

Particle Theory of Matter

SolidLiquidGas

How does temperature affect viscosity?

How does the Particle Theory explain an increase in volume when the temperature increases?

How does temperature affect viscosity?

If the temperature increases, the viscosity decreases.

Temperature and viscosity are **inversely related**.

How does the Particle Theory explain an increase in volume when the temperature increases?

When the temperature increases, the volume increases because the particles spread out more, causing them to take up more space.

Another property of fluids is compressibility.

What is compressibility? Think about the word compress or compression.

What do you think compresses more, a liquid or a solid?

Compressibility: the ability to become more compact when squeezed.

For example, when you kick a soccer ball, the force of your foot compresses the ball and temporarily deforms it.

Does the same happen with a golf ball?

1. Which would compress more:

a) a helium balloon or a water balloon?

b) an empty plastic bottle or a full plastic bottle of juice?

c) A bike tire or a car tire?

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b) an empty plastic bottle or a full plastic bottle of juice?

-empty

c) A bike tire or a car tire?

-bike tire

2. Can you use the Particle Theory to explain your answers to the above questions?

Materials in a liquid state are **incompressible**.

Because of this, equal levels of liquids produce equal pressure.

What do you think will happen if you took a bottle of water and drilled two holes at equal depths?

What if the holes are at different depths?

<https://www.youtube.com/watch?app=desktop&v=YtdEN-40tUI>

Pascal's Law:

Regardless of container shape, pressures are identical as long as the levels of the liquid are equal.

When depths are different, the more water there is above the hole, the greater the pressure.

Calculating Pressure:

Pressure = Force / Area

$P = F/A$

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a) What exerts more pressure on the wall? Me pushing on the wall with my thumb, or me pushing on a tack in the wall with my thumb? Why?

b) Use the same logic to explain why a sharp knife works better than a dull knife.

Calculating Pressure:

Pressure = Force / Area

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A tack!

Remember our **inverse** relationships. Pressure is on the top and Area is on the bottom. They have an inverse relationship. **For pressure to increase, area has to decrease** (if the force is the same.) I could also keep the area the same and increase the force. Pressure and Force do NOT have an inverse relationship because when force increases, pressure increases.

b) Use the same logic to explain why a sharp knife works better than a dull knife.

A dull knife touches the object with more area. More area means less pressure (if force is the same) because they are **inversely related**.

On a piece of paper, individually answer the following questions:

(You don't have to write down the question.)

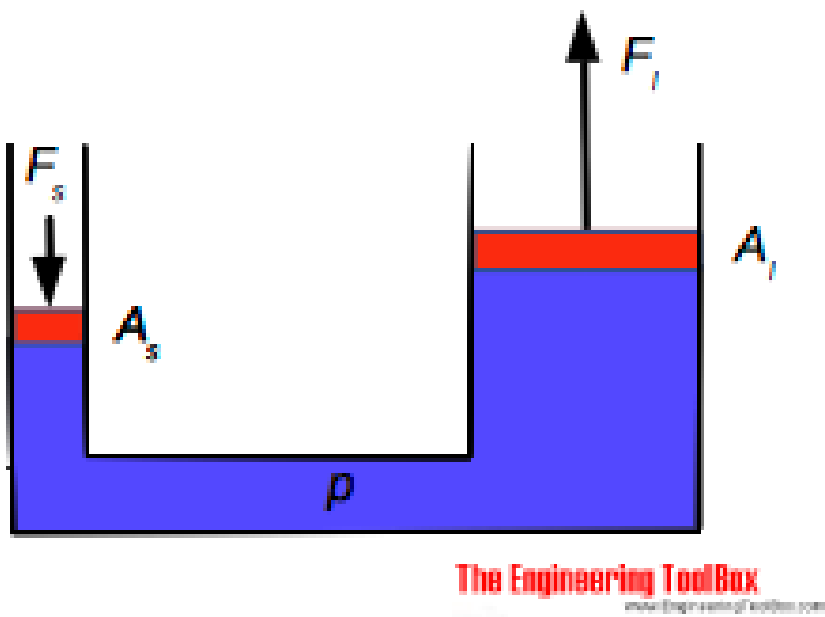
1. Using the formula $P=F/A$, explain why we use snowshoes in the winter.

