CONCEPTS TO BE COVERED ON THE SECOND TEST BIO 580

Nerve impulse:

- Why is the resting potential about –70? What does that have to do with permeability to Na+ or K+?
- What things cause the various parts of the action potential: depolarization, repolarization, hyperpolarization?
- Voltage clamp can be used to study voltage regulated channels - what kinds of voltage clamps are there - whole cell, patch.
- What kinds of channels are there? What regulates Na+ channels, Ca++ channels, K+ channels?
- How is calcium involved in neurotransmission?
- Discuss three kinds of neurotransmitters and how they are released, how they affect their receptors, and how eliminated. Is there a difference in speed of transduction for ligand gated channels and second messenger regulated channels ?
- What is the difference between somatic and autonomic nervous system motor neurons? Discuss the difference between αadrenergic, βadrenergic, cholinergic, muscarinic, nicotinic.

3.A. What are some differences between ion channel receptors and second messenger receptors?

B. How can the same ligand (adrenaline or acetylcholine- choose one) cause opposite effects in two different kinds of cells?

5.A. What causes the difference between a resting potential and action potential?

B. What causes changes in cell behavior following an action potential in nerve or muscle?

11. WHAT EVENTS OCCUR AT THE SYNAPSE OF THE POSTSYNAPTIC CELL AT TRANSMISSION? 12. WHAT EVENTS OCCUR AT THE SYNAPSE OF THE PRESYNAPTIC CELL AT TRANSMISSION?

Compare an inhibitory with an excitatory synapse.

3. Why is Na+K+ATPase important in cell physiology and homeostasis?

4. Which poisons inhibit ion flow? Which drugs prevent nerve transmission? Which drugs mimic neurotransmitters? What does a stimulant do ?

B. How are ion pumps important in cells?

MUSCLE CONTRACTION

What are the important things about muscle we need to know in order to determine how it works?

1. Structure - What are the possible anatomical elements involved in shortening?

2. What possible ways are there for chemical elements to cause shortening? Hint: Assume fibers are protein andf that tertiary and quaternary structures are involved.

3. What are the actin effects on myosin ATPase?

4. How is that related to allowing ADP,P to go off myosin?What is a sarcomere and what kinds of proteins are in A,I,M,H,Z,H bands? What proteins cause lining up of striations across a cell?

5. What is the sliding filament model? Which filaments move? Do any filaments shorten?

6. How is the sarcoplasmic reticulum related to contraction and relaxation? What is the relationship of dihydropyridine receptors and ryanodine receptors? How is ATP important in actin filament formation? How is ATP important to myosin?

7. What are the control proteins for contraction in striated muscle? In smooth muscle? Do they effect actin or myosin? What kinds of things control control proteins?

8. What is the structure of a thin filament, and a thick filament?

10 Cardiac and smooth muscle: Are there sarcomeres in heart muscle?

How is control of contraction of cardiac and smooth muscle different from striated muscle?
What is the difference in a node pacemaker cell and a muscular ventricle cell that makes one control the other?
What is the relationship of troponin-C and calmodulin?
4. How are thin filaments important to muscle contraction if they do not change in length during contraction?

Cell Division. How are interpolar MT and kinetochore MT different? What is the difference in their function in cell division? How can you tell which ends are + and which - in MT making KMT or IMT? How can we know whether these MT are shortening or lengthening during cell division?
What do we mean by motor protein? Is the sliding filament model for MT movement, just interaction of MT, or are there other proteins involved as we saw with myosin and actin sliding?

Vision 3. WHAT IS A COMMON THEME FOR PROTEINS INVOLVED IN CHANGES OF STATE SUCH AS IN VISION OR CONTRACTION OR CILIARY MOTION?
What is the physiological basis for one important difference between the resting state in rods and cones as compared to nerve cells? What about the difference at stimulation?

If the resting potential is +20 mv, what would be your guess as to the permeabilities of various cations through the membrane from inside and out?

What is a phosphodiesterase for cGMP doing in vision?
The structure of the retina, the difference between sensory cells and nerves.

The visual pigments and their absorption maxima. The breakdown of visual purple on exposure to light.

The filter system in cones, differences between rods and cones.
The roles of Ca++ channels, Na+ channels, cGMP, transducin, rhodopsin, and phosphodiesterase in vision.

SENSORY AND MECHANORECEPTORS;
What kinds of actin structures are present in microvilli or stereocilia of ears?
How can myosin have a role in hearing?
How is opening ion channels important in taste and hearing but closing them is in vision?