Invertebrate Zoology- Fall 2010 FINAL EXAM- First Hour (midterm 3)

You have one hour to complete this portion of the exam. After one hour your paper will be collected and you will be given the second portion of the exam. If you finish this portion early, you may request the second portion before the end of the first hour. However, you may not look at this portion again.

Read through this exam before you begin. It consists of four (4) parts. You must answer each part, however, in each part you are required to answer only a subset of the questions. If you answer more questions than indicated in any part, your answers will be graded in order, and you will be graded only on the number of questions indicated. Feel free to use labeled diagrams liberally.

Part I. Answer nine (9) of the following twelve (12) questions: (18 points; 2 points each)

- 1. Identify a chordate subphylum to which we do NOT belong.
- 2. Identify a phylum with less that 1,000 extant species all of which possess 4 pairs of clawed legs and 1 pair of antennae.
- 3. The thyroid gland of vertebrates is considered to be homologous with endostyle of members of what class?
- 4. Identify an unshelled "lophophorate" phylum the members of which are entirely marine and are never colonial.
- 5. Identify the invertebrate phylum that is the most problematic of all metazoan phyla to place in a phylogenetic context.
- 6. Identify a "lophophorate" phylum that includes some freshwater species and also species that undergo both sexual and asexual reproduction.
- 7. The stomochord of what class of invertebtates was once confused with the chordate notochord?
- 8. Identify the internal structure(s) that serves as the primary organ of respiration in the echinoderm class that spends its adult life lying on its side.

- 9. Identify a synapomorphy for the Echinodermata.
- 10. Identify a terrestrial phylum of non-deuterostomes that sheds its exoskeleton and consists of no more than 120 extant species.
- 11. Identify a "lophophorate" class that was conspicuously speciose throughout certain periods of geological time and bears hinged valves.
- 12. Identify TWO classes of echinoderms in which the water vascular system does NOT play a key role in locomotion.
- Part II. Identify the function(s) of 7 of the following 11 structures. In each case identify an invertebrate Phylum in which it is found, or Class if a structure is found in only a subset of the taxa in a phylum. (14 points; 2 points each)

1. slime papillae:

Phylum/Class:

2. pedicellaria;

Phylum/Class:

3. notochord:

Phylum/Class:

4. pharyngeal basket:

Phylum/Class:

5. paxillae:

Phylum/Class:

6. glomerulus:

7. madreporite:

8. statoblast:

Phylum/Class:

9. Cuvierian tubules:

Phylum/Class:

Phylum/Class:

Phylum/Class:

10. mutable collagen:

Phylum/Class:

11. malpighian tubule:

Phylum/Class:

Part III. Answer 8 of the following 12 questions (48 points; 6 points each).

1. Compare and contrast (i.e., describe similarities and differences between) a "regular" and an "irregular" echinoid.

2. Select 3 classes of echinoderms and describe respiration in each.

3. Provide a tree illustrating the postulated interrelationships among the 5 extant classes of echinoderms. Provide potential synapomorphies for each node on the tree. Map the presence of larvae with arms bearing rods onto the tree to illustrate that this feature is likely homoplasious.

- 4. Based on the tree of arthropod interrelationships of Regier et al. (2010), indicate which of the following groups are likely to be monophyletic and which are likely not monophyletic. In the case of ONE of the non-monophyletic groups, discuss which other major taxon has members that are likely included.
 - Crustacea Malacostraca Maxillopoda Myriapoda
 - Cheliceriformes
- 5. a. What is the Cambrian explosion?

- b. Why does it figure so prominently in discussions of the evolution of invertebrates?
- c. Approximately how long ago did it occur?

6. Using labeled diagrams, and without going into their ultimate fates in the adult individual, describe the formation of the tripartite paired elements of the enterocoelom in an echinoderm.

7. Describe 3 synapomorphies for the chordates.

8. a. What is *Xenoturbella*?

b. Describe the 2 primary options with respect to its relationships to other invertebrate taxa. Which of these options now seems most likely to be correct?

9. Compare and contrast (i.e., describe similarities and differences between) the 3 phyla considered to be lophophorates. Be certain to name each phylum; you may find it best to present your answer in the form of a table.

10. Illustrate the orientation and location of the oral and aboral surfaces of each of the 5 echinoderm classes. In each case also indicate the general location of the tube feet.

11. a. Compare locomotion in ascidians to locomotion in thaliacians. Be certain to consider all life stages.

b. Compare locomotion in chaetognaths to locomotion in enteropneusts. Be certain to consider all life stages.

12. a. Compare and contrast (i.e., describe similarities and differences between) reproduction in bryozoans and ascidians; be certain to consider both sexual and asexual processes if relevant.

b. Compare and contrast (i.e., describe similarities and differences between) reproduction in colonial and solitary ascidians; be certain to consider both sexual and asexual processes if relevant.

PART IV. Complete 20 of the 26 blank cells in the following table of invertebrate life cycles and larval types. Note: each row must involve a DIFFERENT larval form. (20 points)

TAXON (phylum or class)	Includes greater than 900 species (± 50) (yes/no)	includes freshwater species (yes/no)	free swimming adult stage (yes/no)	Larval stage (write NONE if development of all included species is direct)
Hemichordata	no	no	no	
		no	no	auricularia larva
Thaliacea		no		
Echinoidea		no	no	
Brachiopoda			no	
Ophiuroidea		no	no	
Asteroidea	yes		no	
Enteropneusta		no		
				NONE
Bryozoa				

BONUS QUESTIONS:

- 1. What is traditionally done to/with the blue and white buoy prior to setting a lobster trap on the Project Oceanology vessel? (Hint: Billy elected for a modified version of this tradition!)
- 2. Over the course of the semester, Dennis ended up with a collection consisting of the following organisms: a sea hare, sea star, sea peach, sea anemone, sea squirt, sea cucumber, sea spider, sea horse, and sea pen. How many PHYLA of INVERTEBRATES are represented by Dennis' collection?