Biol 11 Ch 29 REVIEW ANSWERS: Echinoderms and Invertebrate Chordates

1. List the 4 characteristics that unify the echinoderms. ***Echinoderms have 5-part radial symmetry, spiny skin (that's what the name means, a water vascular system and an endoskeleton. (they also have tube feet)***
2. List the 3 characteristics that unify the chordates. ***Chordates have a notochord, pharyngeal slits, and a hollow, dorsal nerve cord.***
3. Why are echinoderms considered our relations? (distant, that is!) ***Echinoderms are the most primitive animals to have an endoskeleton like ourselves, and the larvae of echinoderms is very similar to other chordates' larvae. We believe that chordates share our ancestors, so echinoderms must also be related in some way.***
4. How are the "top" and the "bottom" of a starfish described? ***The "top" surface is called the aboral surface; the "bottom" (where it's mouth is) is called the oral surface.***
5. Describe the water vascular system, listing all its structures. ***Water enters the water vascular system through the madreporite (acts like a sieve to prevent larger pieces of debris from entering) and moves to the ring canal. From the ring canal, radial canals branch into the legs. The tube feet are attached to the radial canals. There can be hundreds of tube feet on each arm. When water is forced into the tube feet, they lose their suction and let go of whatever they were holding. When water is pulled out of the tube feet, the ends of the feet act like suction cups and "stick" to whatever they were touching. One tube foot is not very strong; it is only when many tube feet attach to something that there is any strength in the attachment.***
6. What is the water vascular system used for in echinoderms? ***The water vascular system is used for locomotion of the animal, and sea lilies use the feet to capture plankton when they are filter feeding. The system also provides internal transport distributing oxygen and carrying carbon dioxide. Since the tube feet have very thin skin covering them, gases are exchanged through the tube feet,(respiration) and metabolic wastes are excreted through the tube feet.***
7. Describe the step-by-step process that would occur after a starfish captured a bivalve. ***The starfish uses its tireless tube feet to open the bivalve. Once opened, the starfish flips its stomach out of its mouth and into the bivalve. It releases digestive enzymes into the shell. The enzymes digests the bivalve inside its own shell, the stomach absorbs the nutrients, and the pulls its stomach back inside its body. Solid wastes pass out through the anus.***
8. How and what do sea lilies/basket and brittle stars eat? ***Sea lilies, basket stars and some brittle stars use their tube feet to capture plankton from the water when they filter feed.***
9. How and what do sea cucumbers eat? ***Sea cucumbers eat like earthworms do; they suck in the ocean floor in front of them, sand, detritus and all. They digest the detritus, and the sand and solid wastes pass out through their anus. They often leave a trail of castings behind them as they move along the ocean floor.***

10. How do echinoderms breathe? ***Echinoderms exchange gases through the thin skin of the tube feet. Some also have skin gills for picking up oxygen. The oxygen is distributed through the body with the water vascular system.***
11. How do starfish distribute nutrients to its cells? ***Nutrients are distributed by the digestive glands themselves – they are highly branched and reach most of the tissues.***
12. Where does excretion of solid waste occur in echinoderms? What is the one exception to this rule? ***All echinoderms have an anus; solid wastes exit the body there. The exception is the brittle star, that has no anus, so solid wastes exit via the mouth.***
13. Where do metabolic wastes get excreted in echinoderms? ***Metabolic wastes are excreted from the body in the form of ammonia through the thin walls of the tube feet and in some causes, the skin gills.***
14. How is the nervous system of starfish arranged? ***Echinoderms have a nerve ring that surrounds the mouth and radial nerves branching from the ring that enervate the arms.***
15. What major structure of a nervous system do echinoderms lack? ***Echinoderms do not have a brain.***
16. What types of sensory cells do echinoderms have? ***Echinoderms have chemoreceptors and statocysts. They are scattered around the body. They also have many eyespots that detect light at the ends of their arms.***
17. How do starfish move? Sea urchins? Sea cucumbers? ***Starfish use their tube feet and muscle fibres pulling against the endoskeleton to move. Sea urchins and sand dollars have their endoskeleton fused, so they have to move their spines that project outside their body. They use their tube feet along with the spines to move. Starfish, brittle stars and feather stars use their arms to move; feather stars can even swim a short distance by flapping their arms. Sea cucumbers move like earthworms, by contracting their muscles.***
18. What type of sexual reproduction do starfish employ? How is this executed? ***Starfish use external fertilization. Starfish release their gametes into the ocean during the mating season. If other starfish detect starfish gametes in the water, they release theirs as well.***
19. Describe the lifecycle of a starfish. ***Fertilized starfish eggs hatch into a free-swimming larva that has bilateral symmetry. This larval form is very similar to the larvae of the invertebrate chordates. The larva swims around with the rest of the plankton for awhile; many echinoderms are eaten at this stage by filter feeders. If the larvae live, the eventually swim to the ocean floor where they undergo metamorphosis and change into the radially symmetrical adult form of the echinoderm. There are separate sexes of echinoderms – they release their gametes (eggs and sperm) into the water during mating season when they detect other gametes in the water.***
20. What happens to a starfish if you cut it up? ***Starfish are able to regenerate themselves provided that a portion of the middle section of their body is in place.***
21. List the 5 classes of echinoderms. Study the pictures in the book and be prepared to identify these classes and some individuals on the test. ***The five classes include***

