of each branch of the autonomic nervous system. See if you can figure out (or maybe search for) what terms the letters represent.

PARASYMPATHETIC

S

L

U

D

D

SYMPATHETIC

E

E

E

E

32. Which specific receptor is found on the effector tissue of a parasympathetic division? \_\_\_\_\_.
33. Which type of neuron is always the preganglionic neuron? \_\_\_\_\_.
34. Which division of the efferent pathway in the PNS controls skeletal muscles? \_\_\_\_\_.
35. How many neurons are found in the pathway between the CNS and the skeletal muscle? \_\_\_\_\_.
36. What is the neurotransmitter released from a somatic motor neuron? \_\_\_\_\_.
37. What kind of receptor (nicotinic or muscarinic) is found on skeletal muscle? \_\_\_\_\_.

**Multiple Choice Question Practice:** Answer these questions on this paper by circling the best response.

- Which statements apply to the **parasympathetic** division of the nervous system?
  - It is dominant during "resting and digesting."
  - Its ganglia are on or near their target organs.
  - Epinephrine is the primary neurotransmitter of the parasympathetic division.
  - It is dominant during "resting and digesting" and its ganglia on or near their target organs.
  - All of the statements apply.
- Which neuron has its cell body in a ganglion?
  - preganglionic neurons
  - postganglionic neurons
  - somatic motor neurons
  - preganglionic neuron and postganglionic neurons
  - preganglionic neuron, postganglionic neuron, and somatic motor neurons
- Increased **parasympathetic** stimulation
 

a) increases heart rate	b) increases sweat	c) increases gastric motility
d) dilates blood vessels in the arms and legs	e) dilates the pupils	
- The receptor(s) for the parasympathetic neurotransmitters is/are \_\_\_\_\_ receptors.
  - acetylcholine
  - adrenergic
  - muscarinic
  - nicotinic
  - both c and d

5. Which functions in the body are controlled through the autonomic nervous system (ANS)?

1. Blood pressure
2. Heart rate
3. Contraction of skeletal muscle
4. Stimulation of thirst

a) 1 and 2    b) 1 and 3    c) 1, 2, 3    d) 2, 3, 4    e) 1, 2, 3, 4

6. \_\_\_\_\_ is released by all autonomic preganglionic neurons.

- a) the adrenergic receptor    b) acetylcholine    c) the cholinergic muscarinic receptor  
d) norepinephrine    e) the cholinergic nicotinic receptor

7. The **sympathetic** division releases: 1) \_\_\_\_\_ at effector tissue onto 2) \_\_\_\_\_ receptors.

- a) 1)  $\alpha$  and  $\beta$ ; 2) adrenergic receptor  
b) 1) acetylcholine; 2) norepinephrine  
c) 1) norepinephrine; 2) muscarinic  
d) 1) norepinephrine; 2)  $\alpha$  and  $\beta$   
e) 1) norepinephrine; 2) nicotinic

8. The neural pathway from the spinal cord to the target tissue has two neurons, the preganglionic neuron and the postganglionic neuron.

- a) true only for the sympathetic division    b) true for both divisions  
c) true only for the parasympathetic division    d) not true for either

9. The cell bodies of preganglionic neurons are found either in the brain stem or in the sacral region of the spinal cord.

- a) true only for the sympathetic division  
b) true for both divisions  
c) true only for the parasympathetic division  
d) not true for either

10. The neurotransmitter norepinephrine is released by neurons at the neuroeffector junction.

- a) true only for the sympathetic division  
b) true for both divisions  
c) true only for the parasympathetic division  
d) not true for either

11. If a physiological dose of an experimental drug were administered, and the subject responded to the chemical, which of these responses would indicate that this drug is an epinephrine **agonist**?

- a) constriction of respiratory airways  
b) hypoglycemia (low blood glucose)  
c) increase in fatty acids in the blood  
d) decreased sweating  
e) decreased heart rate

**12.** For the following questions use these 2 responses to match the statement with the effect.

**A** = Parasympathetic response

**B** = Sympathetic response

\_\_\_\_\_ Pupil dilation.

\_\_\_\_\_ Increased urination.

\_\_\_\_\_ Decreased blood flow to erectile tissues.

\_\_\_\_\_ Increased activity in digestive tract.

\_\_\_\_\_ Pupil constriction.

\_\_\_\_\_ Increased blood flow (vasodilation) to skeletal muscle.

\_\_\_\_\_ Increased in blood flow to erectile tissue.

\_\_\_\_\_ Stimulation of the adrenal cortex to release hormones.

\_\_\_\_\_ Constriction of blood vessels to the digestive system (via  $\alpha$  receptors).

\_\_\_\_\_ Increased watery saliva in the mouth.

\_\_\_\_\_ Increased blood pressure.

\_\_\_\_\_ Bronchiole constriction, decreases air flow in the lungs.

\_\_\_\_\_ Increased sweat gland activity, especially on palms of hand.

\_\_\_\_\_ Stimulation of bile release.

\_\_\_\_\_ Stimulation of the production (synthesis) of glycogen in the liver.

\_\_\_\_\_ Bronchiole dilation, increased air flow in the lungs.

\_\_\_\_\_ Stimulation of the catabolism of glycogen in the liver to release glucose into blood.

\_\_\_\_\_ Decreased heart rate (via muscarinic receptors).