

Please **read the questions carefully** and be as specific as possible in your answers.

Section I - Short Answer (3 points each).

1. The *quadrate* bone in the jaw joint of reptiles evolved into the _____ of mammals, while the reptilian *articular* became the _____ in mammals.
2. Name a group of vertebrates in which the bones of the foot/lower leg are arranged in the *digitigrade* form _____
3. Define/describe *connective tissue*
4. Name the type of vertebrate skull with two openings, one above and one below a postorbital squamosal bar _____
5. For a muscle to exert the most force (or torque), where would its insertion be placed relative to the fulcrum (pivot point) of the bone being moved? *Proximal* or *distal* (circle one).
6. Name a type of teeth in which the softer dentine is worn down while the enamel forms a series of grinding ridges _____.
7. Define/describe a *portal system* in vertebrate circulation.
8. Name the specific structure where the respiratory (gas exchange) surface is found in fish gills

9. Name the four stomach chambers found in ruminants
_____, _____, _____, _____
10. Gas exchange surfaces that increase surface area are called _____ in reptiles, and _____ in mammals.
11. Name the specific type of cell that insulates neurons in the peripheral nervous system

12. Define/describe a *nucleus* in the central nervous system.

13. The general function of afferent neurons is _____, while the general function of efferent neurons is _____
14. Define/describe the function of cranial nerve number II.
15. Name the evolutionary **process** that resulted in morphological similarity between the marsupial Tasmanian wolf and placental dogs _____
16. We currently prefer to avoid using the names of some traditionally recognized taxonomic groups such as *aganatha*, *reptilia*, and *homeothermia*. Why?
17. With which of the following do crocodiles share a more recent common ancestor. (Circle one) *Birds* or *Turtles*.
18. Define/describe the *brainstem*.
19. Name the specific structure found at the distal end of a nerve that senses heat

20. Name the specific type of cells that synapse with olfactory sensory cells and pass through the olfactory tract _____
21. Name the structure in the inner ear where hair cells are found _____
22. Define/describe the function of the *optic chiasm*
23. In the nephron, fluid is forced out of the blood in the _____ and collected by _____
24. Define/describe *uricotelism*.
25. In teleost fishes a special duct carries eggs away from the ovary. Describe how this differs from most other vertebrates.
26. Name the bone found in the intromittent organ of many mammals _____

27. Define/describe a *bicornuate uterus*.

28. Within compact bone, canals that hold blood vessels and nerves are called _____

29. The *pit organ* of rattlesnakes senses what kind of radiation? _____

30. Define/describe *Bergman's Rule*.

31. Four features are usually given as characteristics of "vertebrates". However, only three of these are true synapomorphies of (found **only** in) the Craniata. Name these three.

_____, _____ and _____

32. As the size of animals increases, the _____ increases proportional to the cube (3rd power) of body length, while the _____ increases proportional to the square (2nd power) of body length.

33. Name the term used to describe the evolutionary retention of larval features of ancestors as adult features of descendants _____

34. Following the extinction of the dinosaurs at the end of the Cretaceous period, there were major radiations of mammals, birds, snakes, and teleost fishes. Name the period in which this occurred _____

35. Name two tissues or organs derived from *primary ectoderm*. _____, _____

36. In a vertebrate embryo at the hollow blastula stage, name the **process** that involves the inward migration of cells through the blastopore _____

37. *Radial* pterygiophores of fins are homologous with what part of the tetrapod limb?

38. A *movable* joint between bones is called a _____

39. Cells of the dermis are rich in collagen fibers, while cells of the epidermis are rich in _____

40. The sympathetic nervous system employs the neurotransmitter adrenaline (epinephrine) so is referred to as _____, while the parasympathetic nervous system employs acetylcholine so is referred to as _____

Section II - Longer Answer (10 points each).

1. Diagram and label a cross-section of the spinal cord and associated structures showing a somatic reflex arc with three neurons.

2. In some groups of vertebrates fossil series showing transitions from one form to another are incomplete, while in many groups very good transition series exist. Explain why we would expect good fossil series to be generally hard to find. Then name and describe two examples where good transitional fossil forms exist.

3. Diagram blood flow in the fetus of a placental mammal. Show the heart, lungs, and placenta and label important blood vessels and structures (particularly those unique to fetal circulation). Indicate where oxygen in the blood is high and where it is low.