the starfish, the sea urchins/sand dollars, the sea cucumbers, the brittle stars and the sea lilies/sea feathers.

22. How do echinoderms (site the different classes) defend themselves against predators? ***Starfish have a tough, spiny skin, and they hide in dark places most of the day to avoid predators. Sea urchins use their spines to protect themselves; one species even have poisons on the end of their spines. Sand dollars dig themselves into the sand. Brittle stars are faster than most echinoderms – they can escape and they also have the ability to drop an arm – it will wriggle wildly while the rest of the animal scurries away. Some sea cucumbers can cover their predator in glue, which immobilizes them.***
23. How does the endoskeleton of starfish differ from the sand dollars and sea urchins? ***The endoskeleton of a starfish (and brittle stars) are flexible and can bend a bit for movement. The sand dollars and the sea urchins have endoskeletons that have fused to make a solid box. They are inflexible, so they have to find a different way to move.***
24. Why are evolutionists interested in sea lilies and feather stars? ***These are the most ancient of the echinoderms – there are fossils of these animals that date back a very long time.***
25. What makes sea urchins the perfect subject for studying embryology? ***Sea urchins have extremely large eggs, and they are fertilized externally. This makes them very easy to study, since you don't have to set up elaborate conditions to watch the fertilization and development processes.***
26. What is a notochord? What happens to it? ***A notochord is a long, flexible supportive rod. It usually is only a developmental stage and will be replaced by the backbone in vertebrates.***
27. How do pharyngeal slits differ between aquatic chordates and terrestrial? How about humans? ***In aquatic chordates, the pharyngeal slits remain and usually, gills will develop beneath them. In terrestrial chordates, the slits only remain for a short time in the period of development, and then they close up. In humans, the pharyngeal slits don't ever really appear – pouches appear in this region which will soon also disappear.***
28. Why are tunicates included in the chordate classification? ***Tunicate larvae exhibit the 3 characteristics of chordates.***
29. How do tunicates eat? ***They are filter feeders that use their gills to filter plankton out of the water. They have a digestive system, and solid wastes exit via the anus.***
30. What do lancelets have that adult tunicates don't? ***Lancelets have a head! They also retain their notochord and the hollow dorsal nerve cord is still in the correct place.***
31. How are the muscles/nerves of a lancelet arranged? Why is this significant? ***There muscles and nerves show evidence of segmentation. Muscles are v-shaped and paired on each side of the body. Each muscle gets one nerve that branches from the main nerve cord. This is the same way that all vertebrates have their muscles and nerves arranged – a further piece of evidence that we may have had a common ancestor with the invertebrate chordates.***

