

Exam Short Answer Assessment Rubric (assuming a 0-10 point scale)

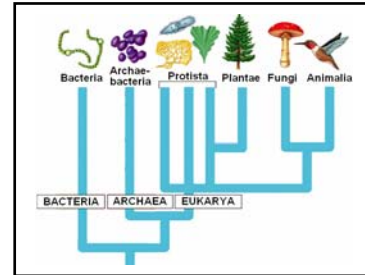
Criteria for a Grade of:

- “10”** Your response **consists of clear concise and insightful points that are substantiated by details of both content and context.** ALL essential terms relevant to the answer are presented and correctly used. No extraneous material is included. The sequence of phrases and/or sentences flows effortlessly and indicates a high level of organization, preparation, and effort. All words are legible.
- “9-8”** Your response **consists of clear concise and insightful points that are mostly substantiated by details of both content and context.** However, you will receive a “9-8” if essential terms or ideas relevant to the answer are vaguely or incompletely presented, or omitted. Or, if extraneous material or digressions are included, or if the answer is mostly complete, but clearly lacks organization, you will receive a “9-8.” Lastly, if there are illegible words within an otherwise mostly complete answer, you will receive a “9-8,” since one cannot tell if these illegible words contain material that is relevant.
- “7-5”** Your response **includes most of the major points to answer the question, however, critical supportive details, terms, explanations, etc. are incomplete or lacking.** You will also receive a “7-5” if the flow of information is choppy and lacks a rigor of focus and/or contains irrelevant information as filler. You will also receive a “7-5” if basic information is presented accurately but with little synthesis or insight. For example, simply listing terms without explanation when a question asks you to “List AND briefly explain...” will earn you a “7-5” for that response. As another example, omitting a figure when one is asked for will earn you a “7-5.”
- “4-1”** Your response **contains major content, contextural and/or logical flaws, and/or critical components of the answer are omitted.** Key terms, if present, are imbedded in glaring misconceptions. Few points are made beyond the obvious, and/or for essay responses, the flow of information is very choppy, poorly connected, and suggests a lack of preparation for that question.
- “0”** **You did not attempt to answer the question.**

PLEASE WRITE YOUR SECRET ID NUMBER HERE: _____

EVOLUTIONARY BIODIVERSITY

Q1. What are the basic principals of Phylogenetic Systematics?
 What is the tree diagram above supposed to show?
 (please answer this question in essay form)



(10 pts)

Q2. Please **CHOOSE ONE** of the questions below and answer it in the space provided.

QUESTION #2. What is wrong with the name of the large Domain of prokaryotic life called the "Archaeobacteria." What does this name mean? Why do you think they were given this name, and do they deserve it?

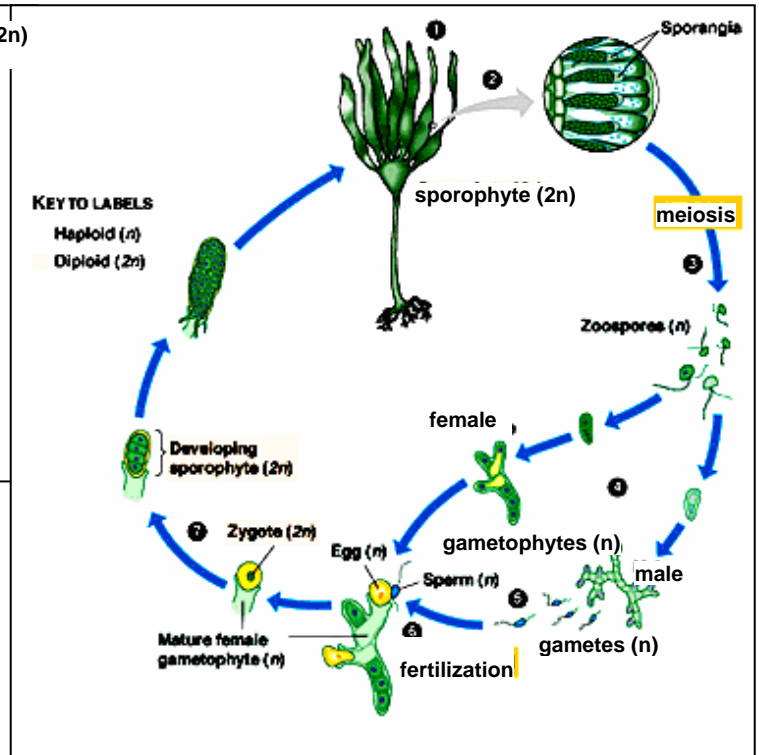
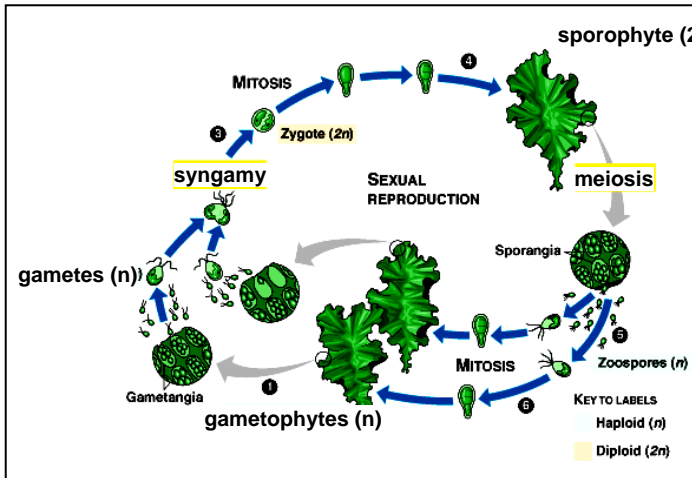
QUESTION #3. Describe the structure and function of the prokaryotic cell wall. Use a figure in your description. How do the various major groups of prokaryotes differ in their cell walls? What are the advantages and disadvantages of having a cell wall?

