

Biology 121, Human Physiology Study Guide for Final Exam, Spring 2003

Final Exam is worth 200 points. The Final will be comprehensive and cover the entire course. However, rather than have you guess or obsess over what's going to be on the final, we will just tell you. Our rationale for doing this is to ensure that A) you will learn the important aspects of physiology that I hope you can retain from this course, B) you will spend less time obsessing and more time studying, and C) nobody will be tempted to just "give up" because of the overwhelming amount of material to review.

20 Points will be multiple choice and will cover the reproductive system. 90 Points will be short answer questions and will cover most or all of the following (**most** of these are diagrams you've seen before -- or perhaps drawn before -- on this or last year's posted exams, or on lab reports):

Citric Acid Cycle
Chemiosmotic Hypothesis (electron transport chain)
Action Potential
Neurotransmitter Release
Withdrawal Reflex
Excitation-Contraction Coupling in Skeletal Muscle
EKG/Cardiac Cycle
Baroreceptor Reflex
Hb/O₂ Saturation Curve
CO₂ + H₂O \rightleftharpoons H₂CO₃ \rightleftharpoons H⁺ + HCO₃⁻ (in red blood cells for CO₂ transport, and in regulating acid/base balance in the blood)
Structure and function of the nephron
Fluid compartments in the body (ECF, ICF, etc.)
Digestive Enzymes
Spermatogenesis and oogenesis
Female Reproductive Cycle
Fertilization and parturition

90 Points will be essay/illustrate-type questions. Nine (9) of the following 20 questions **WILL APPEAR ON THE FINAL EXAM**. Some of them are exactly as you have seen them on previous exams, some are new. A few require that you integrate information covered in different parts of the course and do some thinking. Each will be worth 10 points (even the "define homeostasis" one!). If you are prepared to answer all 20 of these questions, you will "ace" this part of the final. Web notes, notes from class, and in some cases, lab reports are the best resources for these questions; some excellent discussions/illustrations can also be found in the textbook, with the added advantage that they are indexed. Prior to the exam, you may work together on these. On the final you will be on your own, however, and it is not open book, so you should know the answers well. **THERE WILL BE NO "CHOOSE ONE OF THE FOLLOWING" OPTIONS ON THE FINAL.**

- 1) In this course, we have periodically mentioned how exercise can affect the function of various body systems. Describe 3 major effects of sympathetic activity during exercise.
- 2) The osmolarity of a typical cell is 300 mOsm. Suppose you had just consumed a liter of plain water, and suppose you had no regulatory systems to compensate, so your ECF became 280 mOsm. Describe what would happen to the cells in your body and why. Include the direction of water movement, possible resultant osmolarities, and effects on cell size.
- 3) Define Homeostasis.
- 4) Pick your favorite hormone involved in salt and/or water balance. What stimulates the release of your hormone, from where, and what are its principle actions?
- 5) Choose your favorite tropic hormone, and a non-tropic hormone or hormones that it regulates, and discuss A) actions of the non-tropic hormone and B) any negative feedback interactions that regulate levels of the tropic and/or non-tropic hormone.
- 6) What does insulin do and what happens to carbohydrate metabolism when insulin release is impaired (type I diabetes)?
- 7) Describe how a photoreceptor or a hair cell converts a light stimulus or a sound stimulus into a chemical signal.
- 8) Could a person survive without their pituitary gland? What would happen and how would you attempt to treat this condition?
- 9) What is a chemoreceptor? Define chemoreceptor and provide 4 examples from different locations in the body. Describe the function of each.
- 10) Ouabain is a poison that strongly inhibits the Na^+/K^+ ATPase. Describe two different ways that ouabain could lead to death.
- 11) The food additive Olestra is a fat substitute that cannot be digested. Predict the consequences of the use of this product on a) body weight, and b) gastrointestinal function. In your answer for b) include any reasons why a person would NOT want to consume Olestra.
- 12) Choose your favorite negative feedback loop and describe it thoroughly.
- 13) You are doing experiments with a newly discovered peptide hormone. Predict a) how this hormone will travel in the blood, b) what kind of receptor it will interact with, and c) the general effects on its target cells.

- 14) Describe and illustrate Na⁺-dependent secondary active transport as a mechanism for transporting a substance (such as glucose) across an epithelial cell layer (such as in the kidney tubules). Include relative concentrations of Na⁺ and glucose in the various locations.
- 15) Choose one of the following neurotransmitters (circle your choice): Glutamate, GABA, Dopamine, Acetylcholine, Norepinephrine. List the following features.

Is this a neurotransmitter or neuropeptide? _____

How is it synthesized and packaged into vesicles? _____

Does it act on metabotropic or ionotropic receptors? _____

Discuss one major role of this neurotransmitter that was discussed in class :

- 16) Describe excitation-contraction coupling in skeletal muscle (begin with acetylcholine release from the motor neuron and end with cross-bridge cycling, though you do not need to describe cross-bridge cycling).
- 17) Describe (and illustrate) the pathway of the action potential through the heart (the nodes and so forth).
- 18) Describe the effect of ONE local factor and ONE extrinsic factor that control blood flow through an arteriole.
- 19) Explain how a change in tube diameter affects flow through that tube (such as the flow of blood through a blood vessel, air through the bronchi, or sewage through a sewer pipe).
- 20) Describe the two primary characteristics of the lung which greatly facilitate the exchange of oxygen and carbon dioxide with the blood.