

1. (15) Briefly identify any 5 of the following taxa by stating what group it belongs to, what its primary characteristics are, and what its significance is. **You can identify the 6th for extra credit.**

Name	Group	Primary Characteristics/Significance
<i>Biarmosuchus</i>		
<i>Kannemeyeria</i>		
<i>Moschops</i>		
<i>Lycaenops</i>		
<i>Estemmenosuchus</i>		
<i>Titanophoneus</i>		

2. (15) Choose any four characteristics of *Thrinaxodon* and compare/contrast each with the corresponding characteristic h mammals and reptiles. Why do we think that *Thrinaxodon* had a higher level of metabolism than most reptiles?


3 (15) Describe the major changes in the jaw and teeth over the transition from reptile to mammal. Use *Thrinaxodon*, *Cynognathus*, *Probainognathus*, *Kayentatherium*, and a primitive mammal like *Morganucodon* as landmarks in your discussion. What is the difference between an advanced cynodont and a primitive mammal?

4. (10) Name the bones in the ear of a reptile and a mammal. For each bone, give the ancestral bone from which it was derived.

5. (10) Mammals

a. _____ is the reason why multituberculates are known as Allotheria

b. _____ is the reason why multituberculates are believed to have become extinct.

c.  in the box, draw the cusp patten of **either** a symetriadont **or** a triconodont. Circle the nar of the corresponding pattern

e. _____ is the reason why monotremes cannot be linked into the basic mammalian classification

f. _____ and _____ are two primitive traits of monotremes

g. _____ and _____ are two specialized traits of monotremes

h. _____ is the reason that marsupials and placentals are considered to be very closely related compared to other mammals.

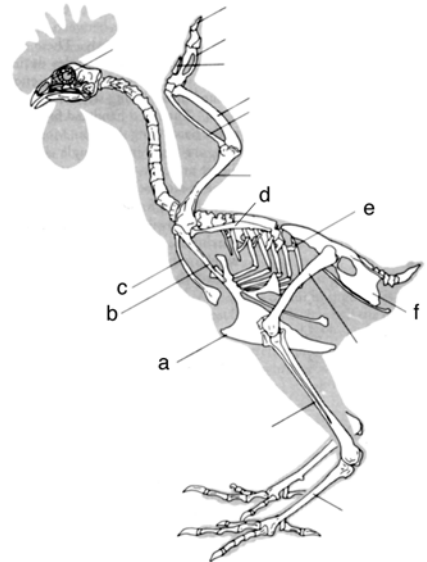
i. _____ is the extra bone found in the pelvis of monotremes and marsupials, but not placentals.

8. (20) Birds

a. Describe any three characters in *Archaeopteryx* and compare them to a modern bird.

b. Describe the structure of the wing in *Archaeopteryx* and compare it to the wing of a Hoatzin. In what different ways to adult and juvenile Hoatzins use their wings?

c. In the diagram below, identify the labeled bones and explain how they are used in flight.



d. What is the significance of creatures like *Protoarchaeopteryx*, *Caudipteryx* and *Sinosauripteryx*?

e. What do *Microraptor* and modern quail tell us about the origin of flight?

Optional Comprehensive – 100 points

1. (15) Fill in the blanks

- a _____ is the reason why it is difficult to relate modern agnaths to fossil agnaths
- b _____ are two possible reasons for the appearance of bone in agnaths
- c _____
- d _____ is the reason that in general modern lampreys are not good models for how Paleozoic agnathans lived
- e _____ is the one element of the lamprey life style that may be relevant to the behavior of Paleozoic agnathans
- f _____ briefly identify *Haikouichthyes* and *Mylokunmigia*
- g _____ what is the significance of the two organisms in “f”
- h _____ briefly identify *Haikouella*
- i _____ what is the significance of *Haikouella*
- j _____ what is the character that primarily separates the two classes of Paleozoic agnathans?
- k _____ is the reason we think that *Hemicyclospis* and its relatives possibly possessed an electrical sensory system
- l _____ is the order of agnathans that is often considered to be the ancestors of modern lampreys
- m _____ is the reason that the order in “l” is linked to lampreys
- n _____ is the general term for organisms with jaws
- o _____ are very primitive vertebrates originally known only by their tooth-like feeding elements

2. (12) Ediacara and Burgess Shale

a. Describe how and when the Ediacara and Burgess Shale faunas were preserved

b. What do the Ediacara and Burgess Shale fauna tell us about the history of life? Name and describe one organism from each and indicate its relationship to modern organisms.

3 (10) Complete the table below by writing in the names of the eras and periods with the oldest at the bottom.

Era	Period

4. (12) Fill in the blanks

- a _____ is the primary difference between actinopterygians and sarcopterygians.
- b _____ is an important change that occurred to the back of the skull in the series *Eusthenopteron* → *Panderichthys* → *Acanthostega*
- c _____ is the reason that it is probably not necessary to find a one-to-one, bone-by-bone correlation between the limbs of *Eusthenopteron* and tetrapods
- d _____ is the difference between the pelvis of *Eusthenopteron* and *Acanthostega*.
- e _____ is what we learn about limb use in the coelacanth
- f _____ is an important reason why *Panderichthys* makes a good intermediate between *Eusthenopteron* and tetrapods.
- g _____ is one challenge that had to be met in making the transition to land.
- h _____ is how the challenge in h was met
- i, _____ is a second challenge that had to be met in making the transition to land
- j _____ is how the challenge in i was met
- k _____ is a challenge that needed to be met, but was not met by the earliest tetrapods
- l _____ is how the earliest tetrapods coped with the unmet challenge in j

5 (11) Describe at least three observations that would suggest that *Acanthostega* was primarily an aquatic organism. What implications does *Acanthostega*'s fish-like lifestyle have for any theory of why/how vertebrates became terrestrial?

6. (6) Fill In the Blanks

- a. _____ is a character that links *Seymouria* with amphibians
- b. _____ is a character that links *Seymouria* with amniotes
- c. _____ is a character that links *Diadectes* with amniotes
- d. _____ is a character that is very unique in *Diadectes*
- e. _____ is a feature in the amphibian skull that is lost in reptiles
- f. _____ in lower tetrapods, this may be the **real** function of the feature described in e,

7. (10) Draw a diagram of an amniotic egg. Label the parts and explain their functions. What is the evidence that *Seymouria* might have laid such an egg? How do we know that it did not? Given the difficulty of determining egg types in fossils, explain why we talk so confidently about the earliest amniotes.

8. (8) Pelycosaurs

- b. Briefly compare and contrast the skull openings and the jaw mechanics of *Dimetrodon* and humans. What changes in the skull happened to go from the *Dimetrodon* condition to the human condition?

