

Invertebrate Zoology- Fall 2008
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 the 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 an animal phylum the members of which possess a mixocoel and lobose appendages, and also that you might expect to find living following exposure to liquid nitrogen.

2. Identify an animal phylum the members of which possess a mixocoel and lobose appendages, and that is thought to have inhabited marine environments 500 or more million years ago.

3. Identify a morphological feature that is considered to be **unique** to the Cephalochordata, Craniata, and Urochordata.

4. Identify a class of echinoderms that includes species that possesses pedicellaria.

5. According to the phylogeny of Giribet (2007) are the bryozoans protostomes or deuterostomes?

6. Identify TWO classes of echinoderms in which elements of the water vascular system play a key role in locomotion.

7. Identify a chordate subphylum that includes species that are sessile as adults.

8. What function is the glomerulus considered to perform in hemichordates?

9. Identify a lophophorate phylum that includes species known to produce statoblasts.

10. Identify a phylum of predators, once considered to exhibit deuterostome features, whose phylogenetic relationships among the protostomes remains uncertain.
11. Identify a non-chordate phylum that possesses pharyngeal gill slits at least at some point in its development.
12. The first fossil evidence of embryos suggests that animals originated approximately how many million years ago (± 50 million years.)

Part II. For 5 of the following 8 larval stages, identify the phylum to which it belongs AND ALSO the class to which it belongs in each instance in which you have chosen an echinoderm larva. (15 points; 3 points each)

auricularia larva	actinotroch larva
brachiolaria larva	lobate larva
tadpole larva	doliolaria larva
tornaria larva	bipinnaria larva

LARVA	PHYLUM	CLASS (if applicable)
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

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

1. Describe feeding in each of the following echinoderm classes.

a. Crinoidea

b. Echinoidea

c. Holothuroidea

2. Describe the concept of the Vendozoa. Include some indication of the age of the “taxon” and also some indication of the types of organisms it was thought to include. Was the group considered to include representatives of any of the extant phyla?

6. Describe sexual and asexual reproduction in the Ectoprocta (Bryozoa).

7. For the phylum Chaetognatha, describe in detail each of the following processes:

a. Feeding

b. Locomotion

8. Select a phylum that is uncontestedly deuterostomate and provide the following information:

Phylum: _____

a. Total number of extant species. _____

b. Whether or not it includes freshwater species. _____

c. Whether or not it includes colonial species. _____

d. Identify one larval stage if any (indicate if none). _____

e. Whether or not it includes species with an endostyle in the adult form. _____

f. Whether or not it includes species that possesses a tunic. _____

9. a. What is a notochord? Do adult ascidians possess this feature? Explain your answer.

b. Describe feeding in an adult solitary ascidian.

10. In each of the following cases, identify a taxon that conforms to the criteria specified.

a. An echinoderm class that includes species that attach via a stalk, or that crawl using cirri and arms.

b. A subphylum of chordates in which all of the adults are pelagic.

c. A class of benthic, solitary, deposit feeding hemichordates.

d. A class of echinoderms that respire primarily using dermal papulae and tube feet.

e. A phylum that was entirely marine in the Cambrian, but now appears to be entirely terrestrial.

f. A subphylum of chordates that exhibits a wheel organ and a notochord as an adult.

11. a. Describe why the appendicularians are considered to represent a neotenic group of chordates.
- b. Describe the tunic of an ascidian.
12. In each of the following cases, identify the structure that conforms to the criteria specified.
- a. The primary feeding structure of regular sea urchins.
- b. The sieve-like opening to the water vascular system in asteroid echinoderms.
- c. The protective structure in which adult appendicularians reside.
- d. The anterior of the three eucoelomic cavities found in deuterostomes.
- e. The eucoelom filled ring of tentacles found surrounding the mouth in phyla such as the Phoronida.
- f. The anterior extensions of the water vascular system that assist in feeding in holothuroidian echinoderms.

Part IV. And now for some questions from Dennis. Answer 6 of the following 9 questions. (18 points; 3 points each)

1. In his meanderings along the seashore, Dennis has collected the following specimens: a radula, the test of a sand dollar, a sea urchin spine, and the lower valve of a brachiopod.
 - a. How many deuterostome phyla would the authors of your textbook consider are included in Dennis' collection?

 - b. List one of these deuterostome phyla.

2. For each of the following taxa, identify the type of sample that Dennis would need to collect in order to have any chance of encountering a representative. In each case be certain to also indicate the habitat from which the sample would come.
 - a. tardigrade

 - b. salp

 - c. ophiuroid

3. Dennis is considering a new pet. Select a pet for Dennis from one of the phyla covered in the last third of the course and describe how Dennis should go about housing, feeding and caring for this creature. (Consider selecting one that he might actually be able to keep alive for a while!)

4. Dennis would like to use his birthday money to purchase fossils at the mineral show coming up in Boston. Being a precocious young fellow, he is interested in expanding his collection to include representation of impressions of animals from the Ediacaran fauna. List 3 phyla for which he should target to purchase if he is to succeed in this goal.

a.

b.

c.

5. Dennis and his friends have developed a new, really fun game involving invertebrate zoology trading cards. The goal of the game is to obtain cards representing as great a diversity of phyla as possible. In the final round of the game, Dennis' friend Toni has the following cards: a tardigrade, a pterobranch, an appendicularian, an enteropneust, and a thaliacean. Dennis' cards consist of: an onychophoran, an ascidian, a urochordate a chaetognath, and an ophiuroid. Has Dennis or Toni won the game? Explain your answer.

6. Dennis has decided that it would be really neat to bring an example of an unusual invertebrate phylum to show and tell at school to amaze his classmates (and the teacher!) If Dennis were to consult you about his plan, what taxon would you suggest he choose and what reasons would you give him for having chosen that taxon?

7. Dennis has developed an interest in the Trochozoa (again being the precocious little boy that he is!)
 - a. If he wished to expand his invertebrate collection to ensure that he has at least some representation of this group, identify TWO phyla that he should be certain to include.

 - b. If he would also like to include an example of a larval stage typical of the trochozoa, what larval stage should he also be certain to include in his collection of invertebrate larvae?

8. On his Thanksgiving vacation Dennis visited the Monterey Bay Aquarium and was fascinated by the pelagic invertebrates exhibit. That having been said, he was not really able to identify some of the creatures he saw. Based on the information provided by Dennis below do your best to help him identify the phylum to which each of the unknown creatures belongs.
 - a. A creature that looked like a clear jelly tube, open at both ends, that moved by shooting water out of one of the openings.

 - b. A sort of small creature with spines on the sides of its head that made it look sort of like it had a moustache. It had several fins, one at the end of their tail and a pair of fins along its body; it shot through the water chasing prey really fast, like a little arrow.

 - c. Tiny little animals that appeared to float in the water upside down. Each had 8 arms that were stiffened by rods. The arms looked like they were covered with many little hairs. (Dennis had to use the microscope provided by the aquarium to see these ones!)

9. Dennis remains pretty unclear about the concept of a eucoelom. Can you describe to him in simple terms what this really is and why it matters whether an organism has one or not.