Name: Answer Key
Chapter 3 study guide

Period: _____
Date: _____

Chapter 3 Study Guide: Test Wednesday 2/28/18

WARNING: This guide is not the only thing you should use to study. It does not provide you with everything you need. You should also rely on your textbook, homework, and classroom notes. Use everything you can for the best results.

Topic 1: Pressure – Textbook pg. 74 – 80 (Notebook pg. 18-20)

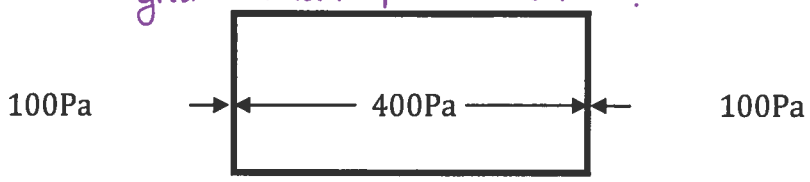
1. Pressure is a force spread over the _____ of an object.
   a. Mass b. Volume c. Area d. Weight
2. The calculation for pressure is:
   a. Mass/Volume b. Force/Area c. Area/Force d. Force/Mass
3. If the area over which a pressure is exerted increases, the pressure will:
   a. Decrease b. Increase c. Multiply d. Stay the same
4. A force of 350N is applied to the two square surfaces shown below. Calculate the area of and the pressure exerted on both rectangles. Which one experiences greater pressure?
   - Box A: 20m by 20m L×W
   - Area = $400m^2$
   - Pressure = .875 Pa ($\frac{350N}{400m^2}$ =)
   - Box B: 12m by 12m L×W
   - Area = $144m^2$
   - Pressure = 2.4 Pa ($\frac{350N}{144m^2}$ =)

$$P = \frac{F}{A}$$

5. You step on a single nail, and the pressure it experiences is 100Pa. Then you step on a group of 50 nails. What will be the pressure experienced by each nail if you step on all of them at the same time? 100Pa = 1 nail

$$\frac{100Pa}{50} = 2Pa \text{ per nail}$$

6. Look at the air pressure inside a container and the air pressure outside. What will happen to the container and why? It will explode outward because pressure inside is greater than pressure outside.



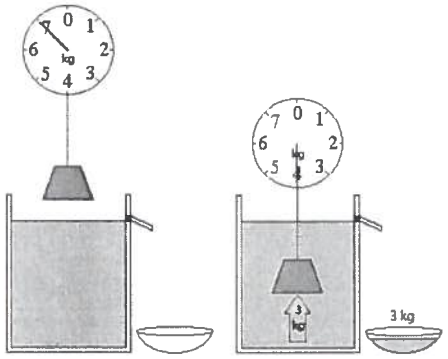
7. As you climb Mount Everest, you find despite breathing hard you can't get enough air. You actually have to start using a breathing apparatus that provides you with enriched and pressurized air. Why (in terms of air pressure and elevation)?
   The air is less and air pressure is lower so it gets harder for air (and oxygen) to get into your lungs.

Topic 2: Buoyancy – Textbook pg. 82 - 84(Notebook pg. 21-24)

8. When an object is placed in water, what is it that creates the buoyant force?
   a. Gravity b. Weight c. Mass d. Water
9. Fill in the blanks for Archimedes principle.

When objects are placed in water, they will displace *(push aside) some of that water. The weight of the displaced water* equals *the strength of the buoyant force. If the weight of the water displaced is equal to or* greater *than the weight of the entire object, then the object will* float.

10. Look at the weight of the object before and after placed in water.



- What is the object's weight force? 7 Kg down
- What is the buoyant force? 3 Kg up
- Will the object sink or float? Sink, because the weight force is greater than the buoyant force

11. Imagine an object has a weight of 250Kg. How much water would it have to displace to have:
    - Positive buoyancy: > 250 Kg
    - Neutral buoyancy: 250 Kg
    - Negative buoyancy: < 250 Kg
12. Imagine a 35,000Kg ship displaces 38,000Kg of water when placed in the ocean.
    - What is the strength of the buoyant force? 38,000 Kg
    - What type of buoyancy will the boat experience? positive
    - Will the boat float or sink? float

* Buoyant Force equals the weight of water displaced.

