

# Biology 1012

## Exam I - Study Topics

**Readings from your textbook (Freeman, Biological Science, 3rd Ed) to be covered on the exam:** Chapter 27 (pp 474-479); Bioskills 3 (B.4-B.5) (pp 543-548), Chapter 28 pp 496-497), Chapter 29 (pp 519-520), Chapter 32 (all pp), Chapter 41 (all pp), Chapter 42 (all pp)

**Topics You Should Know for the Exam:** (Note this list can't possibly cover everything, but it does list the major topics you should study)

### Chapter 27, 28, 29

- Phylogeny
  - Reading Phylogenetic Trees
  - Clades
    - Synapomorphies
    - What is a clade?
    - Monophyletic, Paraphyletic, Polyphyletic
  - Homology and Homoplasy
  - Using Morphological and Molecular synapomorphies to construct phylogenetic trees.
- Hierarchical Classification of Organisms
- Domains of Life
  - Characteristics of the Eukarya, Archaea, and Bacteria
  - Phylogeny of the Eukarya

### Chapter 32

- Major morphological synapomorphies used to construct the animal phylogenetic tree.
  - How do the animal phylogenetic trees based on molecular synapomorphies differ from those based on morphological synapomorphies.
  - Differences between protostomes and deuterostomes
- Feeding Classification Schemes for animals
- Reproductive strategies
- Metamorphosis
- Characteristics of major phyla of animals
  - Porifera
  - Cnidaria

- Platyhelminthes
- Mollusca
- Annelida
- Arthropoda
- Nematoda
- Chordata

## **Chapter 41**

- Adaptation vs Acclimatization
  - Adaptive strategies
- Tissue Types and Characteristics
- Relationships between body size and physiology
  - Surface to volume ratios
  - Limiting factors on cell size
  - Modifications to increase surface area
- Metabolic rates
  - Factors affecting metabolic rates
  - BMR
  - Measuring metabolic rates
- Homeostasis
  - Homeostatic mechanisms
  - Negative feedback and positive feedback
  - Thermal regulation
    - Methods of heat exchange
    - Adaptations for thermal regulation
    - Endothermy vs ectothermy

## **Chapter 42**

- Osmoregulation
  - Passive vs. Active Transport
    - Diffusion & Osmosis
    - Facilitated Transport
    - Cotransporters
    - Active Transport
  - Osmoconformers vs. Osmoregulators
  - How do marine and freshwater fish differ in terms of how they osmoregulate?
- Shark Osmoregulation

- How does the shark rectal gland function?
- Salmon Osmoregulation in salt and freshwater?
  - Differences in osmoregulatory processes in salt and freshwater
- Osmoregulation in insects
  - Techniques for conserving water
  - Insect excretory system structure and function
- Types of Nitrogenous wastes
- The vertebrate excretory system
- Human Kidney structure and function
  - Components of a nephron
  - Events that occur in each component
  - Hormonal regulation of kidney function

Additional Skills:

- Formulating hypotheses
- Designing experiments
- Interpreting results
- Reading graphs

## Practice Questions for the First Exam.

1. What Kingdoms are found in the Domain Eukarya? Which of those Eukaryote Kingdoms is NOT a clade? Why is it not a clade?

2. What synapomorphies could you use to separate the phyla Cnidaria, Arthropoda, and Chordata?

3. In what ways do protostomes differ from deuterostomes? Give an example of a protostome and a deuterostome.

4. In which tissue type are the cells most densely packed together? Draw a diagram showing the major features of this tissue type. Where on your body would you find this type of tissue?

5. The pancreas produces two hormones used in glucose metabolism. Insulin causes cells to remove glucose from the blood stream and store it as glycogen, and glucagon causes cells to convert glycogen back to glucose and release it into the blood stream. When glucose levels get too high, insulin is released and when they get too low, glucagon is released. Draw a diagram that shows the 2 negative feedback loops used to regulate blood glucose concentrations.

6. Suppose you are walking along a beach and find an organism washed up on shore that is very different from any you have seen before. What characteristics would you look for to try and determine whether it is an animal? If it is an animal what characteristics would you look for to determine the group of known animals to which it is most closely related?

7. Endotherm vs. Ectotherm. Draw a graph showing how the internal temperatures of an earthworm and a human would change as the environmental temperatures rise from 0 to 30°C. Why do ectotherms typically eat less frequently than endotherms?

8. Design an experiment to determine whether the changes observed in a population of lizards in response to intensified global warming represent acclimatization or adaptation?

9. On a cold day in January you find yourself standing at the bus stop waiting for your bus. The temperature is below zero and the wind is blowing hard. You realize you are beginning to feel really cold. Explain what steps your body would take to try to warm you. How does your body know what to do and when to do it? What feedback mechanisms are involved?

The final two questions relate to chapter 42. We will not be doing them in discussion, but you should work on them on your own.

10. Diagram how the shark rectal gland functions to secrete salt?

11. Diagram the parts of a human nephron, and indicate what processes typically occur at each part.