

Evolution of Circulatory and Respiratory Systems Concept Questions

1. Why do some organisms require a circulatory system while others do not?
2. a) Seaweeds live in water and are large compared to mosses which live on land. Neither have vascular tissue. Provide an explanation for this difference.
b) Explain how the transition to a terrestrial lifestyle for plants required the evolution of vascular tissue.
c) Why is long-distance transport important for vascular plants?
3. What three important features are used by botanists to divide plants into four groups?
4. 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?
5. Explain why xylem and phloem together can be considered a transport system.
6. 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.
7. How does the cooperation of transpiration-cohesion-tension theory and root pressure result in water moving throughout the entire plant?
8. a) If you were able to inject some air bubbles into the xylem vessels of a tree, what would happen?
b) How does your answer to (a) explain why, if you buy cut flowers, it is best to cut the stems underwater and then transfer the flowers to a vase while the cut ends are still wet?
9. Explain how the pressure flow hypothesis accounts for the movement of food in a plant.
10. Why are maple trees tapped in early spring rather than in summer or autumn?
11. Explain the compromise a plant has to make between photosynthesis and water conservation.
12. Why are open circulatory systems found mostly in animals that are small?
13. 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?
14. How is circulation through two loops (as in amphibians, birds, and mammals) superior to circulation through just one (as in the fishes)?
15. The blood that enters the lungs of an amphibian has relatively (more or less (choose one)) 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 _____.
16. Why is the three chambered amphibian heart not as efficient as a four chambered heart?

17. What purpose is served by the respiratory system?
18. Why do organisms require oxygen?
19. a) Why do some organisms require a respiratory system while others do not?
b) Describe the importance of surface area to the respiratory surface.
20. Why are gills necessary in more complex organisms such as molluscs?
21. There is far more O₂ in the air than in an equal volume of water. Despite this fact, the gills of a fish are able to extract sufficient O₂ from the water but not from the air. Hence, a fish out of water suffocates. Explain why this is so.
22. a) What is a tracheal respiratory system?
b) Why is it an advantage?
c) Why is this especially important for flying insects?
23. 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.
24. How has the respiratory system of birds developed over that of other vertebrates?
25. Why is the respiratory surface for terrestrial organisms inside rather than outside the body?