QUESTION #5. Since simple cell division results in identical daughter cells, there will be very little opportunity for genetic variation among clonal bacterial lineages. Yet, bacterial populations often exhibit at least as much genetic variation than do typical eukaryotic sexually reproducing species. Please list and briefly explain the major mechanisms that generate genetic variation within bacterial populations (hint: there are at least three major means).

Question #: _____

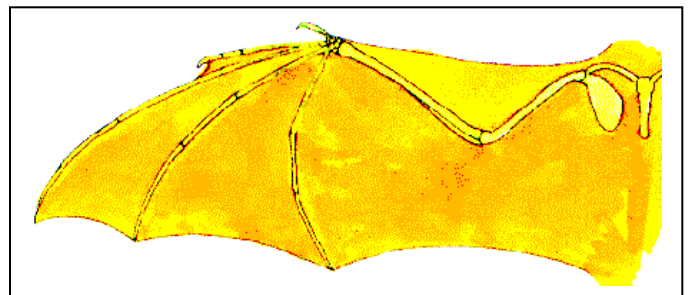
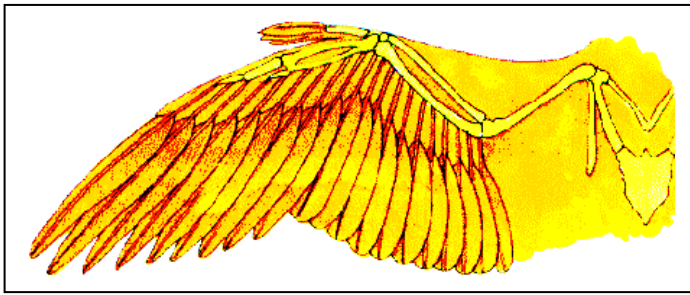
Its answer: _____

(10 pts)



Q3. Compare and contrast the Sea Lettuce life cycle (above) with the Kelp Life Cycle (at right) with respect to differences in the alternation of generations, gamete design, parental investment, and gender differences.

(10 pts)



The figures show the structure of the wings of a bird (left) and bat (right). Note the form and function of the arm and hand bones in these two “wings”.

