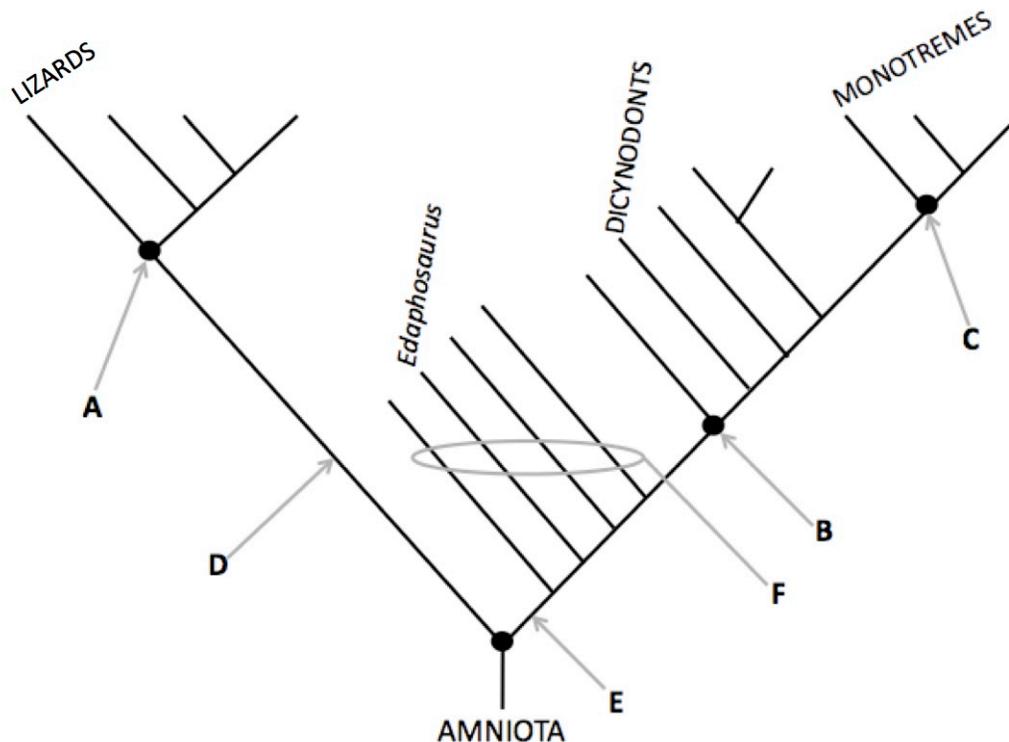


EEB 3254/5254 SAMPLE LECTURE EXAM QUESTIONS & ANSWERS

ANSWER QUESTIONS 1-4 WITH REFERENCE TO THE PHYLOGENY DRAWN BELOW

- (1) (5 pts) Provide the names of the node groups A, B and C
- A. (2 pts) **Reptilia**
 - B. (1 pt) **Therapsida (not Cynodontia because Dicynodonts are not cynodonts...)**
 - C. (2 pts) **Mammalia**
- (2) (4 pts) Give the stem group names for the lineages indicated by the arrows labeled D and E.
- D. **Sauropsida**
 - E. **Synapsida**
- (3) (2 pts) What is the informal name given to the group of lineages circled and labeled F?
- F. **pelycosaurs**
- (4) (8 pts) Answer the following questions based on what the common ancestor of the two main amniote lineages (D and E) would have been like (the black dot just above the name "AMNIOTA").
- a) Did it masticate its food? **No**
 - b) Did it have hair? **No**
 - c) What kind of posture/limb position did it have? **sprawled, limbs to side**
 - d) Was it a homeotherm? **No**
 - e) Did it have a masseter muscle? **No**
 - f) Did it have ribs on its neck vertebrae? **Yes**
 - g) Did it have a secondary palate? **No**
 - h) Did it lay eggs or give birth to live young? **Eggs**



- (5) (3 pts) What is 'the crown group definition' of Mammalia?