2. Using the formula $P=F/A$, explain why you can spray water a longer distance if you cover up part of the opening of a hose.

***Hint: It might be helpful to use the term "inversely related" in at least one of your answers.**

Hydraulic Systems

systems that use liquids in a confined space to transfer forces.

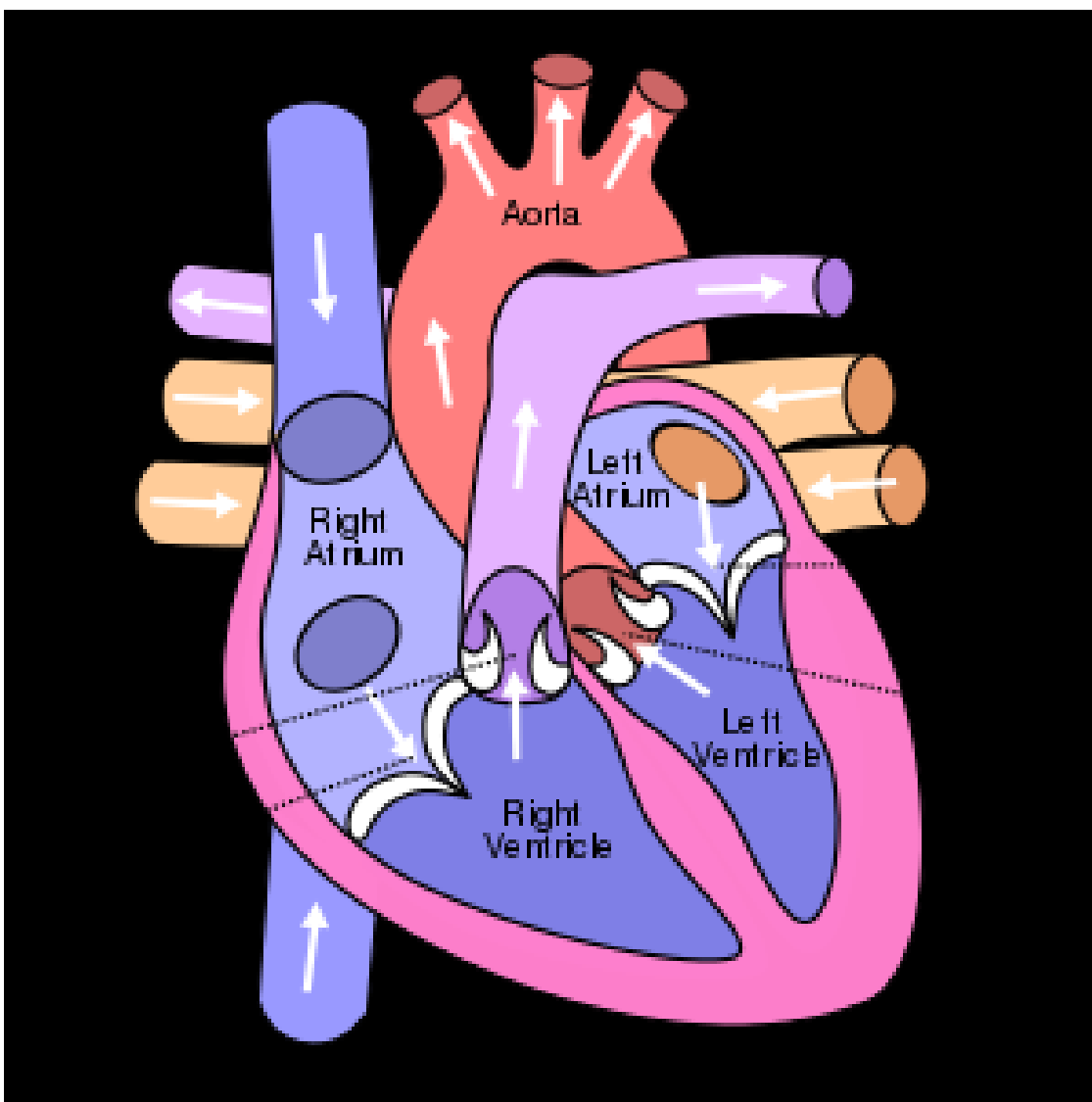


The output force can be larger than the input force.

