NAME _____ LAB TIME/DATE _____

REVIEW SHEET
exercise
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Human Reflex Physiology

The Reflex Arc

1. Define *reflex:* *Motor response to a stimulus which is mediated over a neural pathway called a reflex arc.*

2. Name five essential components of a reflex arc: *receptor*, *sensory neuron*, *integration center*, *motor neuron*, and *effector*

3. In general, what is the importance of reflex testing in a routine physical examination? *Allows the condition of the nervous system to be assessed. Pathology is indicated by exaggeration, distortion, or absence of reflexes normally present.*

Somatic and Autonomic Reflexes

4. Use the key terms to complete the statements given below.

Key:
a. abdominal reflex
b. Achilles jerk
c. ciliospinal reflex
d. corneal reflex
e. crossed extensor reflex
f. gag reflex
g. patellar reflex
h. plantar reflex
i. pupillary light reflex

Reflexes classified as somatic reflexes include a *a*, *b*, *d*, *e*, *f*, *g*, and *h*.

Of these, the simple stretch reflexes are *b* and *g*, and the superficial cord reflexes are *a* and *h*.

Reflexes classified as autonomic reflexes include *c* and *i*.

5. Name two cord-mediated reflexes: *Achilles reflex* and *patellar reflex (crossed extensor reflex is also cord-mediated)*

Name two somatic reflexes in which the higher brain centers participate: *abdominal* and *plantar (also the corneal and gag reflexes)*

6. Can the stretch reflex be elicited in a pithed animal? *Yes, in a singly pithed frog in which the cord is intact.*

Explain your answer. *It is a cord-mediated reflex (initiated and executed at the spinal cord level).*

7. Trace the reflex arc, naming efferent and afferent nerves, receptors, effectors, and integration centers, for the following reflexes:

patellar reflex *Proprioceptors (stretch receptors) in the quadriceps muscle → afferent fibers of femoral nerve → spinal cord → efferent fibers of femoral nerve → quadriceps muscle.*

Achilles reflex *Proprioceptors (stretch receptors) in the gastrocnemius muscle → afferent fibers of sciatic nerve → spinal cord → efferent fibers of sciatic nerve → gastrocnemius (triceps surae) muscle.*

8. Three factors that influence the rapidity and effectiveness of reflex arcs were investigated in conjunction with patellar reflex testing—mental distraction, effect of simultaneous muscle activity in another body area, and fatigue.

Which of these factors increases the excitatory level of the spinal cord? *Simultaneous muscle activity*

Which factor decreases the excitatory level of the muscles? *Muscle fatigue (exercise)*

When the subject was concentrating on an arithmetic problem, did the change noted in the patellar reflex indicate that brain activity is necessary for the patellar reflex or only that it may modify it? *Only that it may modify it. Will occur in any case.*

9. Name the division of the autonomic nervous system responsible for each of the following reflexes:

ciliospinal reflex *sympathetic* salivary reflex *parasympathetic*

pupillary light reflex *parasympathetic*

10. The pupillary light reflex, the crossed extensor reflex, and the corneal reflex illustrate the purposeful nature of reflex activity. Describe the protective aspect of each:

pupillary light reflex *Protects the retina from excessive illumination, which is damaging to the photoreceptors.*

corneal reflex *Protects the eye from trauma.*

crossed extensor reflex *Withdraws the injured limb from the painful stimulus while simultaneously extending the opposite limb. If the upper limbs are involved, extension of the opposite limb acts to push the stimulus away. If the lower limbs are involved, extension of the opposite limb prepares the limb to receive the body weight.*

11. Was the pupillary consensual response contralateral or ipsilateral? *Contralateral*

Why would such a response be of significant value in this particular reflex? *If the light source was intense, both eyes would probably be illuminated.*

12. Differentiate between the types of activities accomplished by somatic and autonomic reflexes. *Autonomic reflexes involve the activation of smooth or cardiac muscle and glands. Somatic reflexes involve the activation of skeletal muscles.*

13. Several types of reflex activity were not investigated in this exercise. The most important of these are autonomic reflexes, which are difficult to illustrate in a laboratory situation. To rectify this omission, complete the following chart, using references as necessary.

Reflex	Organ involved	Receptors stimulated	Action
Micturition (urination)	*Bladder*	*Stretch receptors in the bladder wall*	*Impulse goes to cord (afferent fibers) and returns (efferent fibers), causing bladder contraction and relaxation of its internal sphincter.*
Hering-Breuer	*Lungs*	*Stretch receptors in the lungs*	*Upon excessive inspiration, afferent impulses are sent to the pons and medulla oblongata, which in turn send efferent impulses to terminate the inspiratory effort.*
Defecation	*Rectum*	*Stretch receptors in the rectal walls (colon terminus)*	*Afferent impulses to the sacral region of the cord followed by efferent impulses to the muscles of the rectum and the anal sphincters to initiate feces evacuation.*
Carotid sinus	*Carotid artery*	*Pressure receptors in the carotid sinus*	*When arterial pressure increases excessively, sensory impulses travel to the cardioinhibitory center in the medulla oblongata, which in turn sends efferent impulses via the vagus nerve to slow the heart, thus decreasing its rate and the blood pressure.*

Reaction Time of Basic and Learned or Acquired Reflexes

14. How do basic and learned or acquired reflexes differ? *Although there is no clear-cut distinction, in general basic reflexes are inborn and use a specific reflex arc. Learned or acquired reflexes are the result of practice and repetition, involving more neural pathways and higher intellectual activities.*

15. Name at least three factors that may modify reaction time to a stimulus. *Receptor sensitivity, nerve conduction velocity, and the number of neurons and synapses involved.*

16. In general, how did the response time for the unlearned activity performed in the laboratory compare to that for the simple patellar reflex? *It was much longer.*

17. Did the response time without verbal stimuli decrease with practice? *Yes* Explain the reason for this.

The subject was anticipating the stimulus.

18. Explain, in detail, why response time increased when the subject had to react to a word stimulus.

Choice and decision making about the response involved and the large number of synapses involved increased the response time.

19. When measuring reaction time in the BIOPAC® activity, was there a difference in reaction time when the stimulus is predictable versus unpredictable? Explain your answer.

It is most likely that the reaction time will be shorter during the segments with predictable, evenly-spaced stimuli, than during the random segments. The subject can more easily predict the onset of the stimulus, reducing reaction time.