Animal Physiology Study Guide
1. Which of the following are an example of passive transport?
2. Which active transport?
3. How can you tell?
1. Which of the following are an example of passive transport?
2. Which active transport?
3. How can you tell?

Passive: uses diffusion, substance moves in the direction of: [high] to [low]

Passive: requires ATP, substance moves in the direction of: [low] to [high]
1. How does the reception for peptide (protein) hormones and steroid hormones differ?

2. Explain why reception differs.

3. The response to a certain signal-transduction pathway is transcription, what does this mean?
Hormones like epinephrine/adrenaline are proteins (peptides)

Thus they can not diffuse through the lipid bilayer

And they are too large to use protein channels

Thus, they must bind with a protein receptor on the exterior surface of the cell

Cyclic AMP (cyclic AMP) is a second messenger, its small size allows it to diffuse quickly within the cell, it is used in some pathways and its action is similar to other relay molecules
Steroid hormones (like testosterone) are lipid soluble.

Thus, they can diffuse through the lipid bilayer.

As a result, they do not need a receptor on the cell membrane.

Instead, the receptor is found within the cell.

Here, testosterone is causing a gene to be transcribed, which means a mRNA molecule has been produced, which can be translated into a new protein.
Describe and explain steps 1 – 5 in an action potential, as shown in the graph below:
Stage 1: During resting potential, the membrane is polarized (there is an electrical potential across membrane) at approx. -70 mV.

Stage 2: A stimulus opens some Na\(^+\) channels, Na\(^+\) inflow depolarizes (inside voltage increases) the membrane. If it reaches threshold, it triggers an action potential.

Stage 3: During action potential, all or most of the Na\(^+\) channels open, because of Na\(^+\) influx, inside the membrane becomes positive relative to the outside.

Stage 4: During the falling phase, Na\(^+\) channels close and K\(^+\) channels open, K\(^+\) exits the cell, causing the inside to become negative once again relative to the outside.

Stage 5: During undershoot the Na+/K+ pumps work to bring the membrane back to resting potential, and thus able to respond to the next stimulus.
1. What is the function of a sensory neuron?

2. What is the function of an interneuron?

3. How does a sensory neuron communicate with an interneuron?
1. What is the function of a sensory neuron? Sensors that detect external stimuli (light, sound, touch, smell) & internal stimuli (blood pressure, muscle tension)
2. What is the function of an interneuron? Neurons in spinal chord or brain that integrate sensory input.
3. How does a sensory neuron communicate w. interneuron? Neurotransmitters
How does our brain integrate information about smell?
Chemoreceptors in the nasal cavity are stimulated by odorant molecules (lock-key-fit). They send an action potential via other neurons to the part of the brain that integrates and processes olfactory (smell) information.
Word Bank
- Axon terminals
- Cell body/Soma
- Dendrites
- Nodes of Ranvier
- Schwann cells
- Axon
Which structure’s function is to:
1. Receive messages from other neurons?
2. Transmit electrical signals over long distances?
3. Release short-distance chemical signals?
4. Act as insulation, thus speeding up transmission?
1. What is the stimulus?
2. What is the receptor?
3. Which steps represent transduction?
4. What is the response?
1. What is the stimulus? light
2. What is the receptor? rhodopsin
3. Which steps represent transduction? Circled area
4. What is the response? Starts an action potential
Describe what is occurring in each of the steps of the reflex arc shown:
1 sensory receptor stimulated

2 Afferent neuron sends signal to spinal chord

3 integration

4 Signal sent to motor neuron

5 response = muscle contraction
1. How does the muscle get the signal to contract?

2. What would occur if the ACh (acetylcholine) receptors on the muscle cell were blocked by a toxin?
1. How does the muscle get the signal to contract?
A motor neuron releases a neurotransmitter (ACh); binding to receptors on the skeletal muscle cell membrane triggers contraction.