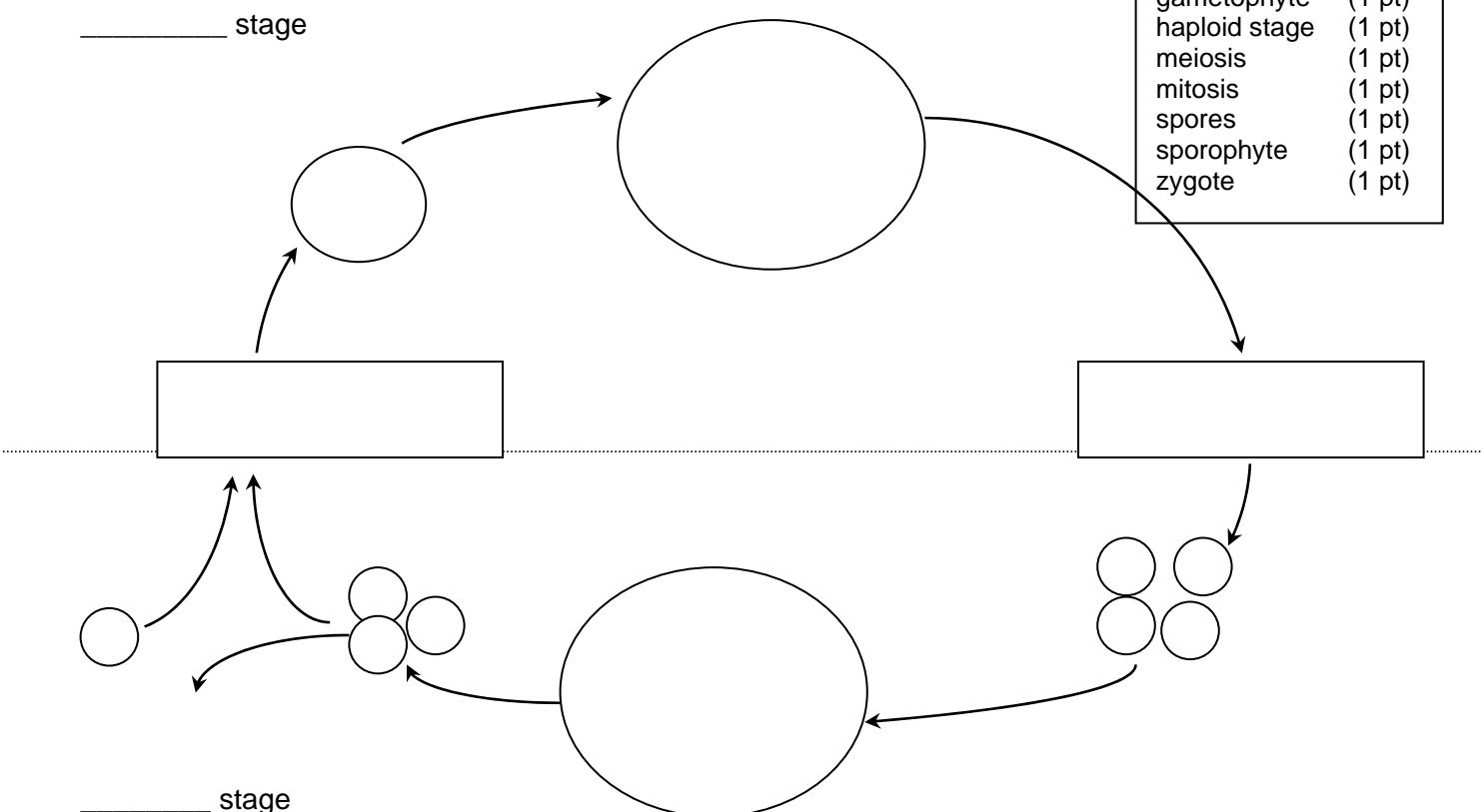
Q4. Use your knowledge of the concept of a “shared derived character” and explain if these “wings” are “homologous” or “analogous”? Please state your choice and write a brief essay including a definition of the terms homologous and analogous, and refer to specific details visible in the figures above to support your choice.

(10 pts)

Q5.

(a). Please clearly document the schematic figure below showing the generalized life cycle for a plant. Include in your figure ALL of the terms in the box at right to label either the appropriate life stage or process:

- | | |
|---------------|--------|
| diploid stage | (1 pt) |
| fertilization | (1 pt) |
| gametes | (1 pt) |
| gametophyte | (1 pt) |
| haploid stage | (1 pt) |
| meiosis | (1 pt) |
| mitosis | (1 pt) |
| spores | (1 pt) |
| sporophyte | (1 pt) |
| zygote | (1 pt) |



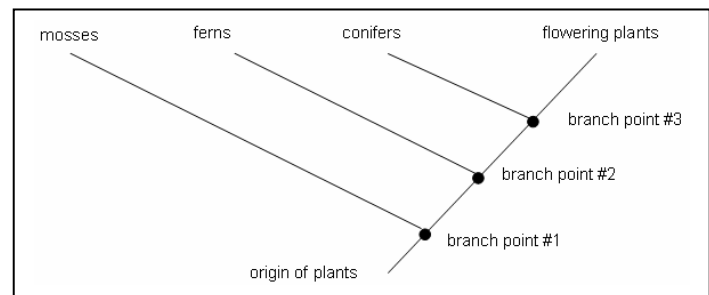
(10 pts)

(b). A major characteristic of plants is the "alternation of generations" during plant life cycles. What exactly alternates?