13. During its long trip, the ship from problem #12 docks and loads on supplies. The ship's weight increases to 39,000Kg, while the amount of water it displaces goes up to 38,500Kg.
    - What is the strength of the buoyant force? 38,500 Kg
    - What type of buoyancy will the boat experience? negative
    - Will the boat float or sink? sink
14. One method of raising a sunken ship to the surface is to inflate large air bags inside its hull. If the bags are not adding much mass at all, what must they be doing in order to raise the ship?

They are increasing volume and therefore increasing the amount of water displaced.

Topic 3: Density – Textbook pg. 85 - 87(Notebook pg. 24-27)

15. Mass is the amount of matter inside an object.
16. Volume is the amount of space inside an object.
17. A solution with a volume of 252 mL has a mass of 500g. What is its density?

$$D = \frac{m}{V} = \frac{500g}{252mL} = 1.98\ g/mL$$

18. A solid with a volume of 1.68mL has a density of 9.2 g/mL. What is its mass?

$$M = D \cdot V = 9.2\ g/mL \cdot 1.68\ mL = 15.46g$$

19. A hollow metal sphere is placed in water and floats.
    - Which is bigger: ***its mass*** or ***its volume***
    - The density of the sphere must be less than 1g/mL.
20. An object with a density of .8g/mL floats in water (1g/mL). If you wanted the object to sink, you would have to place it in a liquid with a density of what?

less than .8 g/mL

21. ***True/False:*** All substances have unique densities that can be used to identify them.
22. If you wanted to change the density of an object so it would float:
    - What would you do to its mass? decrease it
    - What would you do to its volume? increase it

23. Large cruise liners float on water, even though the steel used to make them is much denser than water.
    - Why does the ship still have a density that is overall less than water's?
      The volume is a lot greater than the mass. This results in a low density.
    - If it broke and took on water, its mass would ↑ (increase) volume would stay the same and density would ↑ (increase)

Topic 4: Pascal's principle – Textbook pg. 90 - 94(Notebook pg. 28-29)

24. ***True/False:*** Squeezing a closed bottle of water, only increases pressure at the top of the bottle.
25. Pascal's principle states that when force is applied to a contained fluid, the change in pressure is transmitted equally to all parts of the fluid.
26. A hydraulic system consists of a tube filled with a liquid and capped at both ends by two pistons. When a downward force is applied to one piston, the force is transmitted equally throughout the entire liquid, and the force is ultimately transmitted to the second piston.
27. A hydraulic system is made of two pistons of equal area. If the first piston is pressed down with 350Pa of pressure, what pressure will the second piston press up with? 350 Pa
28. Suppose you apply 300N of force to a piston of a hydraulic system. The force is transmitted through the hydraulic system fluid to another piston with 20 times the area of the first piston.
    - By how many times will the force be multiplied at the second piston? 20
    - What will the upward force of the second piston be? 300 N × 20 = 6,000 N up
29. If you want to lift objects like cars and things that are even heavier, then you would use a hydraulic system with:
    a. Pistons that are the same size
    b. Pistons that are both small
    c. A piston that has an area of 3cm2 and a piston with an area of 3.5cm2.
    d. A smaller piston and a much larger piston.

Topic 5: Bernoulli's principle – Textbook pg. 95 - 99(Notebook pg. 30-32)

30. ***True/False:*** Fluids always flow from low to high pressure. * High to Low
31. When liquid is placed in a funnel, the liquid flows from the wide end of the funnel through the skinny end of the funnel. When it does this:
    - The speed of the liquid: ***increases*** or ***decreases***
    - The pressure of the liquid: ***increases*** or ***decreases***
32. Bernoulli's principles states that as the speed of a moving fluid increases, the pressure within the fluid decreases.
33. On an airplane wing:
    - Where is air speed the greatest? ***On top of the wing*** or ***Below the wing***
    - Where is air pressure the greatest? ***On top of the wing*** or ***Below the wing***
    - In what direction is the net force? ***Up*** or ***down***
34. You are driving on the highway when a large truck drives past you at 100mi/hr. As the truck drives past you, the car feels like it gets sucked toward the truck. What happened?
    a. The air between the car and the truck increased in speed
    b. The air pressure between the car and the truck dropped
    c. The high air pressure on the other side of the car pushed it toward the truck
    d. All of the above
35. A hurricane blows air over the top of a roof of a house. Eventually, the roof rips off and flies upward into the sky.
    - Where was the air pressure the least? ***On top of the roof*** or ***Below the roof***
    - Where was the air pressure the greatest? ***On top of the roof*** or ***Below the roof***
    - Why did the roof fly off? ***Net force was up*** or ***net force was down***