

## ***Review sheet for exam III***

**WARNING:** I have tried to be complete, but I may have missed something. You are responsible for *all* the material discussed in class. This is only a guide.

**NOTE:** the extra material I provided is *not* on this review sheet (you are *still* responsible for this).

### 1) Nervous system - overview and neuron function

- Why do animals have a nervous system? What three steps do we need to consider when looking at the nervous system? What is the CNS? PNS? What is a nerve? Ganglion?
- What are the three parts of neurons, and what does each of them do? Do all neurons look alike?
- What is a myelin sheath? How is it different in the PNS vs. the CNS? What do astrocytes do?
- What is the main function of neurons? How is the resting potential in neurons maintained? What is the resting voltage? What ions are involved in maintaining this resting voltage? Where are they?
- What three things can a stimulus do, and how does the movement of ions affect this?
- What is an action potential? How is an action potential generated? Which ions are involved and which direction do they move? What voltage changes take place? Which ions cause which voltage changes? What is the role of the ion gates in all of this? What is depolarization? Hyperpolarization?
- What prevents the signal from traveling backwards? How fast can the signal travel? What controls the speed of the signal?
- What are synapses? What types of synapses are there, and how do they differ?
- Explain how a signal can be transmitted from a pre-synaptic neuron to a post-synaptic neuron. Which chemicals are involved? What kinds of gates can be opened? What is a neurotransmitter? Why is it so important that this is broken down quickly? What happens to the voltage in the post-synaptic neuron?
- How does the post-synaptic neuron figure out what to do? What types of neurotransmitters are there? Know about acetylcholine, dopamine & serotonin. What do LSD, morphine & heroin do?

### 2) Nervous system - sensory input

- what are sensory neurons designed to do? What are the 5 categories of receptors (NOT the “5 senses”)? How does the sense of touch work? What kind receptors make up the sense of touch? What is the function of pain? Where do we have most of our “touch” receptors?
- What are the parts of the outer ear? What is the function of these parts? What are the parts of the middle ear? What is the function of these parts? What do the eustachian tubes do?

- What is the function of the inner ear? What is the cochlea? The oval window? Round? Vestibular canal? Tympanic canal? Cochlear duct? What is the function of all of these parts? What is the tectorial membrane and how does it work? What about the organ of Corti? How do we determine pitch? Volume? What is the range of hearing in healthy humans?

- Know about bats - what is their range of hearing? How do they use sound to navigate? What can they determine about their environment using sound waves? What are some other animals that use echolocation? What's unique about elephants?

-How do we sense movement? How do we determine our balance? What are the semi-circular canals? The utricle? saccule?

-What is the difference between smell and taste? What can we “taste”? Smell? How does the sense of smell work? Why is a dog's sense of smell usually so much better than ours? How many “different” kind of sensors do we have? What about dogs? (hint: we have the same number of “different” receptors). Where are these receptors, and how do they work?

-Where do flies have their taste receptors? What is so impressive about turtles and salmon?

-Know the function and structure of all parts of the eye: sclera, choroid, tapetum, cornea, lens, iris, ciliary muscles, retina, aqueous humor, vitreous humor.

- how does the shape of the lens change? What happens to the lens as we age?

-What are rods? Cones? How can we see color with cones? Which is more light sensitive? Where do we have more rods? More cones? What about other animals? What is the fovea centralis? Blind spot? Do we have the best (in terms of resolution) vision of any animal? Which, if any, animals do better?

-How does depth perception work?

-Which animals can see infrared? UV? Which animals have an electric sense, and what is it? A magnetic sense?

### 3) Nervous system - motor output

-What is a skeleton, and why do we need one? What are joints? Why do muscles usually occur in opposing groups?

- What is the structure of a muscle? What are muscle fibers? Myofibrils? What makes up myofibrils? What is a sarcomere? What two filaments are found in a sarcomere?

- What happens when an action potential arrives in a muscle fiber? What is the role of Ca? What does tropomyosin do? What is a troponin site? What does sarcoplasmic reticulum do? What happens when a myosin binding site is uncovered? What is the role of ATP? Which step in muscle movement requires energy (i.e., ATP)? What do the myosin heads do? What is rigor mortis, and how can it be explained in terms of myosin and actin? How many times per second can this cycle repeat?

- How are muscles controlled? What controls the number of muscle fibers that are activated?

What is tetanus (not the disease!)?

- What are fast fibers? Slow fibers? How are smooth muscles different from the striated (or voluntary) muscles that we've been discussing up to this point? How are cardiac muscles different?