(5 pts)

PLANT EVOLUTIONARY BIODIVERSITY

Q6. Consider the diagram below showing the evolutionary relationships among the major groups of plants:

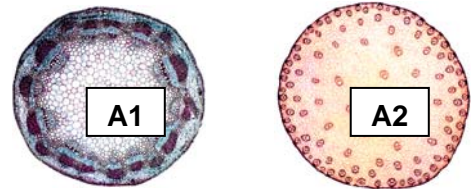


- (a). Branch point #1 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in mosses that derive to the LEFT.
(5 pts)
- (b). Branch point #2 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in ferns that derive to the LEFT.
(5 pts)
- (c). Branch point #3 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in conifers that derive to the LEFT.
(5 pts)

Q7. Please CHOOSE ONE of the questions below and answer it on the NEXT PAGE:

A. Adaptations of Plant Transport Systems.

- (a) Which of the stem cross sections at right is from a monocot? Please briefly explain how can you tell?
- (b). Briefly describe the major differences in the structure and function of xylem and phloem in angiosperms.



C. Adaptations of Plant Photosynthetic Systems: Leaf and Stem Design

Sketch and briefly describe the basic form and anatomy of photosynthetic tissues. Please include in your answer defining explanations of the terms chloroplast, granum, stroma, thylakoid, and Calvin Cycle.

D. Adaptations of Plant Development and Growth

Describe the basic properties (structure and function) of the following plant tissue types: dermal, vascular, and ground tissue. Please also indicate which possesses parenchyma, collenchyma, and sclerenchyma cell types.

E. Adaptations of Plant Nutrient Demand and Mutualisms for Nutrient Acquisition

Please briefly describe the process of plant carnivory as a “novel” strategy for obtaining nutrients. How do carnivorous plants function, what critical nutrients are acquired? Lastly, please explain how these plants might have evolved?

F. Adaptations of Plants to Defend Against Predators, Parasites, and Diseases

Please briefly describe one important example of a coevolutionary mutualism involving invertebrates in defense of plants.

G. Adaptations of Plant Sensory Systems, Physiological Regulation and Environmental Response

Please briefly describe the roles of the following three plant hormones: auxin, cytokinins, and gibberellins.

Q7. Please write your answer to this question here:

Question Letter: _____

Its Answer:

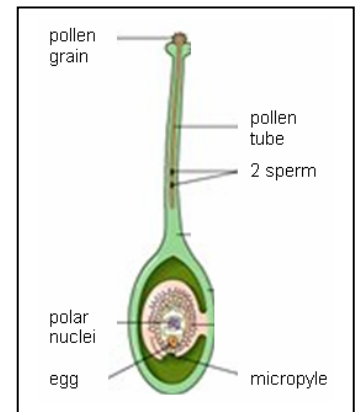
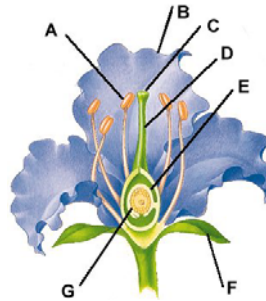
(10 pts)

Q8. Please fill in the blanks with the appropriate term:

- (a). "The delayed meiosis hypothesis suggests that by delaying meiosis and growing a large multicellular sporophyte many more _____ (2 pt) can be produced per mating."
- (b). "The condition in which gametes for the mating types are identical is called _____ (2 pt)."
- (c). "The condition in which gametes for the mating types differ is called _____ (2 pt)."

Q9. Please examine the flower diagram at right and place the appropriate letter next to each of the terms below

- ovary _____ (1 pt)
- style _____ (1 pt)
- anther _____ (1 pt)
- stigma _____ (1 pt)
- sepal _____ (1 pt)
- petal _____ (1 pt)



Q10. Angiosperms are noted for a unique method of ovule fertilization known as "double fertilization" Please refer to the figure at right and briefly explain "double fertilization."

(6 pts)

Q11. Please **CHOOSE ONE** of the questions below and answer it in the space provided.

QUESTION #1. How exactly do stomata open and close? How do guard cells work? Specifically explain the roles of ions and any plant hormones.

QUESTION #4. Some cacti thrive in some of the hottest deserts on earth where water is extremely scarce for most of the year. To deal with the scarcity of water, cacti have evolved an unusual set of adaptations including a remarkable capacity to soak up water into fleshy stems when it rains and hold onto this water during drought. One way cacti have to hold onto water is to ONLY open their stomata at night when it is cooler and more humid. However, if CO₂ is only allowed into these plants at night how are cacti able to synthesize sugar with it via photosynthesis during the day many hours later?

