

## Study Guide for 1st Midterm

1. Describe four characteristics of arthropods that distinguish them from other invertebrate phyla.
2. Distinguish between monophyletic, paraphyletic and polyphyletic phylogenetic relationships. Use diagrams to clarify your definitions if necessary. Give an example of each (they don't have to involve invertebrate taxa).
3. Distinguish between homologous and analogous (convergent) characters. What role does each play in evolutionary analysis?
4. Distinguish among the following kinds of character states sympleisomorphy, synapomorphy, and autapomorphy.
5. What is a sister-group? Give an example.
6. Outline two phylogenetic hypotheses concerning the relationships among the Arthropoda, Annelida and Mollusca. Give any evidence you can in support of your hypotheses.
7. What are the four major groups (subphyla) within the Arthropoda?
8. Explain the difference between biramous and uniramous limbs. Why were they thought to be important in arthropod phylogeny?
9. Explain the difference between gnathobasic and whole-limb jaws. Why were they thought to be important in arthropod phylogeny?
10. Sidney Manton argued that the Arthropoda had a polyphyletic origin, whereas Willi Hennig and others argued in favor of a monophyletic origin. What kinds of characters did these researchers use to come to their conclusions? Why do you think that the characters selected had such an important effect on the researchers' conclusions.
11. What are the major groups in the Atelocerata? List three characters that these groups share that distinguish them from other arthropods.
12. What characters distinguish the Hexapoda from the Myriapoda.
13. Why do entognathans have their name?
14. Define the following terms and give an example of each: Apterygota, Pterygota, Paleoptera, Neoptera.
15. What are the major groups of orders within the Neoptera? Which ones are thought to be formal monophyletic groups and which are thought to be informal groups?

16. The Dictyoptera is thought to be a monophyletic group consisting of three orders, the Mantodea, Blattodea, and Isoptera. Some entomologists have argued that the Isoptera split off from the *Cryptocerus* cockroaches. If true how would you arrange the phylogenetic tree of the Dictyoptera? What does this tell you about validity of the three orders?
17. Why are the phylogenetic relationships of the orders in the "Orthopteroid Complex" so hard to determine?
18. What evidence is there that acoustical communication arose more than once within the Orthoptera?
19. What characteristics do the parasitic orders Phthiraptera and Siphonaptera have in common? Are these the result of convergent evolution or a shared evolutionary heritage? Explain your answer.
20. What is unusual about the development of the Thysanoptera?
21. Distinguish between Exopterygota and Endopterygota.
22. Distinguish between the four major schemes of insect development (ametabolous, hemimetabolous, paurometabolous, and holometabolous). Name an insect order that follows each of these schemes.
23. What three orders are thought to be most useful in biological control of insect pests?
24. Why is the Coleoptera so successful?
25. What insect orders transmit human disease?
26. What single factor is thought to have led to the diversification of the Lepidoptera?
27. Briefly describe the natural history of the two major informal groups in the Apocrita of the Hymenoptera.
28. Distinguish between the three basic orientations of insect mouthparts (hypognathous, prognathous and opisthognathous). Give an example of each. What do these orientations tell you about the feeding habitats of the insects that possess each of them?
29. Briefly describe the five basic structures of insect mouthparts, noting their orientation to one another and their general function. How have these mouthparts been modified to produce the sucking tube in the order Hemiptera (Lepidoptera, Diptera, etc.)? If you use sketches in your answer, be sure to label everything clearly.
30. Briefly describe how mandibles with one and two points of articulation differ in their movement.

31. What are the two main common features of sucking mouthparts in insects? What functions do they serve?
32. Provide evidence that sucking mouthparts have evolved independently numerous times in insects.
33. How do the sucking mouthparts of the Lepidoptera and the Hymenoptera differ from one another?
34. Define the following morphological terms associated with the sucking/lapping mouthparts of Diptera: haustellum, rostrum labellae, pseudotracheae.
35. What are the four basic categories of feeding habits? Give an insect example of each.
36. What is the difference between monophagy, oligophagy and polyphagy? Give examples involving insects.
37. What is the difference between phagostimulants and token stimuli in promoting feeding behavior?
38. Briefly describe four solutions employed by insects in neutralizing the effects of xenobiotics in the diet. Give examples.