Lecture Exam I Review and Study Guide

Readings from your textbook (Freeman, Biological Science, 3rd Ed) to be covered on the exam:

Chapters 27 (pp 543-548), BioSkills 2 (pp B-3 – B-5), Chapter 28 (pp566-568), Chapter 29 (pp 593-594), 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 Homoplasty
    - Using Morphological and Molecular synapomorphies to construct phylogenetic trees.
- Hierarchical Classification of Organisms
- Domains of Life
- Characteristics of the Eukarya
- Phylogeny of the Eukarya

Chapter 32 – Introduction to Animals

- Major morphological synapomorphies used to construct the animal phylogenetic tree.
- How do the animal phylogenetic trees based on molecular synaphmorphies differ from those based on molecular 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 - Animal Form and Function

- 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 – Water and Electrolyte Balance in Animals

- Osmoregulation
    - Diffusion vs. Osmosis
    - 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
    - Osmoregulation in insects
        - Insect excretory system

- Types of Nitrogenous wastes

- The vertebrate excretory system
    - Kidney structure and function
        - Components of a nephron
        - Events that occur in each component

Additional Skills:

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

Practice Questions.

1. (Category: Phylogeny, reading and Interpreting Data) SINEs are genes that jump from place to place on chromosomes. (They are parasitic sequences similar to viruses.) The following table shows the distribution of 20 different SINES in the genotypes of 7 animals.

SINE #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cow	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0
Deer	0	0	0	0	0	0	0	1	?	1	1	1	1	1	1	?	1	1	0	0
Whale	1	1	1	1	1	1	1	0	?	1	0	1	1	0	0	0	?	1	0	0
Hippo	0	?	0	1	1	1	1	0	1	1	0	1	1	0	0	0	?	1	0	0
Pig	0	0	0	?	0	0	0	0	?	0	0	0	?	?	0	0	0	1	1	1
Peccary	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	1	1
Camel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

A. Which of the above animals appears to be least closely related to all the others.

B. Which of the above SINEs are synapomorphies that identify whales and hippos as closest relatives? (a '?' means that it is not clear whether a certain SINE exists in that species.)

A. 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 18
B. 1, 2, 3, 4, 5, 6, 7, 10, 12, 13, 18
C. 4, 5, 6, 7
D. 4, 5, 6, 7, 9, 10, 12, 13, 18
E. 8, 11, 14, 15, 16, 19, 20

C. What morphological synapomorphy could be used to describe a monophyletic group containing all the animals.

2. (Category: Animal Phylogeny) 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?

3. (Category: Animal Form and Function) Describe the types of tissues found in your leg, indicating the name of the tissue, the organ(s) in which it is located, and its function.

4. (Category: Animal Form and Function) Suppose a friend of yours wants to buy a pet and is trying to decide between a rat and a turtle. In making the decision, all he cares about is how much it will cost to feed the animal. Your friend says he can't decide because both animals weigh the same and the food costs the same per pound. Which would you advise him to buy and why?

5. (Category: Animal Form and Function) Design an experiment to determine whether the changes observed in a population of lizards in response to intensified global warming represent acclimatization or adaptation?

6. (Category: Animal Classification) How do the developmental stages of a fertilized earthworm egg differ from those of a fertilized cat egg? Describe the major stages in the development of a fertilized protostome egg into an embryo.

7. (Category: Animal Form and Function) 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 a warm you. How does you body know what to do and when to do it? What feedback mechanisms are involved?

The final two questions relate to chapter 42.

8. (Category: Water and Electrolyte Balance) Diagram how the shark rectal gland functions to secrete salt?

9. (Category: Water and Electrolyte Balance) Diagram the parts of a human nephron, and indicate what processes typically occur at each part.