QUESTION #12. What role do stomata play in the solution to the problem of getting water up to the leaves from the roots of woody plants (which for a tall tree such as a redwood can be over 350 feet up!)? Using a little system diagram, sketch and describe the role of stomata in water uptake.

Question #: _____
Its answer: _____

(10 pts)

Q12.

Why might there be a higher density of stomata for leaves in the sun than leaves in the shade? Please note that you must use all of the terms in the box below correctly in your response.

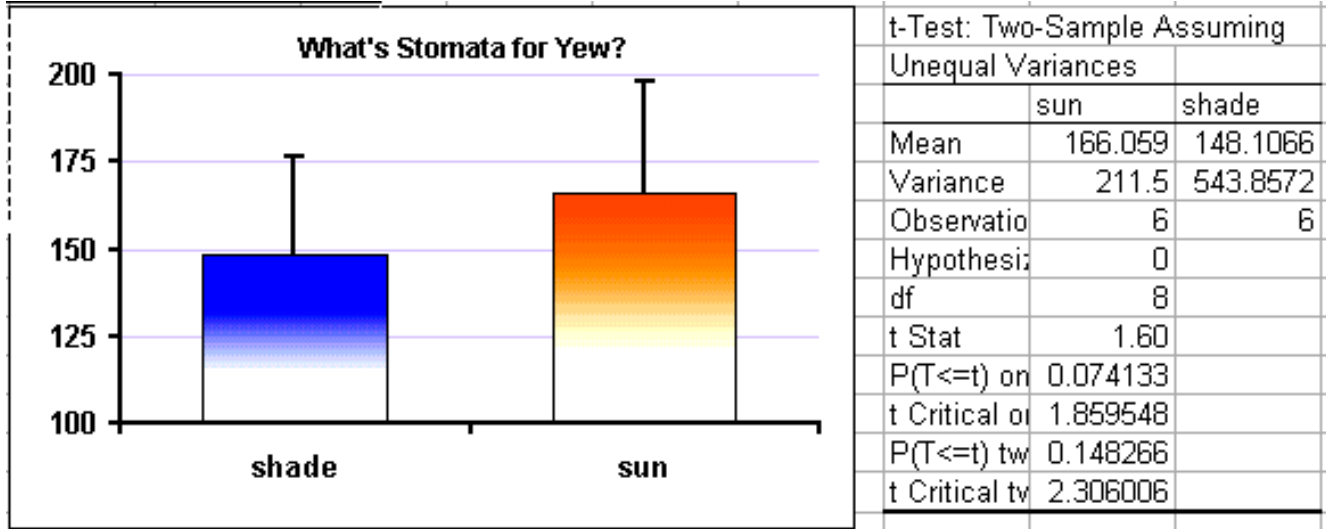
carbon dioxide	evaporative cooling	evolution	adaptation
photosynthesis	leaf temperature	natural selection	

(10 pts)

Q13.

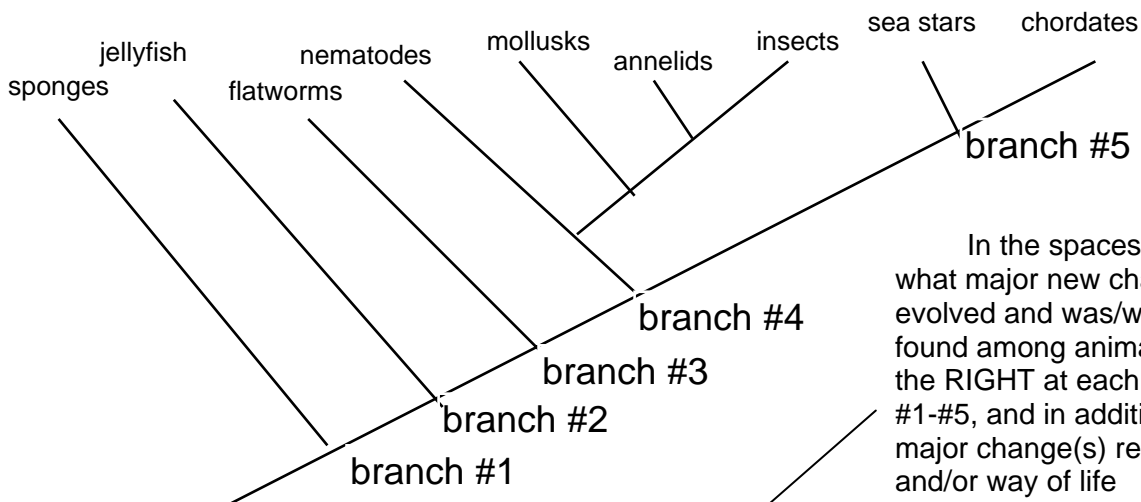
- (a) Below is an analysis table and graph of stomata data (on a yew plant for the sun versus shade). According to this analysis, is there a significant difference between the density of stomata in the sun versus the shade?

