complete

Day 5 –Density & Buoyancy ___/64pts 2 ec pts printing

#8 Density & Buoyancy: All objects experience a buoyant force when immersed in a _____.

a. Density is _____ per unit _____.

b. Know how to calculate the density of substances (regular & irregular solids, liquids) from measurements of mass & volume.

c. The buoyant force on an object in a fluid is an _____ force equal to the _____ of the fluid the object has displaced.

d. Know how to predict whether an object will float or sink.

A. Density Basics (1 pts for each question ____/**8pts**)

1. What is the formula for density? _____

2. How do you measure the mass of an object?

_____

_____

_____

_____

3. How do you measure the volume of a box of cereal?

_____

_____

4. How do you measure the volume of an irregular object like a plastic teddy bear?

_____

_____

5. What is the density of water? _____

6. What is buoyancy?

_____

_____

_____

_____

7. Why do large cruise ships float in water?

_____

_____

_____

_____

8. How can you accurately predict whether an object will float or sink?

_____

_____

_____

_____

B. Calculating Density & Making Prediction: Use the information provided to fill in the blanks & determine whether an object will sink or float in water. (1/2 pt each: ___/10)

Object	Mass (gram)	Volume (mL or cm^3)	Density (g/mL or g/ cm^3)	Sink or Float?
Piece of Cork	24	100		
Piece of Wood	89	10		
Steel Cube	7.8	1		
Steel Nail		1.6	7.8	
Block of Gold	575		19.3	
Ice Cube		1	0.92	
Rubber Stopper	33	30		
Milk Carton	2		0.95	
Block of Aluminum	81	30		
Pinewood		25	0.50	

C. Sample Test Questions (1pt ea: ___/26)

1. Which physical property of an object can be determined by dividing its mass by its volume?
a. weight b. density c. ductility d. state

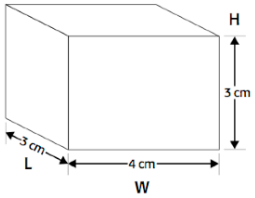
2. What is the density of a 64-g iron cube that displaces 8 mL of water?
a. 512 g/ml b. 32 g/mL c. 8 g/mL d.4 g/mL

Densities of Common Substances*

Substance	Density* (g/cm^3)	Substance	Density* (g/cm^3)
Helium (gas)	0.0001663	Zinc (solid)	7.13
Oxygen (gas)	0.001331	Silver (solid)	10.50
Water (liquid)	1.00	Lead (solid)	11.35
Pyrite (solid)	5.02	Mercury (liquid)	13.55

*at 20°C and 1.0 atm

3. A solid sample has a mass of 22.5 g and displaces 30 mL of water. Use the table above to determine which sentence best describes the solid sample.
a. It is denser than mercury. b. It is less dense than water.
c. It is less dense than helium. d. It is denser than zinc.



4. What is the volume of the solid pictured?
a. 12 cm^2 b. 12 cm^3 c. 36 cm^2 d. 36 cm^3

5. A piece of pinewood floats on the surface of a lake because the water exerts
a. an upward force equal to the weight of the wood.
b. a downward force equal to the weight of the wood.
c. an upward force equal to the weight of the displacement water.
d. a downward force equal to the weight of the displacement water.

Physical Properties

Sample Number	Mass	Volume
1	89 g	10 mL
2	26 g	10 mL
3	24 g	100 mL
4	160 g	100 mL

6. The table shows properties of 4 different materials. One of these materials is cork, a type of wood that floats in water. Given that the density of water is 1 g/mL, which of the samples is most likely cork?
a. 1 b. 2 c. 3 d. 4

Wood Sample Densities

Type of Wood	Density ($\frac{g}{cm^3}$)
African Teakwood	0.98
Balsa	0.14
Cedar	0.55
Ironwood	1.23

7. According to the table, which wood will sink when placed in a fluid with a density of 1.14 g/cm^3?
a. African Teakwood b. Balsa c. Cedar d. Ironwood

8. Which physical property can you use to determine if a substance will float in water?
a. density b. volume c. malleability d. conductivity

Mass Density & Volume Questions

9. ___ is the amount of matter an object has.
a) Weight b) Mass c) Volume d) Density

10. A graduated cylinder is used to measure_____.
a) Weight b) Mass c) Volume d) Density

11. If we use the units of grams (g.)for mass and cubic centimeters (cm3) for volume, then the units for density will be
a) grams b) cm 3 c) g - cm 3 d) g/cm 3

12. The mass of an object is 6 kg on earth. On the moon the mass would be
a. 6 kg. b. 0 kg. c. 1 kg. d. 3 kg.

13. A cube has a side of 5 cm. It has a mass of 250 grams. The density of the cube is
a. 50 g/cm3 and will float in water
b. 2.0 g/cm3 and will float in water
c. 50 g/cm3 and will sink in water
d. 2.0 g/cm3 and will sink in water

14. A spring scale is used to measure the mass of an object on earth. The scale on earth reads 60 grams. On the moon the scale would read.
a) 60 grams b) 10 grams c) 600 grams d) 0 grams

15. Liquid water is more dense than ice because
a) A liquid H 20 molecule has more mass than an ice H 20 molecule.
b) A chemical change occurs when ice melts that causes the mass of water to increase
c) When ice melts there is an increase in the amount of water molecules
d) there are a greater number of H 20 molecules per unit of volume in liquid water than ice.

