

## Evolution of Circulatory and Respiratory Systems Concept Questions

1. Why do some organisms require a circulatory system while others do not?
2. Seaweeds can attain large sizes without the presence of support or vascular tissue while mosses cannot. Why did the transition to a terrestrial lifestyle for plants require a system of transport?
3. Root hairs are small structures on roots that increase the surface area of the root. Why is it important for root hairs to develop soon after germination?
4. Explain why xylem and phloem together can be considered a transport system.
5. Cork is a tough, waterproof tissue that replaces the epidermis in some plants. Older roots become covered in cork as they mature. Explain. Would you expect both young and old roots to have vascular tissue? Explain.
6. How does the cooperation of transpiration-cohesion-tension theory and root pressure result in water moving throughout the entire plant?
7. If you were able to inject some air bubbles into the xylem vessels of a tree, what would happen?
8. Explain the pressure flow hypothesis.
9. Why are maple trees tapped in early spring rather than in summer or autumn?
10. Explain the compromise the plant has to make between photosynthesis and water conservation.
11. Why are open circulatory systems found mostly in animals that are small?
12. Some organisms have a circulatory system with blood but the blood has no hemoglobin.
  - a) What is the function of the blood in these organisms?
  - b) Why is it an advantage to have hemoglobin in the blood?
13. How is circulation through two loops (as in amphibians, birds, and mammals) superior to circulation through just one (as in the fishes)?
14. The blood that enters the lungs of an amphibian has relatively (more, less) oxygen than the blood that enters the gills of a fish. The reason for this is that the blood that goes from an amphibian's heart to its lungs is \_\_\_\_\_. The blood that is carried to all organs of a fish's body is \_\_\_\_\_. The blood that is carried to the fish's gills is \_\_\_\_\_. The blood that is carried to the organs of an amphibian is \_\_\_\_\_.
15. Why is the three chambered amphibian heart not as efficient as a four chambered heart?
16. What purpose is served by the respiratory system?

17. Why do organisms require oxygen?

18. a) Why do some organisms require a respiratory system while others do not?

b) Why is a respiratory surface an important part of the respiratory system?

19. Why are gills necessary in more complex organisms such as molluscs?

20. There is far more  $O_2$  in the air than in an equal volume of water. Despite this fact, the gills of a fish are able to extract sufficient  $O_2$  from the water but not from the air. Hence, a fish out of water suffocates. Explain why this is so.

21. a) What is a tracheal respiratory system?

b) Why is it an advantage?

c) Why is this especially important for flying insects?

22. a) Why are amphibians considered to be transitional between fishes and terrestrial vertebrates?

b) What adaptations allowed amphibians to colonize the land?

c) What features of the frog restrict them to living near the water?

d) State the advantage and disadvantage of using the skin as a respiratory surface.

23. How has the respiratory system of birds developed over that of other vertebrates?

24. Why is the respiratory surface for terrestrial organisms inside rather than outside the body?