

Review of main topics for Exam #1 – BIO 345 Spring 2008

Our first exam is Tuesday, February 12. The exam will be a mix of question types – a few multiple choice, a few fill-in-the-blank, some definitions, diagram labeling and some short answers. There will also be a few bonus questions for extra points. This exam will be worth 20% of your final grade for this course.

Below is a list of the main topics we have covered since the start of the semester. This list is meant to help guide you as you study, but IT IS NOT THE ENTIRE SET OF MATERIAL THAT WILL BE COVERED ON THE EXAM. **Anything** that we have talked about in class is fair game on the exam. ****Remember to bring a calculator to the exam****

- A. Basic concepts: membranes, diffusion, receptors, transport, the Na/K-ATPase pump
- Membrane structure and components (phospholipids, proteins, carbohydrates, cholesterol)
 - Membrane fluidity
 - Simple epithelia
 - Roles of enzymes
 - Types of receptors and how they work
 - Principles of diffusion, Fick's diffusion equation
 - Active transport
 - The Na/K-ATPase pump and how it works
 - Secondary active transport
 - osmosis
- B. Electrochemical gradients and potentials
- the Donnan equilibrium
 - concept of permeability, semipermeable membranes
 - the electrochemical environment in the average cell
 - Nernst and Goldman equations, what they tell you and how to calculate them
- C. Neurons
- neuron structure/anatomy/glia cell types and roles
 - membrane resting potentials and what maintains them
 - changes in membrane potential: depolarization, hyperpolarization
 - characteristics of graded and action potentials
 - the neuronal action potential – how it is triggered, how it is propagated, how permeability to Na⁺ and K⁺ change over the course of it and how the membrane potential changes as well
 - refractory periods and their roles
 - factors affecting speed of impulse transmission, saltatory conduction
 - types of synapses, synaptic events, post-synaptic potentials
 - the model system: the vertebrate neuromuscular junction
 - neurotransmitters
- D. Sensory structures and nervous systems
- types of sensory receptor cells
 - how cells perceive stimuli and how information is converted to an electrical signal

- examples of receptors (e.g. stretch, Pacinian corpuscles, statocysts, hair cells, taste buds) and how they work
- putting it all together: how a graded potential is initiated, how it may trigger an action potential, how the AP moves down the axon, what happens at the synapse and how a PSP is generated (and how information is coded along the way)
- types of neurons, terms to describe direction of information flow in the nervous system
- example of an information circuit: the cockroach's startle response
- nervous system complexity in the animal kingdom

E. Muscles

- muscle types
- anatomy of a skeletal muscle
- role of contractile proteins
- sliding filament theory
- regulation of contraction by proteins and Ca^{++}
- excitation-contraction coupling at the VNMJ
- twitch and tension
- muscle fibre types
- examples of muscle modifications