2. What would occur if the ACh (acetylcholine) receptors on the muscle cell were blocked by a toxin?
If receptors were blocked, ACh could not bind and the muscle would not contract, muscle fatigue or paralysis would ensue.
1. What does step #1 represent?
2. What triggers Ca\textsuperscript{2+} channels to open?
3. Name the process shown in step #3
4. Describe what is occurring in step #4
1. What does step #1 represent? Propagation of action potential
2. What triggers Ca\textsuperscript{2+} channels to open? Change in voltage
3. Name the process shown in step #3 Exocytosis
4. Describe what is occurring in step #4 Ligand binds to receptor, response is opening ion channel
During resting potential of a neuron:
1. Is the inside of the neuron – or + relative to the outside?
2. Are the sodium channels open or closed?
3. Are the potassium channels open or closed?
During resting potential of a neuron:
1. Is the inside of the neuron – or + relative to the outside? **Neg.**
2. Are the sodium channels open or closed? **closed**
3. Are the potassium channels open or closed? **closed**
1. Describe how two neurons are oriented relative to each other in order to communicate:

2. Identify the direction of information flow between neurons (include dendrites, axon, terminals):
1. Describe how two neurons are oriented relative to each other in order to communicate: Axon terminals of presynaptic neuron communicate with the dendrites/cell body of the postsynaptic neuron

2. Identify the direction of information flow between neurons (include dendrites, axon, terminals):
Describe what happens when an action potential reaches a chemical synapse at the end of an axon:
Describe what happens when an action potential reaches a chemical synapse at the end of an axon: Calcium ions diffuse into the axon terminal causing vesicles to fuse with the membrane, dumping neurotransmitter into the postsynaptic cleft.
1. Which is the post and which the pre-synaptic neuron?
2. Describe how neurotransmitter will transmit the impulse at the synapse:
Incoming action potential ends at presynaptic neuron's axon terminals. Message crosses the synaptic cleft via neurotransmitters. Binding of neurotransmitters on the postsynaptic neuron triggers an action potential.
Why is the maintenance of blood glucose homeostasis an example of negative feedback?
The opposing action of two hormones regulates blood glucose around a set-point. When blood [glucose] is too high, insulin is released, which acts to lower blood [glucose]. When blood [glucose] is too low, glucagon is released, which acts to increase blood [glucose].
1. Name the ligand/signaling molecule:
2. How does it interact with the receptor?
3. What do the relay molecules do?
4. What is the response
1. Name the ligand/signaling molecule: **insulin**
2. How does it interact with the receptor? **Lock-key-fit binding**
3. What do the relay molecules do? **transduction**
4. What is the response **insertion of glucose transporter into the cell membrane**
1. What is the relationship between glucose concentration and *insulin* secretion?

2. What is the relationship between glucose concentration and *glucagon* secretion?

3. What is the relationship between eating (or skipping) a meal and the patterns in the graph?
1. What is the relationship between glucose concentration and **insulin** secretion? As \([\text{glucose}] \uparrow\), insulin secretion \(\uparrow\)

2. What is the relationship between glucose concentration and **glucagon** secretion? As \([\text{glucose}] \downarrow\), glucagon secretion \(\uparrow\)

3. What is the relationship between eating (or skipping) a meal and the patterns in the graph? After eating, insulin secretion \(\uparrow\), if a meal is skipped, glucagon secretion \(\uparrow\)
1. How does positive feedback differ from negative feedback?

2. What is an example?
Positive Feedback

- Reinforces a stimulus
- Leads to even greater response
- Does \textbf{not} play a major role in animal homeostasis
- Instead, helps to drive a process to completion
1. Is positive feedback a mechanism of maintaining dynamic homeostasis?

2. What is an example of positive feedback?

3. What are the characteristics of positive feedback?
1. Is positive feedback a mechanism of maintaining dynamic homeostasis? No

2. What is an example of positive feedback? Labor

3. What are the characteristics of positive feedback? Reinforces a stimulus, leads to even greater response, does not play a major role in animal homeostasis, instead, helps to drive a process to completion
Explain why surgical removal of the thyroid gland results in an increase in TSH levels in the blood:
Explain why surgical removal of the thyroid gland results in an increase in TSH levels in the blood: The thyroid gland produces the hormone thyroxine, which puts the breaks on further TSH production (via the mechanism of negative feedback).
Assuming that anabolic-androgenic steroids (AAS) act in the same way as naturally produced testosterone, predict the effect of long-term abuse of AAS:
Assuming that anabolic-androgenic steroids (AAS) act in the same way as naturally produced testosterone, predict the effect of long-term abuse of AAS: Excess testosterone will put the breaks on the production of LH, which would result in decreased sperm count.