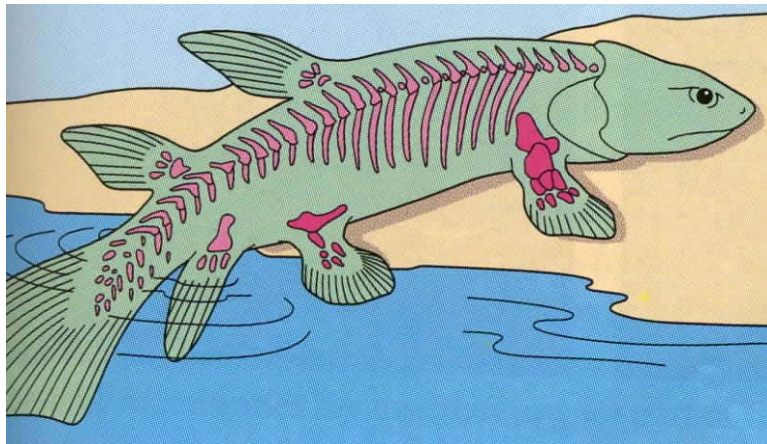


**Answers to Example Questions for Third Lecture Exam**  
**Spring 2006**  
**Arthropods, Echinoderms, Chordates**

The following are examples of some of the styles of questions that may appear on the Michener portion of the third lecture exam to be held on **Wednesday 26 April**. Variations on these question styles, question styles similar to those on the previous exams, and other question styles may also appear on the final.

Answers will be posted on the Bio 1020 web page by Monday 24 April.

1. With reference to the following diagram of an ancestral fish, clearly describe **TWO major skeletal modifications** that were necessary when vertebrates made the transition to land.



**Example modifications**

strengthening of vertebral column, through enlargement of vertebrae and closer articulation of adjacent vertebrae, to support weight of body against gravity in absence of buoyancy

bracing of paired appendages against vertebral column at pectoral & pelvic girdles, to move appendages relative to body for locomotion on land

enlargement & strengthening of bones in appendages(1 in upper limbs, 2 in lower limb), flexible wrist/ ankle joints, feet with toes, to support body off ground for walking

enlargement and strengthening of thoracic cage, to protect vital organs such as heart and lungs from compression

2. Name the **FOUR** structures diagnostic of chordates **and** briefly describe the **function(s)** of each.

**notochord:** longitudinal, flexible rod that acts as endoskeleton for support and muscle attachment; replaced by cartilage or bone during embryonic development in some chordates

**hollow dorsal nerve cord:** central nervous system, arising from infolding of ectodermal tissue early in embryonic development, which serves to coordinate sensory input and motor response; differentiates into tripartite brain & spinal cord in most chordates

**pharyngeal slits:** arise from lateral grooves in pharynx and serve as exit route for water drawn into pharynx during filter feeding; slits & supporting structures modified to function as gills for gas exchange, jaw supports, and middle-ear bones in some chordates

**muscular post-anal tail:** extension of endoskeleton and muscles posterior to anus, providing propulsive force for locomotion in aquatic species; tail modified for other uses in terrestrial chordates (e.g. balance, display); retained internally in some chordates (e.g. chimpanzees, humans)

3. Write in the term **best** described by each statement.

Partial marks will be deducted for incorrect spelling and illegibly written words.

- |                                    |  |
|------------------------------------|--|
| a) <b>Malpighian tubules</b>       | Excretory organ in insects   |
| b) <b>chorion</b>                  | Extra-embryonic membrane that functions to obtain oxygen for the embryo in bird eggs               |
| c) <b>hollow dorsal nerve cord</b> | Embryonic structure from which fish brain develops   |
| d) <b>allantois</b>                | Extra-embryonic membrane that functions as a disposal sac for metabolic wastes in eggs of reptiles |
| e) <b>water vascular system</b>    | Diagnostic characteristic for Phylum Echinodermata   |

4. You have been presented with THREE animals a), b), and c) from the Phylum Echinodermata and, by inspecting each specimen, must decide to which echinoderm class it belongs. Based on the descriptions given in the table, insert the name of the class for specimens a), b), and c)  
 Partial marks will be deducted for incorrect spelling and illegibly written words.

<u>a). Class name</u>	<u>b). Class name</u>	<u>c). Class name</u>
<b>Asteroidea</b>	<b>Crinoidea</b>	<b>Holothuroidea</b>
aboral surface uppermost	oral surface uppermost	no arms
eversible stomach	5 feathery arms	not spiny
tube feet for locomotion	tube feet for feeding	tube feet modified as oral tentacles

5. You have been presented with THREE animals a), b), and c) from the Phylum Arthropoda and, by inspecting each specimen, must decide to which arthropod class each belongs. Based on the descriptions given in the table, insert the name of the class for specimens a), b), and c)  
 Partial marks will be deducted for incorrect spelling and illegibly written words.

