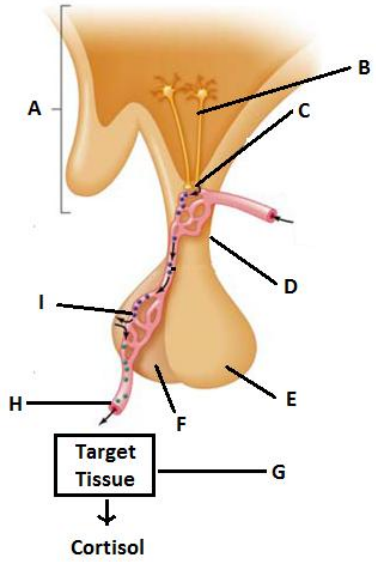
BIO 3303 Study Problems

1. Fill in the blanks based upon cortisol being the end product of the pathway:
a. (the structure) _____
b. (the neurons) _____
c. (the hormone) _____
d. (the structure) _____
e. (the structure) _____
f. (the structure) _____
g. (the gland) _____
h. (the hormone) _____
i. (the hormone) _____



j. Cortisol is a _____ (chemical type?) hormone whose mode of action in receptive cells includes 1) binding to a receptor found in the _____ of the cell; 2) this cortisol-receptor complex travels to the _____ where 3) it binds to specific regions of the DNA to initial specific gene _____.

k. The hormone-type noted in c. (above) is called a _____ hormone as it induces endocrine tissue to release another hormone.

2. Insulin is a classic protein hormone critical in humans (other mammals) to regulate levels of blood glucose; its absence results in diabetes. Answer the following questions related to insulin.
a. Name the Canadian duo who first isolated insulin then used their product to treat a diabetic individual?
b. Insulin acts by what is called a 'direct endocrine loop'; diagram this feedback loop showing the stimulus for release, the endocrine tissue involved, the body tissue effected, and the response.

3a. Nicotine is an agonist of what specific receptor found within the peripheral nervous system?
b. Specifically state the **three** locations within the peripheral nervous system where this receptor is found?
c. One characteristic of nicotine intake is an increase in heart rate but this increase can be blocked (eliminated) by applying a β-blocker (for example propranolol) at the same time as nicotine; explain?

4. True or False: circle appropriate response
a. The posterior pituitary (or neurohypophysis or neural lobe) is composed of endocrine cells that release the tropic hormone oxytocin into the blood. **True or False**
b. The vagus or Xth cranial nerve is the longest parasympathetic nerve innervating basically all visceral organs of the body. **True or False**
c. The Na+,K+-ATPase found on the axon membrane is responsible for membrane repolarization following the propagation of an action potential. **True or False**
d. All (known?) neurohormones of the hypothalamus are peptide hormones with the exception of prolactin-inhibiting hormone which is a catecholamine. **True or False**
e. Ben Johnson was 'busted' based upon high levels of testosterone found in his urine as the synthetic androgen stanazolol acted as an agonist on skeletal muscle to increase muscle mass. **True or False**

5. What defines a cell as an afferent neuron?
A) It has the capacity to respond to environmental stimuli.
B) It is located at the periphery.
C) It has an axon that carries information to integrating centers.
D) It has receptor proteins in its membrane.

6. Advantages of populations of receptors, as opposed to individual receptors, include
A) improved sensory discrimination
B) improved stimulus intensity
C) improved signal firing rate
D) all of the above

7. In olfactory receptor cells, signal transduction cascades often follow this order:
A) receptor binding → G-protein activation → cAMP → cell depolarization
B) cell depolarization → increased intracellular Ca^{2+} → adenylate cyclase activation
C) receptor binding → opening ion channels → G protein activation → cell depolatization
D) cell depolarization → adenylate cyclase → G-protein activation → conformational change

8. Which of the following lists is in the correct order? Sweet tastes are processed in the following way:
A) receptor binding, gustducin activated, adenylate cyclase activated, K^+ channels close.
B) receptor binding, Na^+ channels open, cell depolarizes.
C) gustducin activated, Ca^{2+} channels close, cell hyperpolarizes.
D) transducin activated, PLC activated, Ca^{2+} levels rise, neurotransmitter released.

9. Merkel′s disks are used by the visually impaired for reading Braille. One quality of the receptor that allows this is
A) a phasic firing
B) small receptive field
C) a special sensitivity to deep pressure on the skin
D) a large dendritic tree

10. How does the mammalian eye focus an image? In your description, name the important physical structures in image formation, define the focal point, and explain what accommodation is and why it is important.

11. If all sensory signals are eventually transduced into the common action potential, then how do receptors encode stimulus modality? Give an example.

12. Which of the following pumps is specifically used to return Ca^{2+} *to the sarcoplasmic reticulum*?
A) Ca^{2+}ATPase
B) NaCaX
C) parvalbumin
D) SERCA

13. Smooth and striated muscle share many common features, including
A) organization of filaments into sarcomeres.
B) use of actin and myosin in contraction.
C) a ratio of 2:1 thin to thick filaments.
D) dependence on T-tubules for spread of depolarization.

14. Muscle fiber types can be changed in response to
A) activity levels
B) temperature
C) thyroid hormone levels
D) all of the above

15. Dihydropyridine receptors (DHPR) are also called _____ because of their large Ca^{2+} conductance.
A) T-type Ca^{2+} channels
B) N-type Ca^{2+} channels
C) L-type Ca^{2+} channels
D) Na^{+}/ Ca^{2+} exchangers (NaCaX)

16. Muscle fiber types may be termed glycolytic or oxidative in reference to
A) the amount of myoglobin
B) the speed of contraction
C) the metabolic processes
D) the myosin heavy chain isoforms used

17. Most of the Ca^{2+} stored in the sarcoplasmic reticulum is bound to
A) parvalbumin
B) troponin
C) calsequestrin
D) ryanodine