32. Lancelets look a lot like fish, except for the fact that they have no ***jaw or appendages. They have to wriggle their bodies back and forth to move.***.
33. What is the common theory regarding the evolution of chordates, invertebrate and vertebrate? ***It is thought that vertebrate and invertebrate chordates shared a common ancestor. Both branches have probably evolved a great deal since we branched off from each other.***

34. Label the diagrams of the starfish and the lancelet and the tunicate.

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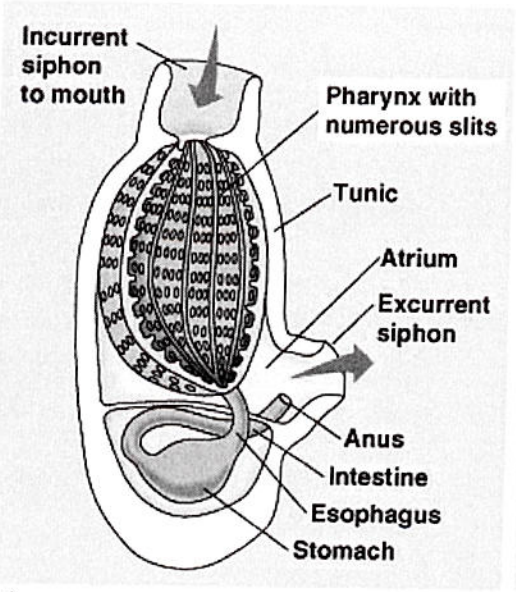

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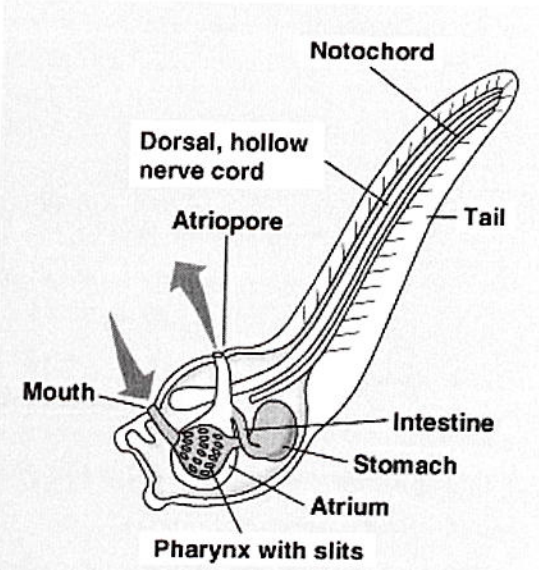

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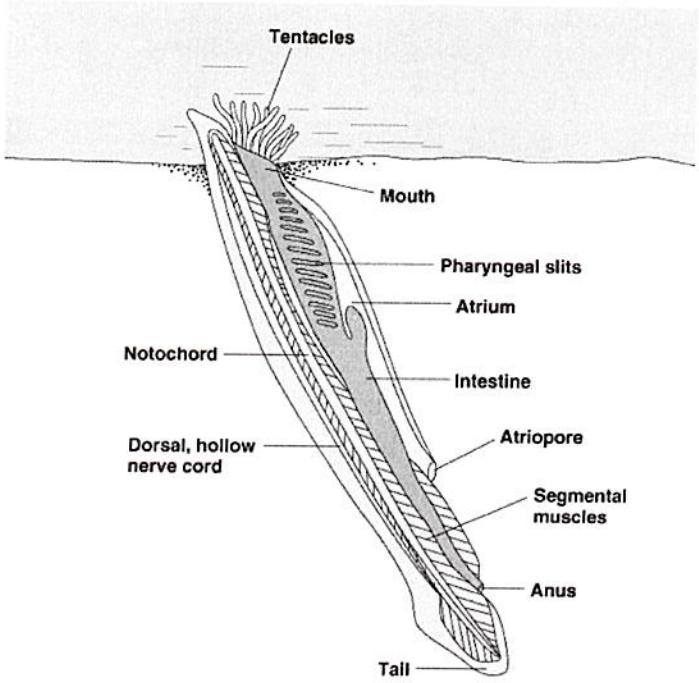

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