

***BIOLOGY 340***  
***Exam Study Guide – All Exams***  
***Comparative Embryology***  
***Dr. Stuart S. Sumida***  
***California State University San Bernardino; Department***  
***of Biology***

Midterm and final exams may include materials studied in either the lecture or laboratory sections of the course.

The following are examples of important topics for each of the midterms. This is by no means a complete or comprehensive list of all potential topics. Anything in the lecture notes may be considered testable material. Furthermore, listing here does not guarantee a particular topic will be on any one particular exam.

### **Midterm One**

Shared derived feature(s) (synapomorphies) of the following taxa:

- Vertebrata
- Chordata
- Bilateria
- Deuterostomia versus Protostomia

Major Germ Layers to Date:

- Ectoderm
- Endoderm
- Mesoderm

Egg and Yolk types:

- Microlecithal
- Mesolecithal
- Macrolecithal
- Centrolecithal

Cleavage patterns:

- Holoblastic
- Meroblastic

Neotony (and examples)

Caenogenesis (and examples)

Spiral versus Radial cleavage and its significance phylogenetically.

Major differences between plants and animal development:

1. Plant cells don't migrate. No migration of cells to create a gut (gastrulation). No migration of cells like neural crest.
2. Meiosis in plants produces spores, not gametes. Plant gametes produced by mitotic division after meiosis.
3. Life cycle of land plants has both diploid and haploid multicellular stages. No multicellular haploid in animals.
4. Plant germ cells not set aside early in development.
5. Plants undergo extended morphogenesis. Meristems (similar to stem cells) persist long after maturity and continue to give rise to new structures (morphogenesis).
6. Plants have greater developmental plasticity.

Alternation of generations in plants.

Plant tissue systems:

- Dermal tissue
- Ground tissue
- Vascular tissue

Meristems

Apoptosis (and potential examples)

Gastrulation (*Drosophila*)

Coelom formation

## Midterm Two

### IMPORTANT TERMS AND CONCEPTS

- Heterochrony
- Blastodisc

- Epiblast & Hypoblast
- Subgerminal space
- Neural groove
- Segmental and Trans-segmental structures
- Holoblastic & Meroblastic
- Yolk types and positions
  - Microlecithal
  - Mesolecithal
  - Macrolecithal
  - Telolecithal

### HERE ARE SOME EXAMPLE QUESTIONS:

You should be able to document early developmental stages in Amphioxus, Amphibians and basal amniotes (birds up through the bilaminar embryo stage). More importantly, be ready to compare them.

Compare and contrast the processes of enteroceleous versus schitzoceleous coelom formation.

Compare and contrast early cleavage in groups with micro-, meso-, and macrolecithal eggs.

What are the differences between involution, invagination, and delamination? Help to explain your answer by using examples from within the Deuterostomes.

Compare and contrast the processes of endodermal movement to the interior of the embryo in amphioxus, amphibians, and/or birds.

Compare and contrast the formation of the dorsal hollow nerve cord in Amphioxus and amphibians.

How is the formation of the putative endoderm in birds accelerated as compared to that of more primitive tetrapods or non-vertebrate chordates?

Essentially, whenever you can make comparisons of the formation of structures between groups...DO IT!

## Final Exam

Be able to compare and contrast formation of each of the extra-embryonic membranes between a reptile-or-bird and a mammal typical of that we discussed in the lecture (a deeply implanting types such as a placental primate).

Draw the Goodrich Diagram and label completely. Be sure to show components of the following systems: skeletal, digestive, muscular, circulatory, nervous. Be able to label and distinguish the types of cranial nerves.

Explain the relationship between somitomeres, Neuromeres, and gill slits. What dorsal root cranial nerves are paired with what ventral root cranial nerves?

In what ways is the early embryonic development of a placental mammal “accelerated” relative to that in a reptile-or-bird?

Be able to name, number, and briefly describe each of the cranial nerves. (See the exercise in Lab 3B.)

Draw a simplified phylogeny of vertebrates and their closest nonvertebrate relatives. Then, map the distribution of yolk and the formation of extra-embryonic membranes (as well as any other embryological feature(s) you can think of) onto the phylogeny.

Be able to draw and label the primitive and early embryonic condition of the aortic arches in vertebrates. Then, be able to derive from that the pattern seen in lungfish, amphibians, reptiles, birds, and mammals.

Why are there an abdominal foregut, midgut, and hindgut? What other structures and services arrange themselves around this fundamental embryonic organization?

What are the major features of the early development of the foregut (liver, stomach, pancreas, mesenteries)?

What is a placenta? What is its function? Describe some of the varying mammalian types of placentae.

What are the major features of the early development of the midgut. Why is there no ventral mesentery associated with the midgut?

Important Terms:

- Ectodermal Placode
- Chorio-allantoic membrane
- Chorio-allantoic placenta
- Choriovitteline placenta
- Mammalia
- Prototheria
- Theria
- Metatheria
- Eutheria
- Heterochrony
- Chondrocranium
- Dermatocraium
- Splanchnocranium
- Major subdivisions of the brain
- Cloaca
- Urorectal septum
- Rectum
- Bladder
- Mesonephric Duct
- Pronephros
- Mesonephros
- Metanephros
- Metapterygial Axis
- Polydactyly
- Pentadactyly
- Digital Arch
- This is by no means a complete or comprehensive list of all potential term or topics.