Invertebrate Zoology
Midterm Exam 2- Fall 2012

Read through the exam before you begin. The exam consists of FOUR (4) parts. You must provide answers for each part, but you are required to answer only a SUBSET of the questions in each part. If you answer more questions than indicated, your answers will be graded in order, and you will be graded only on the number of questions you are required to answer. Feel free to use diagrams to augment your answers.

Part I. Dennis was given a new digital camera for his birthday and has been busy taking photos of all sorts of interesting invertebrate structures. Select the subjects of 6 of his 9 photos and provide the following information:

(i) Identify a Class of invertebrates in which it is found.
(ii) Describe the function(s) performed by the structure.
(iii) Indicate whether or not Dennis needed to *dissect* the relevant invertebrate (something he LOVES to do) in order to obtain his photograph. Justify your answer if you believe there is any ambiguity. (24 points total)

1. a cuttlebone
   (i) _____
   (ii) _____
   (iii) _____

2. an epitoke
   (i) _____
   (ii) _____
   (iii) _____

3. a radula
   (i) _____
   (ii) _____
   (iii) _____

4. a mixocoel
   (i) _____
   (ii) _____
   (iii) _____

5. a clitellum
   (i) _____
   (ii) _____
   (iii) _____

6. a pereiopod
   (i) _____
   (ii) _____
   (iii) _____

7. bipectinate ctenidium (i) _____
   (ii) _____
   (iii) _____
8. chelicerae (i) _____
   (ii) _____
   (iii) _____
9. gastric shield (i) _____
   (ii) _____
   (iii) _____

Part II. Answer 7 of the following 12 questions. (42 points; 6 points each)

1. Using labeled diagrams, illustrate the difference between the developmental origin of a schizocoelom and an enterocoelom.

2. Identify the tagmata with which each of the following appendages/structures is associated:

   a. pereiopod _____

   b. chelicera _____

   c. parapodium _____

   d. prostomial cirri _____

   e. pleopod _____

   f. chilopodan poison claws _____

3. Select one of the 5 phyla of schizocoelous eucoelomates covered to date and provide the following information:
   Name of phylum _____

   a. Approximate total number of species known to date (± 10%). _____

   b. Whether it includes species that are pelagic as adults or not. _____

   c. Whether it includes terrestrial species or not. _____

   d. Whether it includes species with appendages or not. _____

   e. Whether it includes species that can fly or not. _____

   f. Whether it includes species that possess an enterocoelom or not. _____

4. Describe the type of environment (marine, freshwater, etc.) in which you would expect to find the adult stage of a typical member of each of the following taxa:

   a. Symphyla

   b. Sipuncula

   c. Notostraca

   d. Scaphopoda

   e. Pentastomida

   f. Polychaeta

5. Dennis is confused about torsion. Explain the concept to him using an appropriate eucoelomate example. Be certain to include discussion of the morphological consequences of torsion.

6. With respect to the Classes of Crustacea:

a. Identify the Class with the greatest tendency towards parasitism.

b. Identify the Class that includes a large number of species with trunk appendages that are biramous and phyllopodous.

c. Identify the Class that includes the crustacean Order that is most widely consumed by humans globally.

d. Identify 2 Classes that include species that, at least superficially, resemble bivalve molluscs.

_____ _____

e. Which is the more speciose Class, the Branchiopoda or the Malacostraca?

f. Identify the Class that includes the largest known crustaceans.

7. Describe locomotion in each of the following taxa

a. squid

b. gastropod

c. leech

8. Answer each of the following questions with respect to **molluscan Classes**; you may repeat a Class.

a. Identify a Class that includes buoyant species with a coiled shell that don't undergo torsion.

b. Identify 2 Classes that do not possess a veliger larva.

c. Identify a Class that includes numerous species with internal shells.

d. Identify a vermiform Class.

e. Identify a Class that possesses metanephridia.

f. Identify a Class that entirely lacks a radula.

9. Diversity in the invertebrates is wildly variable among phyla.

a. List 3 protostome phyla in order of INCREASING diversity.

1 _____

2 _____

3 _____

b. Select one of these phyla and list 3 of its Classes in order of INCREASING diversity. (Indicate the phylum you have selected by circling its name in part a. above)

1 _____

2 _____

3 _____

c. Identify the MOST speciose Subphylum of non-insect arthropods. _____

10. Describe respiration in each of the following taxa; be certain to describe the structures involved in each case.

a. *Nereis*

b. polyplacophoran

c. crayfish

11. a. Diagram a typical non-phyllopodous, arthropod biramous appendage. Label the coxa, basis, endopodite, exopodite and epipodite.

b. In a uniramous appendage which of these parts is, by definition, lacking?

12. Using fully labeled diagrams, distinguish the functional from the anatomical axes of a cephalopd. Be certain to indicate which diagram illustrates which axis.

Part III. For 12 of the following 16 questions, identify a taxon from the list below that most appropriately fulfills ALL of the criteria listed. You may **NOT** use a taxon more than once. Feel free to justify your answer if you believe there is any ambiguity (24 points).

Rotifera	Protobranchia	Pentastomida
Maxillipoda	Polyplacophora	Pulmonata
Notostraca	Symphyla	Monoplacophora
Nautiloidea	Malacostraca	Chelicerata
Myriapoda	Decapoda	Clitellata
Oligochaeta	Thecostraca	Ostracoda
Opisthobranchia	Annelida	Trilobitomorpha
Cephalopoda	Echiura	Diplostraca
Crustacea	Pogonophora	leeches
Chilopoda	Bivalvia	Sipuncula
Stomatopoda	Diplopoda	Lamellibranchia

1. Phylum that's probably not a phylum after all. _____
2. Includes the only sessile group of crustaceans. _____
3. Not eucoelomates. _____
4. Myriapods with the ability to pinch Dennis. _____
5. Malacostracans with the ability to pinch Dennis with their raptorial 2nd pair of thoracic appendages. _____
6. Annelids lacking parapodia; in the same Subclass as earthworms. _____
7. Includes taxa with a siphuncle, but also taxa that lack a siphuncle. _____
8. Non-annelid group with evidence of segmentation that includes its shell. _____
9. Most speciose Order of crustaceans; many with zoea larvae. _____
10. With a pneumostome and a haemocoel. _____
11. With a bivalve-like "shedable" carapace. _____
12. Dead, gone, and buried, a long time ago. _____
13. Short-lived, predatory, known to sometimes eat tadpoles. _____
14. Most with gills that often also function in feeding. _____
15. Mostly marine mollusks; often de-torted. _____
16. Adults bear setae but lack a gut. _____

Part IV. For 5 of the following 7 questions, fill in the blank with the most appropriate life-cycle stage from the following list: nauplius, glochidia larva, cypris, trochophore, zoea, pilidium, miracidium, megalops, veliger, pelagosphera, acanthor. You may **NOT** use a larval stage more than once. (10 points total)

1. A non-ciliated larva with a single, median eye _____
2. Found in some protostomes _____
3. "In this way, then, the _____, triumphantly askew, acquired his cabin forward holding all his sailing crew"
4. Not found in protostomes _____
5. Found in members of more than one phylum _____
6. Not the only larval stage found in decapods _____
7. Needs a fish to survive _____