# Comparative Vertebrate Anatomy Review for First Lecture Examination

**NOTE: Both text and the laboratory manual should be consulted to ensure that you find the information required to explain the concepts listed below. In general, you must also be able to interpret and explain the images depicted in the text and laboratory manual. You may have to explain something about some of them in answer to examination questions.**

**Be certain you are able to:**

## Chapter 1.

1. Define the study of anatomy, why and how anatomical studies are done, the methodologies used and the kind of information you can learn from each (the last part also draws upon information from Chapter 4).

2. How can the study of anatomy contribute to an overall understanding of biological concepts?

3. Understand the definitions of orientation terminology, and be able to use these terms appropriately.

4. Describe the Linnean classification system. Understand hierarchical relationships and Linnean binomial system of naming organisms. What advantages does this system provide? Know the main categories and their order.

5. Define "grade" as in the level of organization of an organism.

6. Define the classification system known as "cladistics," and be able to discuss the principles by which a cladogram is constructed and be able to draw and explain a sample cladogram.

7. Identify and describe some of the scientific contributions of major anatomists in the past history of the field of comparative anatomy.

## Chapter 2.

1. Define a phylogeny and explain how a phylogeny differs from a classification of organisms.

2. Define the five primary characters of a chordate and be able to describe them as well as their distribution among chordates. Be able to describe the idealized "prechordate," characteristics it shows, and how they evolved.

3. Define the characters that distinguish main protochordate groups i. e., Hemichordates, Cephalochordates and Urochordates from the organisms that in the true chordate lineage.

## Chapter 3.

1. Describe vertebrate characters not present in previous organisms, such as the vertebral column, more specialized structures in regions such as the head, the details of these structures and the implications their evolution have toward alterations in life styles of organisms that show these features.

2. Describe calcichordates and explain the information they provide regarding vertebrate origins.

3. Describe main vertebrate groups from Agnathans through gnathostomes. Describe the diagnostic characters of each group and be able to place them on a hierarchical depiction of relationships, whether cladistic or Linnean. Distinguish between characters known for living examples of these forms from those observed or believed to be present in the extinct relatives of these groups.

4. What are conodonts, and what role have they played in the understanding of vertebrate evolution? Describe their anatomy and the anatomical characters they show, as discovered in the fossil record.

5. Define groups such as ostracoderms, placoderms, chondrichthyes, osteeichthyes, elasmobranchii, holocephali, acanthodii, actinopterygians, sarcopterygians, teleostei, dipnoans, crossopterygii, rhipidistians, labyrinthodonts, lepospondyls, lissamphibia, urodela, gymnophiona, salientia (= anura), sauropsids, synapsids, amniotes, parareptilia, eureptilia, lepidosaurs, archosaurs,

saurischians, ornithiscians, pelycosaurs, therapsids, mammals and avians. Be able to distinguish the members of each of these groups and to discuss diagnostic characters of each, so you could locate them correctly on a cladogram or a Linnean classification scheme.

## Chapter. 4.

1. Discuss the relationships between size and shape and how larger versus smaller affects the life styles of different organisms.

2. How is surface area of an organism related to the volume of that organism and the implications of these differences.

3. Discuss the concept of biomechanics, and give examples of biomechanical constraints and the relationships of biological structure to the laws of physics, such as velocity, acceleration, force, density, mass and work..

4. Identify lever systems as to type, and give examples of how they work and places in vertebrate bodies where different types of lever occur.

5. Explain "gear ratios" of muscles and give examples of them in living organisms.

6. Explain the concept of streamlining and the differences between pressure drag and friction drag.

7. Explain compression, tension and shear forces and how they will affect biological materials when loaded (i. e., stressed).

8. Explain countercurrent, crosscurrent and concurrent exchange mechanisms, and be able to identify examples of where these systems might occur in a living organism.

9. Discuss stereoscopic vision (and extend this concept to hearing) in living organisms, as well as to be able to explain how these structural relationships might affect the lifestyle of animals.

## Chapter. 5.

1. Identify germ layers, and the structures to which they give rise and the organisms which possess each.

2. Identify the types of eggs according to the distribution and amounts of yolk present and the organisms that have each type of egg.

3. Describe the different patterns of cleavage, how complete each is, and the organisms that show this pattern.

4. Be able to classify tissue types, where they occur in organisms, and their functions (discussed in lab).

5. Discuss extraembryonic membranes and the organisms which show each pattern of differentiation.

6. Discuss how timing causes different growth and development patterns (i. e. heterochrony).

## Terms to be able to define and use correctly for the first lecture (and also possibly laboratory) exam(s).

Accommodation, agnathan, allometry, anapsid, anteorbital fenestra, animal pole, apomorphy, archenteron, atrophy, Biogenetic Law, blastocoel, blastocyst, blastopore, bone remodeling, center of mass, coelom, choanae, clade, cladogram, compact bone, convergence, cosmine, cranial kinesis, dorsal lip of blastopore, discoidal cleavage, deuterostome, diapsid, epidermal placodes, euryapsid, free body diagram, ganoine, gastrocoel, gastrulation, gnathostome, grade, heterochrony, hierarchy, holoblastic cleavage, homoplasy, Hox genes, hyperopia, hyperplasia, hypertrophy, index fossil, inner cell mass, inertia, involution, lepidotrichia, metamorphosis, monophyly, myopia, neural crest cells, neural tube, neurulation, neurocoel, node, ontogeny, organogenesis, paedomorphosis, peramorphosis, plesiomorphy, polyphyly, primitive streak, refraction, refractive index, spongy bone, symplesiomorphy, synapomorphy, synapsid, suspension (= deposit feeding), taxon (= taxa), temporal fenestrae, tetrapod, therapsid, trabeculae, transformation grid, trophoblast, vegetal pole, von Baer's Law. There may be additional key terms I have not included, but these, together with the answers you can provide to the questions listed for the chapters, ought to give you an excellent basis for understanding what you need to know for the lecture exam as well as much that will apply to the laboratory exam.