

Chapter 19 Liquids

# Exercises

## 19.1 Liquid Pressure (pages 363–365)

1. Define pressure in words.

Pressure is defined as the force per unit area on which force acts.

---



---

2. What is the equation for pressure?  $\text{pressure} = \frac{\text{force}}{\text{area}}$

3. What three factors determine the pressure of a liquid?

gravity; density; depth

---

4. Is the following sentence true or false? How much a liquid weighs, and thus how much pressure it exerts, depends on its density. true

5. Consider two identical containers, one filled with a dense liquid and the other filled to the same depth with a less dense liquid. Which container exerts more pressure?

The container filled with the denser liquid exerts more pressure.

---



---

6. Circle the letter of each statement that is true.

a. The pressure of a liquid at rest does not depend on the shape of the container or the size of its bottom.

b. The pressure due to liquid = density  $\times$   $g$   $\times$  depth.

c. At a given depth, a liquid exerts more pressure on the bottom of its container.

d. The total pressure of a liquid is: density  $\times$   $g$   $\times$  depth *plus* the pressure of the atmosphere.

7. Is the following sentence true or false? The pressure of a liquid depends on the amount of liquid. false

8. One dam holds back the water from a large, but shallow lake. Another dam holds back the water from a small, but deep lake. Which dam must withstand the greater pressure?

The dam that holds back water from the small, but deep lake.

---



---

9. What principle about liquid and pressure do Pascal’s vases demonstrate?

The pressure of the liquid is the same at any given depth below the surface, regardless of the shape of the container.

---



---



---

## Chapter 19 Liquids

### 19.2 Buoyancy (pages 366–367)

10. The **buoyant force** is the net upward force exerted by a fluid on a submerged or immersed object.

Match each sentence with the correct result.

- |  |  |
|--|--|
| <p><b>b</b> 11. The weight of a submerged object is greater than the buoyant force.</p> <p><b>c</b> 12. The weight of a submerged object is less than the buoyant force.</p> <p><b>a</b> 13. The weight of a submerged object is equal to the buoyant force.</p> | <p>a. The object will remain at any level.</p> <p>b. The object will sink.</p> <p>c. The object will float on the surface.</p> |
|--|--|

14. How much liquid does a completely submerged object displace?

**It displaces a volume of liquid equal to its own volume.**

---

15. Describe a method of determining the volume of an irregularly shaped object.

**Submerge the object in water and measure the volume of displaced water. The volume of the displaced water is equal to the volume of the irregularly shaped object.**

---

### 19.3 Archimedes' Principle (pages 367–368)

16. What does Archimedes' principle state?

**The buoyant force on an immersed object is equal to the weight of the fluid it displaces.**

---

17. What does *immersed* mean?

**Immersed means either completely or partially submerged.**

---

18. Is the following sentence true or false? An immersed container will displace the same volume of water and the same weight of water at any depth. **true**

19. Explain the relationship between the upward force due to water pressure on the bottom of a submerged block and the downward force due to water pressure on the top of the submerged block.

**The difference in pressures on the bottom and top of the block is the same at any depth.**

---

### 19.4 Does It Sink, or Does It Float? (pages 369–370)

20. A submerged object's **volume** determines the buoyant force.

21. When the buoyant force equals the weight of an object completely submerged in water, then the object's weight must equal

**the weight of displaced water**

---

## Chapter 19 Liquids

Match each phrase with the correct word or words.

- b   22. An object will sink.                      a. An object has a density equal to the density of the fluid in which it is immersed.
- c   23. An object will float.                      b. An object is more dense than the fluid in which it is immersed.
- a   24. An object neither sinks nor floats.                      c. An object is less dense than the fluid in which it is immersed.

25. Why does a submarine take in or release water from its ballast tanks?

It does this to adjust its density.

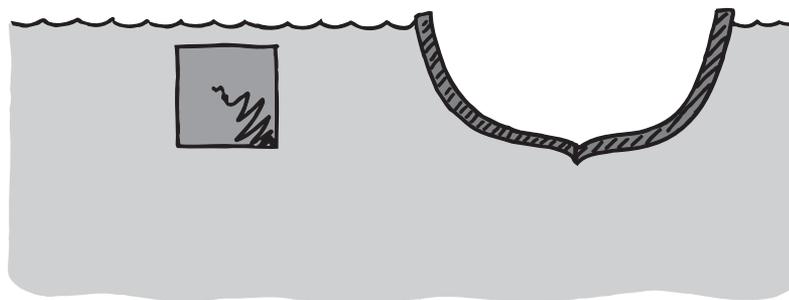
26. How do fish and crocodiles control their density?

Fish take in or release air from an air sac to adjust their density and crocodiles swallow stones to increase their density.

### 19.5 Flotation (pages 371–372)

27. Explain why in the figure below, the iron block on the left sinks, while the reshaped piece of iron on the right floats.

The piece of iron on the right has a greater volume than the piece of iron on the left.



28. Is the following statement true or false? The principle of flotation states that a floating object displaces a weight of fluid equal to its own volume.   false  

29. Every ship must be designed to displace a weight of water equal to

its own weight

### 19.6 Pascal's Principle (pages 373–374)

30. What does Pascal's principle state?

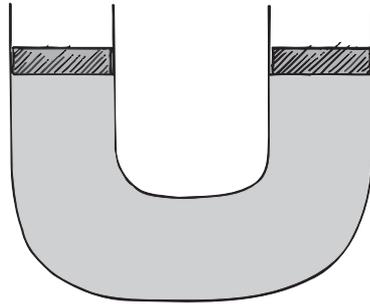
Pascal's principle states that changes in pressure at any point in an enclosed fluid at rest are transmitted undiminished to all points in the fluid and act in all directions.

**Chapter 19 Liquids**

31. Circle the letter of each statement that is true.

- a. Pascal's principle was discovered in the seventeenth century.
- b. The SI unit for pressure is named after Pascal.
- c. The SI unit for force is named after Pascal.
- d. Pascal's principle is employed in a hydraulic press.

Use the figure below to answer Questions 32–34.



32. If pressure is applied to the left piston, what happens to the pressure on the right piston?

**The same amount of pressure is applied to the right piston.**

33. If pressure is applied to the left piston, is there any point in the enclosed fluid where the pressure is greater?

**No, pressure is the same at all points in the enclosed fluid.**

34. In a hydraulic press, the surface area of the smaller piston is  $1 \text{ cm}^2$  and the surface area of the large piston is  $50 \text{ cm}^2$ . What is the force on the larger piston if  $1 \text{ N/cm}^2$  of pressure is applied to the smaller piston?

**50 newtons**

35. Explain why energy is conserved in a hydraulic press even though force is multiplied.

**The increase in force is compensated for by a decrease in distance moved.**

36. Is the following statement true or false? Pascal's principle applies to liquids and gases. **true**

37. Explain how an automobile lift works.

**Compressed air exerts pressure on the oil in an underground reservoir. The oil in turn transmits the pressure to a cylinder, which lifts the automobile.**