

Grade 8 Science: Unit 2-Fluids

Chapter 9: Force, Pressure Area

- *Key Terms: hydraulic systems, incompressible, mass, neutral buoyancy, pascal, pneumatic systems, pressure, unbalanced forces, weight, Archimedes' principle, average density, balanced forces, buoyancy, buoyant force, compressibility, force*

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- Anything that causes a change in the motion of an object.

- _____

Balanced forces:

1. _____
2. _____
3. _____

Unbalanced Forces:

1. _____
2. _____

Mass vs. Weight

Mass

1. _____
2. _____
3. _____

Weight

1. _____
2. _____
3. _____

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- The _____ force on an object submerged in or floating on a fluid.
 - A floating object has _____
 - A sinking object does not.

See figure 9.6 in text page 337

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- Buoyant force _____ the *weight* (force of gravity) of the fluid displaced by an object.

Examples:

- A rock sinking in a lake
 - Weight of rock > buoyant force (weight of water rock displaces)
- A chunk of wood floating on the surface of a lake
 - NEUTRAL BUOYANCY
 - weight of the wood = Buoyant force (weight of water wood displaces)
 - A helium balloon rising
 - Weight of helium balloon < buoyant force (weight of air balloon displaces)

When swimming why you do sink when you roll yourself into a ball, but you float when you lie flat on your back?

- When in a ball you weigh _____ than the water you displaced.
- As you lie back a _____ of volume of water is displaced
- The weight of the displaced water is now _____ than your weight and you float.

Density and Buoyancy

- If the density of the immersed object is _____ than the density of the fluid, it will _____.
- If an object weighs the _____ than the water it is displacing, it will _____.

Which will sink and which will float?

- wooden boat vs. water logged stick?
- metal block vs. metal boat?
- a sealed empty plastic bottle vs. a plastic bottle full of water?

Average Density

- The total mass of all substances that make up an object divided by the total volume.
- If the volume of an object is _____, the average density will _____.

See figure 9.10 page 341

Technologies Developed

1. _____

The average density of the person and the jacket is _____ than the density of water (floats). The density of the person alone is _____ than water (sinks).

2. _____

The sub lets water flow in to sink (density _____). and flow out to float (density _____)..

3. _____

Air inside is forced out when heated (density _____). The air inside is then less dense than the air outside and the balloon _____.

Pressure

1. _____

2. _____

3. _____

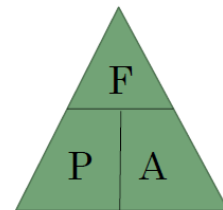
See figures 9.14 – 9.16 page 350

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- The pressure exerted by the layers of air surrounding the Earth that are held by the Earth's gravity. (~ 160 km above the Earth)

Calculating Pressure

- The unit for pressure is the _____
- $1 \text{ Pa} = 1 \text{ N/m}^2$
- You can determine pressure if you know the force and the area.

Formula:



SAMPLE PROBLEMS

1. An aquarium is filled with water that weighs 10 000N. If the base of the aquarium has an area of 1.6 m², what pressure does the water exert on its base?
2. If the atmospheric pressure is 101 200 Pa and you are holding your hand, the atmosphere is exerting a force on your hand. If the area of your palm is 0.006m², calculate the force on your hand.
3. The weight of water in a glass is 4.9 N. If the water is exerting a pressure of 1700 Pa on the bottom of the glass, what is the area of the bottom of the glass?

Why can....

A person wearing snowshoes walk across a section of deep, soft snow without sinking?

The nozzle on a garden hose be used to create a faster or slower flow of water?

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- Pressure applied to a enclosed fluid is transmitted with _____ force throughout the entire container
 - Basis for hydraulic and pneumatic devices.

Examples:

- car lift or hoist
- hydraulic jack
- automobile braking system
- air compressors
- automobile/bicycle tires

HYDRAULICS

- The study of pressure in _____.
- Hydraulic systems:
 - devices that transmit applied force through a liquid to move something else.
 - Hydraulic systems use _____ because they are _____ (they cannot be squeezed into a smaller volume).
 - The liquid must be enclosed in a tube or pipe.
 - The pressure produced will exert in all directions _____.
 - This pressure will cause _____ at the other end of the hydraulic system.

PNEUMATIC SYSTEMS

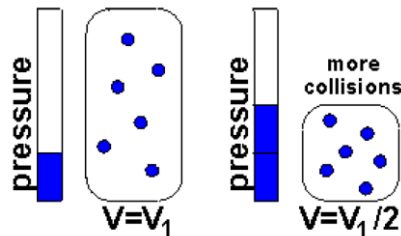
- The study of pressure in _____.
- Compressors are necessary as gases can be _____.
- They build up air pressure.

Summary:

Property	Hydraulic System	Pneumatic System
State		
Volume		
Pressure		

PRESSURE & VOLUME

- _____ pressure of a fluid will _____ volume by the same amount.
- *known as Boyle's Law*



Example: Propane Cylinders (Page 366)

- _____ in pressure with a _____ in volume at constant temperature.

TEMPERATURE & VOLUME

- _____ temperature will _____ the volume of a fluid.

TEMPERATURE & PRESSURE

- _____ temperature of a fluid will _____
the pressure.

In other words...

If the temperature of a fluid is constant (not changing)...

If the pressure of a fluid is constant...

If the volume of a fluid is constant...

Why does this symbol appear on aerosol cans?