<u>a). Group name</u>	<u>b). Group name</u>	<u>c). Group name</u>
<b>Crustacea</b>	<b>Chilopoda</b>	<b>Insecta</b>
biramous appendages	uniramous appendages	uniramous appendages
gills	trachea	trachea
2 pairs antennae	1 pair antennae	1 pair antennae
walking & swimming appendages	1 pair walking appendages per body segment	3 pairs walking appendages

6. a) Explain what is meant by a diagnostic character.

A diagnostic character is common to all members of a particular taxonomic group and is found in no other taxonomic group, and thus a diagnostic character unambiguously assigns an organism to its taxon

b) Name **TWO** diagnostic characteristics of mammals **visible externally** on the living animal.  
 mammary glands that, in females, produce milk  
 hair made of keratin

c) Name **TWO** diagnostic characteristics of mammals present in fossilized skulls.

heterodont teeth

mandible composed of a single bone (dentary)

jaw articulation between dentary and squamosal

3 ear ossicles in the middle ear

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

1) Among the invertebrates, arthropods are unique in possessing

A) a mantle

B) ventral nerve cords

C) open circulation

**D) jointed appendages**

E) segmented bodies

2) The following phyla are all in the Clade Protostomia

A) Chordata, Echinodermata, Arthropoda

B) Mollusca, Echinodermata, Arthropoda

C) Cnidaria, Arthropoda, Annelida

**D) Arthropoda, Annelida, Nematoda**

E) Annelida, Nematoda, Echinodermata

3) An arthropod has all the following characteristics *except*

A) protostomous development

B) bilateral symmetry

**C) a pseudocoelom**

D) three embryonic germ layers

E) exoskeleton

4) The possession of two pairs of antennae will distinguish

A) spiders from insects

**B) crustaceans from insects**

C) millipedes from centipedes

D) millipedes from insects

E) insects from centipedes

5) The transition to land by vertebrates was characterized by

A) evolution of jaws and cranium

**B) strengthening of the axial endoskeleton and pelvic and pectoral girdles**

C) evolution of oviparous reproduction

D) all of the above

E) A and B

6) Structures made of keratin are:

- I avian feathers
- II echinoderm endoskeleton
- III mammalian hair
- IV arthropod exoskeleton
- V reptilian scales

A) II and IV B) IV only C) I and III **D) I, III, and V** E) II only

7) The following is *not* characteristic of all mammals

- A) a four-chambered heart that prevents mixing of oxygenated and deoxygenated blood
- B) giving birth to live young (viviparity)**
- C) notochord during at least some period of their life
- D) glands that produce milk to nourish their offspring
- E) pharyngeal slits during at least some period of their life

8) During complete metamorphosis, an insect would pass through the following life stages in the following sequence

- A) egg, larva, pupa, adult**
- B) egg, nymph, larva, adult
- C) egg, pupa, larva, adult
- D) egg, nymph, pupa, adult
- E) egg, nymph, larva, pupa, adult

9) The following combination of two statements concerning animals is true

- 1. animals are more closely related to fungi than to plants
  - 2. animals are the only organisms that ingest food
  - 3. Kingdom Animalia is monophyletic
  - 4. animals are the only organisms that reproduce by sexual means
  - 5. animals evolved after plants
- A) 2, 3 B) 3, 4 **C) 1, 3** D) 3, 5 E) 2, 5

10) All arthropods share the following characters

- A) exoskeleton, jointed appendages, open circulatory system**
- B) jointed appendages, Malpighian tubules, mandibles
- C) pedipalps, mandibles, antennae
- D) exoskeleton, open circulatory system, mantle
- E) exoskeleton, chelicerae, Malpighian tubules

11) The following combination of Class or Superclass and description is correct

- A) Osteichthyes - no paired fins, bony endoskeleton, jaws
- B) Amphibia - amniotic egg, gnathostomate, endotherm
- C) Chondrichthyes - 2 pairs of paired fins, cartilaginous endoskeleton, jaws**
- D) Reptilia - tetrapod, gnathostomate, cartilaginous endoskeleton
- E) Agnatha - no paired fins, bony endoskeleton, jaws

12) The following are all vertebrates

- A) Cephalopoda, Osteichthyes, Reptilia
- B) Cephalaspidomorphi, Urochordata, Myxini
- C) Osteichthyes, Chondrichthyes, Reptilia**
- D) Cephalochordata, Osteichthyes, Aves
- E) Cephalochordata, Reptilia, Mammalia