The common ancestor of all the LIVING mammals and ALL of its descendants (extinct or alive)

- (6) (2 pts) What would be an *alternative* way to define Mammalia? (you don't have to give the actual definition, just *how* it would be defined, i.e., on what basis would the definition be made)

An alternative would be a 'character-based' definition, such as 'animals with a single bone (dentary) in their lower jaw'. This is what many paleontologists use. [another possibility is a node-based definition, but starting from a deeper node]

- (7) (16 pts) Place a **T** (True) or an **F** (False) next to the following statements.

- T** Small animals heat up and cool down more quickly than large animals.
- F** 'Puncture-crushing' is a form of chewing that reduces food to tiny particles
- T** Living reptiles and mammals extract the same amount of energy per unit of food.
- F** A secondary palate evolved in response to selection for breathing efficiency to support high activity levels.
- F** Ventral limb position is correlated with lateral undulation during locomotion.
- T** Living reptiles can afford slow gut passage rates because they are ectothermic.
- T** The area of the sail in early 'sail-back' synapsids is correlated with body weight/volume, not length
- F** The evolution of modern mammalian characters occurred gradually and sequentially along the main synapsid stem/lineage
- T** Dr. Schwenk is a eutherian *and* a cynodont
- F** The presence of a cochlea distinguishes monotremes from all other mammals
- F** Platypuses retain mostly 'primitive' traits and therefore probably look very much like the common ancestor of all living mammals.
- T** A fundamental difference between mammals and all other vertebrates is the presence in mammals of pharyngeal musculature.
- T** Calling eutherian mammals 'placentals' is misleading because marsupials also possess a placenta.

- (8) (6 pts) What is the significance of **buttocks** in the evolution of synapsids?

Buttocks reflect the evolution of a new locomotory system in mammals in which the force for hind limb propulsion comes from muscles that run from the pelvic girdle to the femur (upper limb bone) (e.g., the gluteus muscles) RATHER than the caudofemoralis, which in reptiles and ancestral synapsids runs along the base of the tail and inserts onto the femur. In the latter situation, the tail base is broad and muscular and blends into the lower trunk. In mammals, the posterior end of the body ends abruptly and there are two, muscular buttocks where the gluteal muscles are, and a slender tail protruding more dorsally. This transformation was associated with the change from a sprawled posture and lateral undulation to dorso-ventral flexion with the limbs positioned under the

body. [NOTE: your answer may not be quite so complete or detailed, but should contain the same basic elements]

(9) (6 pts) What is **inertial homeothermy** and why is it important?

Inertial homeothermy refers to the retention of a relatively high, constant body temperature owing to large body size rather than metabolic heat production. Once a large body heats up—even if the source of heat is from basking in the sun—it has too little surface area to cool down quickly. Hence, even at night when the air temp. cools, the body keeps its relatively high temp. Larger objects have proportionately less surface area for their weight/volume, which is why their rate of heat loss (and gain) is much slower than in smaller objects/organisms. Late therapsids were relatively large and were probably inertial homeotherms. Their metabolism and physiology became adapted to high, constant body temp. When cynodonts evolved small body size, they were forced to evolve endothermy to maintain their small bodies at the higher, constant temperatures they had already adapted to.

(10) (5 pts each) Compare and contrast the following word/phrase pairs. In other words, *in a very brief and concise paragraph*, how are the two words/phrases related—why did I put them together? The relationship between them might be functional or evolutionary or both. In an actual exam, you would be able to choose a subset of the word pairs to answer. A perfect answer will show not only that you understand what each term means, but also how they are connected.

IN THE ACTUAL EXAM, YOU WOULD HAVE SOME CHOICE ABOUT WHICH ONES TO ANSWER

pelage—mammary glands
endothermy—occlusion
gut surface area—endothermy
respiration—lateral undulation
respiration—cellular respiration
palate—deglutition

TOO MANY TO ANSWER. LOOK AT ANSWERS TO PREVIOUS 6-pt QUESTIONS, BUT THINK SHORTER AND MORE CONCISE...