Yes or No ?? (2 pts)



- (b) Explain exactly what information on this printout gives you the answer to the above question? (4 pts)
- (c) How confident are you about this conclusion? Please use specific numbers from the figure above to justify your response. (4 pts)

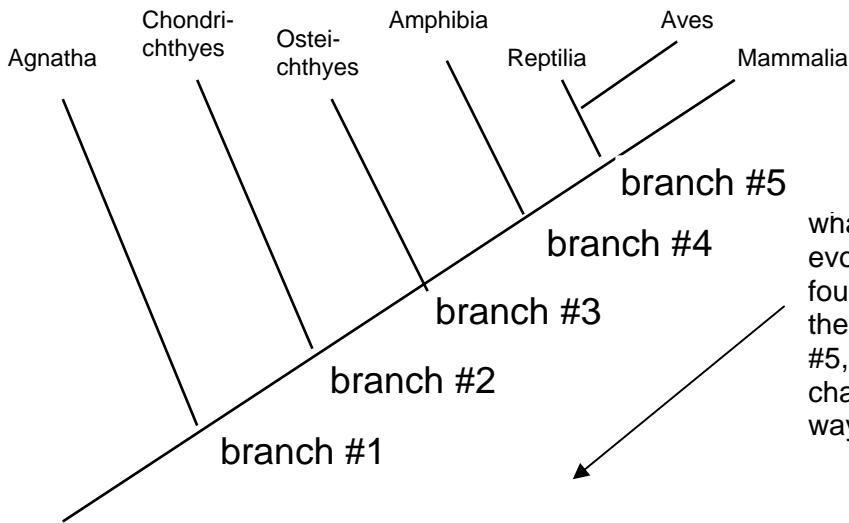
Q14 Consider the diagram below showing the evolutionary relationships (and branch points) among the major phyla of the Animal Kingdom:



In the spaces below, please list what major new characteristic(s) evolved and was/were subsequently found among animals who derived to the RIGHT at each numbered point #1-#5, and in addition state what major change(s) resulted in habitat and/or way of life

- branch #1 - (4 pts)
- branch #2 - (4 pts)
- branch #3 - (4 pts)
- branch #4 - (4 pts)
- branch #5 - (4 pts)

Q15. Consider the diagram below showing the evolutionary relationships (and branch points) among the major groups of the chordate sub-phylum vertebrata:

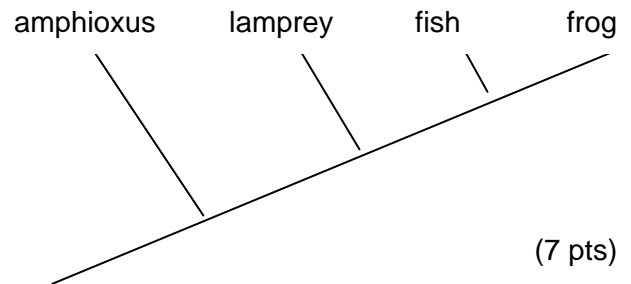


In the spaces below, please list what major new characteristic(s) evolved and was/were subsequently found among animals who derived to the RIGHT at each numbered point #1-#5, and in addition state what major change(s) resulted in habitat and/or way of life

- branch #1 - (4 pts)
- branch #2 - (4 pts)
- branch #3 - (4 pts)
- branch #4 - (4 pts)
- branch #5 - (4 pts)

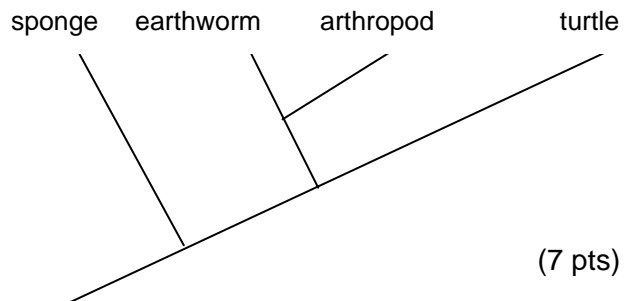
Q16. Skeletal Muscular System

(a). Please briefly explain the major trends in the evolution of the structure and function of the **skeletal** system among the four taxa depicted at right. (amphioxus, agnatha (jawless fish), fish, frog)



(7 pts)

(b). Please briefly explain the major trends in the evolution of the structure and function of the **skeletal** system among the four taxa depicted at right. (sponge, earthworm, arthropod, turtle)



(7 pts)

(c). Please list and briefly describe the three major types of muscle tissues (hint: their names are striated, smooth and cardiac...)