16. Oil floats on water. The most accurate reason for this is
a) oil is less dense than water
b) oil is immiscible (does not dissolve) in water
c) oil is both less dense and immiscible with water
d) water is heavier than oil

17. A graduated cylinder contains 100 ml of a liquid. The mass of the graduated cylinder with the liquid is 145 grams.The mass of the graduated cylinder when empty is 45 grams. The liquid is most likely
a) Ethanol b) Water c) Corn Oil d) Chloroform

18. Which of the following will cause the mass of a metal block to increase
a) putting the block in the freezer
b) measuring the mass of the block on jupiter
b) heating the block
d) None of the above

19. Which of these is not an accurate unit for mass?
a) gram b) pound c) kilogram

20. An 8 oz. empty glass is filled with ice. It has a mass of 254 grams. After the ice melts the total mass would be
a) approximately 260 grams b) 254 grams
c) approximately 250 grams d) much greater than 260 grams

21. A volume of 50 cu.cm. of dry sand is added to 30 cu. cm. of water for a total volume of 60 cu cm. What is the volume of water that goes into the air spaces?
a) 50 cu.cm. b) 60 cu. cm, c) 10 cu. cm. d) 20 cu. cm.

22. A large piece of rock salt is added to a test tube containing water. The level of water is marked and the test tube is sealed. After all the rock salt dissolves it is noted that the level of liquid is below the original marked level. What conclusion(s) can we draw from this experiment?
1) The mass of the system has decreased.
2) When salt is added to water a chemical change occurs
3) The density of salt water is greater than the density of pure water
4) the volume of the system has decreased as a result of a physical change.

Answer choices:
a) 1 only is true
b) 2 and 3 are true
c) 3 and 4 are true
d) 1,2, and 3 are true

23. When the space shuttle circles the earth objects within the ship become weightless. The most likely reason for this is because
a) The shuttle is actually falling back to Earth while circling the Earth, so all objects within the ship are in free-fall.
b) The shuttle is so far away from earth that the effect of gravity is negligible.
c) There is no air
d) none of the above

24. Liquid water is more dense than ice because-
a) A liquid H_20 molecule has more mass than an ice H_20 molecule.
b) A chemical change occurs when ice melts that causes the mass of water to increase
c) When ice melts there is an increase in the amount of water molecules
d) there are a greater number of H_20 molecule per unit of volume in liquid water than ice.

25. The density of water in SI units (International System of Units) is:
a) 1 pound/cu. ft b) 1000 g/1000 ml. c) 1 kg/L d) 1 g/cm3

26. A graduated cylinder is filled with 50cc. of water. A glass stopper is dropped into the graduated cylinder. The volume now reads 65.4 cc. If we know glass has a density of 2.5 g/cm3, what would we expect the mass of the stopper to be closest to?
a) 38.5 grams b) 20 grams c) 26.7 grams d) 42 grams

This Week's Labs: **Flinker**

Total _____/10pts

Build a little thingy that likes to hang out in the middle of water.

Materials

Materials Needed

* styrofoam peanuts * 12 inches of string * some washers or pennies
* large see-through container filled with water

1. Can you make a "flinker"-something that you put in a pitcher of water that doesn't float on the top or sink to the bottom, but just flinks in the middle of the water? Your flinker has to flink for 10 seconds. Design your own flinker using styrofoam peanuts, string and washers or pennies.
2. Test it in the water, then change one thing at a time in your design to make your flinker work better. What can you change to make it flink? Could you attach washers or pennies to your Styrofoam peanut with string? Or, could you change the shape of the Styrofoam?
3. Try to get it to flink for at least 10 seconds.
4. Remember, a Flinker's a Flinker because it doesn't float, it doesn't sink, it flinks!

What happened? Did it flink? For how long? Did it rise to the top? Sink to the bottom? Show your design & write your observations

DRAW YOUR FINAL DESIGN HERE
(5 pts)

OBSERVATIONS 5 pts

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Float My Boat

Total _____/ 10pts

Today, your challenge is to build tinfoil boats and test different designs to see how many pennies you can load without sinking your boat. Let's dive in!

What to DO

1. **Get what you need.**
   • 6-inch squares of tinfoil • Pennies
   • Ruler • Container half-filled with water
2. **Round 1: Build boats.** Make a boat by bending the tinfoil. Draw your design in the data table.
3. **Make predictions.** On the data table, enter your prediction for how many pennies your boat can hold before it sinks.
4. **Test the design.** Float your boat. Add pennies one at a time. Keep going until the boat sinks. Count how many pennies your boat held. But don't count the last one—it sank the boat! Enter this number in the data table. Repeat steps 2–4, making a total of three boats.
5. **Round 2: Build more boats.** Make new designs, using what you learned about the height and thickness of the sides, the size of the bottom, and how to position the pennies. Record your designs, predictions, and test results in the data table.

Draw your designs below!

Boat 1 :**1 pt each**	Boat 2	Boat 3
Observations: Pennies?	Observations: Pennies?	Observations: Pennies?

Conclusion **4 pts**: _____
_____
_____
_____