Human Hydraulic System

Do we have one of these in our bodies?

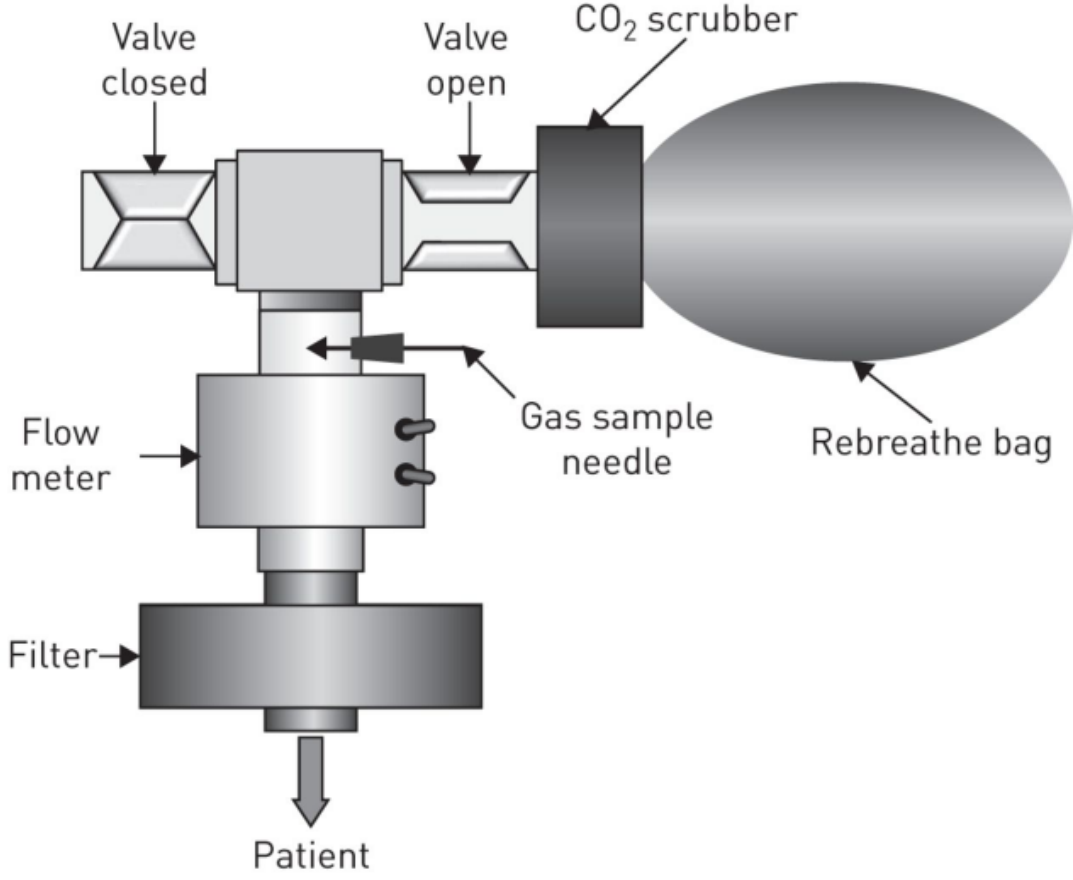
Human Hydraulic System



Blood pressure is the measure of the pressure/force used to pump the blood through your heart.