- striated –
- smooth –
- cardiac –

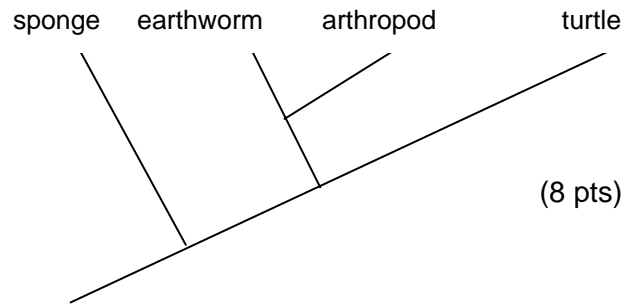
(6 pts)

Q16. Circulatory System

(a) What is the Ecological Problem solved in the Circulatory System? Please explain.

(3 pts)

(b). Please briefly explain the major trends in the evolution of the structure and function of the **circulatory** system among the four taxa depicted at right. (sponge, earthworm, arthropod, turtle)



(8 pts)

(c). Describe the main features of the heart in each of the organisms below.

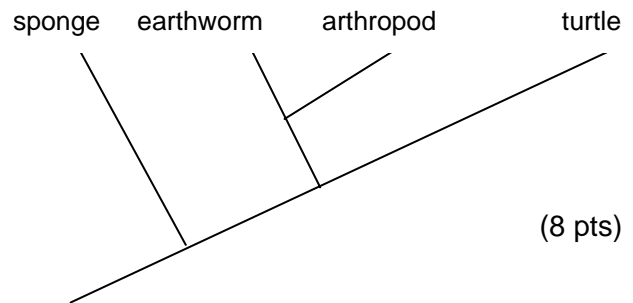
- fishes - (3 pts)
- amphibians - (3 pts)
- birds (Aves) - (3 pts)

Q17. Respiratory System

(a) What is the Ecological Problem solved in the Respiratory System? Please explain.

(4 pts)

(b). Please briefly explain the major trends in the evolution of the structure and function of the **respiratory** system among the four taxa depicted at right. (sponge, earthworm, arthropod, turtle)



(8 pts)

(c). Compare and contrast the respiratory system for humans versus birds.

(8 pts)

Q18. Digestive System

(a) What is the Ecological Problem solved by the Digestive System? Please explain.

(2 pts)

(b) Describe the structure and function of the digestive system of the animals listed below. Include in your answer the following terms where appropriate: filter feeders, acoelomates, coelomates, pseudocoelomates, ruminants, cecal digestors, herbivores, omnivores, carnivores.

- sponges – (3 pts)
- cnidarians – (3 pts)
- cows or rabbits (circle) (4 pts)
- sharks (4 pts)
- humans – (4 pts)

Q19. Reproductive System

(a) What is the Ecological Problem solved by the Reproductive System? Please explain. (2 pts)

(b) Please define Hermaphroditism. (2 pts)

(c) Please describe the basic differences between internal and external fertilization. (4 pts)

(d) Choose two different animals representative of each reproductive mode and describe in detail the structure and function of their reproductive systems for males and females. (10 pts)

Q20. Excretory System

(a) What are the TWO Ecological Problems solved by the Excretory System? Please explain.

1 –

(2 pts)

2 –

(2 pts)

(b) Please define osmoregulation.

(2 pts)

(c). Each of the following taxa uses a different type of structure or organ for excretion of nitrogenous waste. Briefly describe this structure or organ and briefly explain what it does.

Platyhelminthes Class tubelaria- flat worms (2 pts)

Annelida – Class Oligochaeta- Segmented worm (3 pts)

Arthropods Class insecta – insects (3 pts)

Vertebrata Class mammalia - mammals (6 pts)

Q21. Sensory System

(a) What is the Ecological Problem solved by the Sensory System? Please explain.