#### 4) Nervous system - integration

- What is white matter? Gray matter? What are ventricles? Meninges? What is the function of all these parts?

- What are the parts of the PNS? What are spinal nerves? Cranial nerves? What is the autonomic nervous system? The somatic nervous system (be careful if you have the 4<sup>th</sup> edition - it makes some mistakes here - either review my notes carefully or borrow someone's 5<sup>th</sup> edition).

- What is a reflex? What is a sensory neuron? Motor neuron? Interneuron? How does a sensory signal reach the brain?

- Know all the pathways of sensory information going to the brain. Make sure you know what the thalamus does in all of this. What role is played by the sensory cortex? What about the optic nerve? Taste receptors? Auditory nerve? Smell receptors? Make sure you know how all of these reach the appropriate part of the brain (make sure you know what the appropriate part of the brain is).

- What happens to all of these signals once they reach the cerebral cortex? What is the structure of the human cerebrum? What do we do there? Where are the nerve cell bodies? What is the corpus callosum?

- What do the various lobes of the cerebrum do? Why is the frontal lobe so important?

- What is the motor cortex? What is the role of the cerebellum both in movement and in processing sensory input? Why can the cerebellum modify and coordinate movements on the fly?

- What is the medulla? The pons? Hypothalamus? What do they do? What is the limbic system? The reticular formation?

- Why is the corpus callosum so important? What can happen if this is severed? Be familiar with the example in the notes.

- What are the differences between the right and left brain? What is the effect of culture on all of this?

- How does reading work?

- What are immediate memories? Short term memories? Long term memories? How do they differ? What is the role of the hippocampus in memory formation?

#### 5) Plant diversity

- What is the origin of plants? What is the closest living relative to plants?
- Plants needed four major adaptations to move onto dry land. These are:
  - i) structure. Know what roots and shoots do, and how this helped plants colonize land. Make sure you know the function of xylem and phloem.
  - ii) support. How do plants support themselves (if they're more than a few inches tall)?
  - iii) water retention. How can plants conserve water? What structures do they use?
  - iv) reproduction. How can plants reproduce on land? What are spores?
- What is “alternation of generations”? Why is this so important, particularly for more primitive plants? What phases are haploid? Diploid?
- What are bryophytes? When did plants evolve? When did vascular plants evolve? Seed plants? What are vascular plants? Seed plants?
- Which is the dominant life stage in mosses? What do moss sporophytes look like? Gametophytes? Where does meiosis take place? Mitosis? How do sperm get to the egg? Where is the zygote?
- How does the fern life cycle differ from that of mosses? What does the fern sporophyte look like? The gametophyte? Make sure you understand all parts of the reproductive cycle of ferns.
- What are male cones? Female cones? Where is the pollen made? eggs? How does the pollen in Gymnosperms get to the eggs? What is a seed? Why are gymnosperms called “naked seed plants”? How are the seeds of gymnosperms dispersed? What are gymnosperms? (You do not need to know more details for gymnosperm reproduction than are in my notes - the book and overhead provide many details that I did not discuss).
- What are angiosperms? What is a flower? What is a fruit? How do angiosperms move pollen to the eggs? How are angiosperm seeds different than those of gymnosperms?
- How is fruit dispersed? Be able to give at least three different examples. Note that virtually all of our agriculture is dependent on angiosperms. Also be able to provide some examples of how plants have evolved to interact with specific animals.

## 6) Plant structure and function.

- What do roots do? What is the structure of roots? What do shoots do? What are the parts of a shoot? What parts of the plant are supported by shoots? What kinds of buds are there and what do they do?
- How can roots and shoots be modified? (e.g, carrots, potatoes, tendrils, spines, etc.)
- Be familiar with the structure of a basic plant cell. What are a few differences between plant and animal cells?
- What are the basic types of plant cells? What is the function of each, and how do they differ

from each other? We discussed “5” different types in class (parenchyma, collenchyma, sclerenchyma, water conducting cells, food conducting cells). Some of these have subtypes. Make sure you're familiar with all of these (e.g., fibers, sclereids, tracheids, etc.)

- What is xylem? Phloem? What are the three tissue types in plants, and where are they found in roots, shoots, & leaves?

- What are the differences between monocots and dicots? What do the names “monocot” and “dicot” refer to? What is a cotyledon?

- What is the basic structure of leaves? How can a leaf control water loss? What are stomata? What is the role of ground tissue in a leaf? Where is the xylem and phloem in a leaf? What covers the epidermis in most leaves?