

Goal • Check your understanding of Unit 3.

What to Do

Circle the letter of the best answer.

- Which of the following statements regarding particle theory is false?
 - All matter is made up of very small particles.
 - All particles are attracted to one another with equal strength.
 - Particles that make up matter are always moving.
 - There are spaces in between particles.
- What are you calculating if you divide the mass of a substance by its volume?
 - buoyancy
 - density
 - pressure
 - weight
- Which of the following statements is true of Archimedes' principle?
 - The buoyant force acting on an object equals the weight of the fluid displaced by the object.
 - The buoyant force acting on an object is greater than the weight of the fluid displaced by the object.
 - The buoyant force acting on an object is less than the weight of the fluid displaced by the object.
 - The buoyant force acting on an object is not equal to the weight of the fluid displaced by the object.
- On very cold winter days, water vapour in the air can turn directly into a solid and form frost on the inside of windows. Which of the following changes of state occurs when frost forms on a window?
 - condensation
 - deposition
 - solidification
 - sublimation
- Why do objects float more easily in salt water than in fresh water?
 - The density of fresh water is greater than that of salt water.
 - The density of salt water is 1.00 g/mL.
 - The density of salt water is greater than that of fresh water.
 - The particles of fresh water are packed together more tightly than those in salt water.

6. Two different tennis balls (one filled with air, one with water) are struck with the same amount of force. The tennis ball filled with air can absorb much more force than the similar tennis ball filled with water. Which of the following statements is the reason for this result?
- Air is compressible, while water is not.
 - Air is not compressible under ordinary circumstances.
 - The force of gravity is greater on the water-filled tennis ball.
 - The forces on the air-filled tennis ball are more out of balance.
7. A submarine sinks when which of the following occurs?
- Its weight is equal to the buoyant force.
 - Its weight is greater than the buoyant force.
 - Its weight is less than the buoyant force.
 - Water is released from its ballast tank.
8. What causes your ears to pop when you gain or lose altitude quickly?
- a decrease in air pressure in the brain
 - a difference in air pressure between the middle ear and the surrounding air
 - liquid in the ear striking the eardrum
 - Pascal's principle
9. Engineers must plan pipe systems carefully. Which of the following is not a major consideration?
- air pressure outside the pipe
 - diameter of the pipe
 - number of turns of the pipe
 - smoothness inside the pipe

Match the Term on the left with the best Descriptor on the right.
Each Descriptor may be used only once.

Term	Descriptor
_____ 10. compressibility	A. a device that transmits a force through a liquid
_____ 11. condensation	B. ability to be squeezed into a smaller space
_____ 12. hydraulic system	C. change from gas to liquid
_____ 13. low viscosity	D. change from liquid to solid
_____ 14. mass	E. change from solid to gas
_____ 15. pneumatic system	F. force divided by area
_____ 16. pressure	G. high flow rate
_____ 17. sublimation	H. low flow rate
	I. remains the same anywhere in universe
	J. vacuum cleaner

Short Answer Questions

18. Explain the differences among a solid, liquid, and gas in terms of shape and volume.

19. List the main points of the particle theory of matter.

20. Being stranded in cold water can be dangerous. The main problem is that as cold water touches your body, your body becomes cooler while the water becomes warmer. Explain what happens to the energy of the particles that make up your body and the surrounding water particles to account for the temperature changes.

21. A boat travels along the water at a steady speed.

(a) Are the forces on the boat balanced or unbalanced? Explain.

(b) Draw a diagram of the boat and label all the forces acting on it.

22. A student performs an experiment with three balloons. One is filled with air, one with water, and one with cement that is allowed to harden. The student records the following observations:
- When force is applied, the balloon filled with air reduces in volume.
 - When force is applied, the balloon filled with water can be deformed, but does not reduce in volume.
 - The balloon filled with cement cannot be deformed or reduced in volume with applied force.

Explain why the student observed different results for the three balloons.

23. (a) How are pneumatic systems and hydraulic systems similar?

- (b) How are they different?

24. Solve the following problems:

- (a) A 40 cm^3 cube of pure nickel is measured by a student to have a mass of 356 g. What is the density of the nickel?

- (b) A 200 mL sample of alcohol has a mass of 158 g. What is the density of the alcohol?

- (c) A football player with a weight of 125 kg stands on a 0.5 m by 0.5 m scale. What pressure does the platform of the scale exert on the spring below?

- (d) The bottom of a woman's shoe heel measures 0.02 m by 0.04 m. If the woman with a weight of 56 kg balances on a single heel, what pressure does she exert on the ground below?