(4 pts)

(b). How is the sense of hearing similar and how is it different between humans and fishes?
similarities –

(4 pts)

differences –

(4 pts)

(c). How is the sense of vision similar and how is it different between humans and insects?
similarities –

(4 pts)

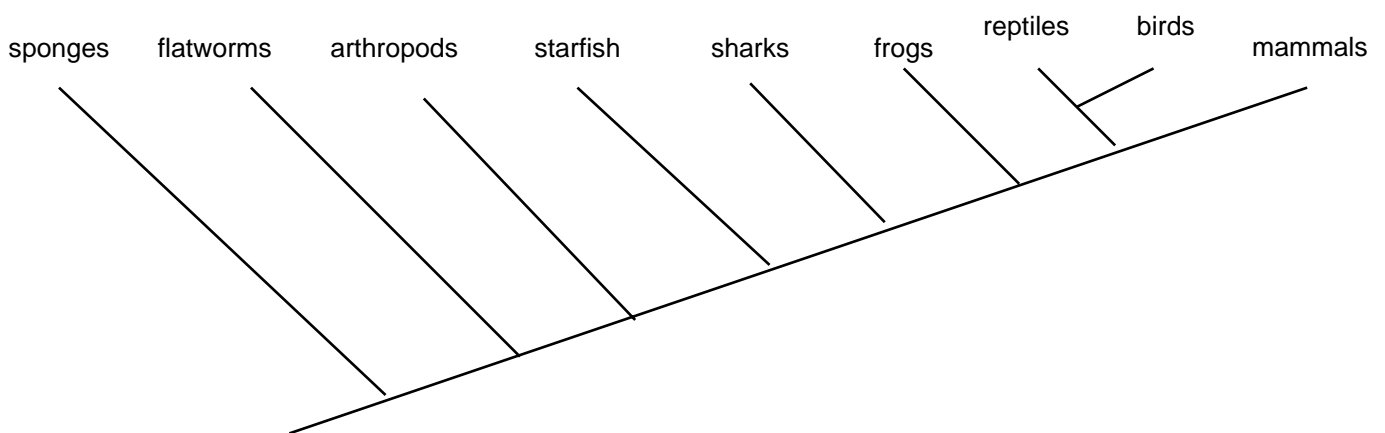
differences –

(4 pts)

Q22. Nervous System

(a) What is the Ecological Problem solved by the Nervous System? Please explain.

(4 pts)



(b). Please explain what are the major evolutionary trends in nervous system design that one finds across the entire animal kingdom. Please refer to the diagram above (but please do not do into unnecessary detail for every organism shown above – EXPLAIN THE BIG PICTURE.?)

(16 pts)

Q23. Endocrine System

- (a) What is the Ecological Problem solved by the Endocrine System? Please explain. (3 pts)
- (b) Please define homeostasis. (2 pts)
- (c) Please list and explain the structure and function of 5 major human endocrine glands
- 1 – (3 pts)
- 2 – (3 pts)
- 3 – (3 pts)
- 4 – (3 pts)
- 5 – (3 pts)

EXTRA CREDIT QUESTION:

According to the syllabus, there are four major Objectives to the lab portion of the course. Please list and briefly explain each of them.

- Lab Objective #1 – (3 pts)
- Lab Objective #2 – (3 pts)
- Lab Objective #3 – (3 pts)
- Lab Objective #4 – (3 pts)

Question 7-I1. WHAT SYSTEM DID YOU STUDY? _____

What is the one really good question ON YOUR SYSTEM that you were prepared to answer that we did not ask you? And, what is the answer to that question?

- (a). the ESSAY question we didn't ask ON YOUR SYSTEM -
(note: think carefully about what question you put down here – it must be a question that warrants a detailed response of at least ½ a page. Your maximum score for part (b) will depend on the degree of difficulty of the question you ask here [just like diving!]) (5 pts)
- (b). its answer - (10 pts)

Question 7-I2. WHAT SYSTEM DID YOU STUDY? _____

What is the one really good question ON A SYSTEM **OTHER THAN YOUR STUDY SYSTEM** that you were prepared to answer that we did not ask you? And, what is the answer to that question?

- (a). the ESSAY question we didn't ask on a DIFFERENT SYSTEM –
(note: think carefully about what question you put down here – it must be a question that warrants a fairly detailed response of at least ½ a page. Your maximum score for part (b) will depend on the degree of difficulty of the question you ask here [just like diving!])) (5 pts)
- (b). its answer - (10 pts)

Please Read This Comment: You are welcome to download some or all of the material we have posted at this site for your use in your biology or other courses. This does not include commercial uses for profit. If you do use any lengthy excerpts (more than 2 lines) of the material above, we request that you formally acknowledge this site and/or sites we have acknowledged as the source(s). We also request that you reciprocate and send us a copy of your biology exam materials so that we may see what you have put together. Please send comments to: grant@pop1.science.widener.edu.

Copyright - Bruce W. Grant, and Itzick Varnick 2005.