Pneumatic Systems:

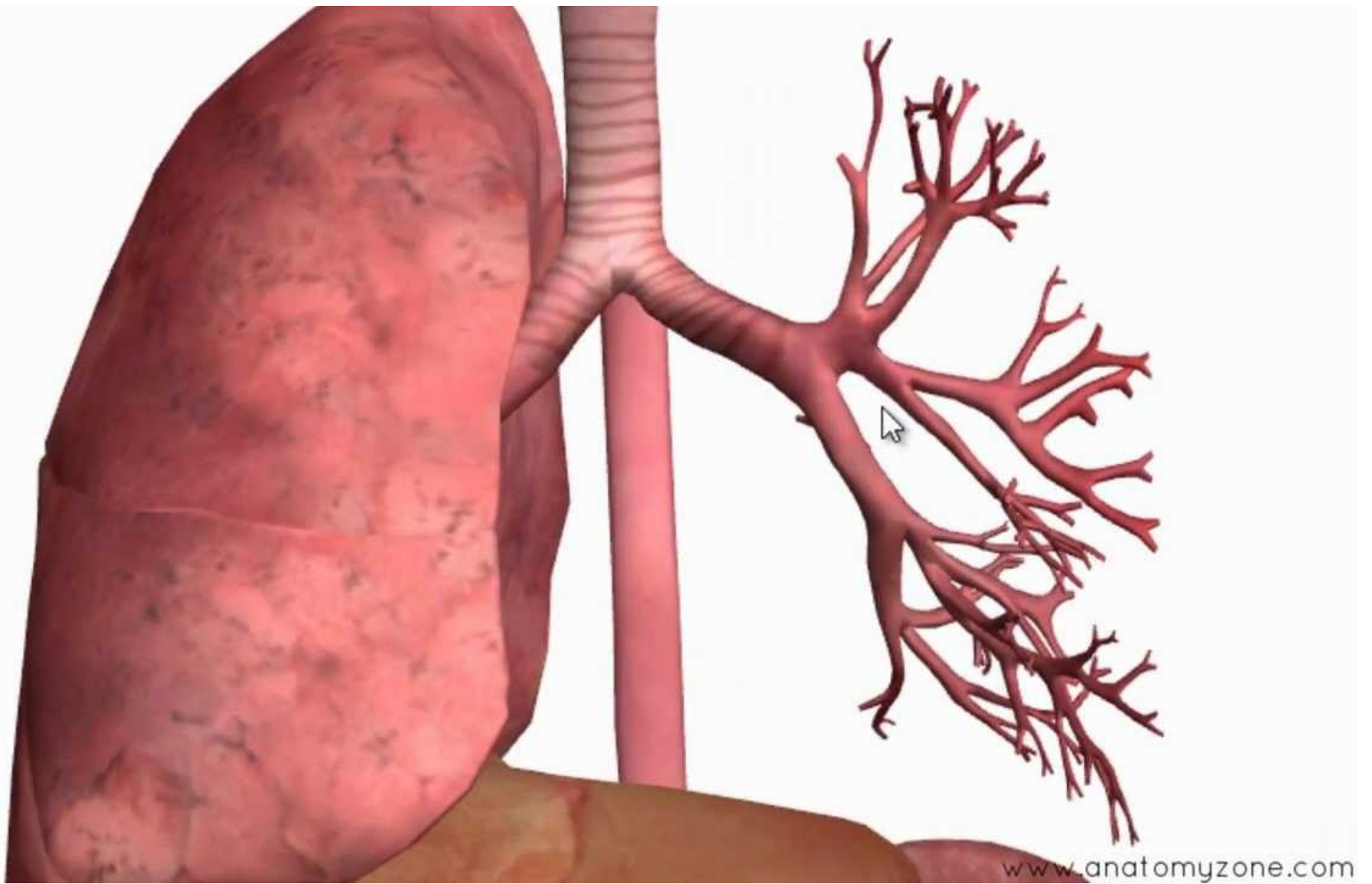
use air or other gases to transmit forces. Because air can be compressed, pneumatic systems use compressors to force fluids to move through the system.



Human Pneumatic System

Do we have one of these in our bodies?

Human Pneumatic System



Grey's Anatomy!

Season 2-Episode 16 35:39

<https://www.netflix.com/watch/70158924?trackId=13752289&tctx=0%2C0%2C7339dfab9>

Recap: There is a bomb in a patient's chest. They will use a pneumatic system as a manual pneumatic system because the patient is unable to use their body's natural pneumatic system.