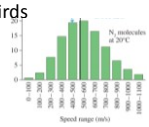
4/23/14

Keeping Cool Humans (cattle and horses) have sweat glands. Dogs, goats, rabbits and even birds pant evaporating water from respiration. Elephants spray water on their skin.

$$Q = ML_v$$



When you are overheated, the hotter molecules are most likely to leave your skin.

Why, then, do you need the sweat?

A. Because the sweat is a lower temperature
B. Lots of energy for phase change
C. Feels nice to have sweat on your skin
D. Water takes more energy to fuse than cool.

What's in the bubbles of boiling water?

A. Water vapor
B. Air
C. Hydrogen gas and oxygen gas
D. Empty space

Calorimetry

PROBLEM-SOLVING STRATEGY 12.1 **Calorimetry problems**

PREPARE Identify the individual interacting systems. Assume that they are isolated from the larger environment. List known information and identify what you need to find. Convert all quantities to SI units.

SOLVE The statement of energy conservation is

$$Q_{\text{net}} = Q_1 + Q_2 + \cdots = 0$$

- For systems that undergo a temperature change, $Q_{\Delta T} = Mc(T_f - T_i)$. Be sure to have the temperatures T_i and T_f in the correct order.
- For systems that undergo a phase change, $Q_{\text{phase}} = \pm ML$. Supply the correct sign by observing whether energy enters or leaves the system during the transition.
- Some systems may undergo a temperature change *and* a phase change. Treat the changes separately. The heat energy is $Q = Q_{\Delta T} + Q_{\text{phase}}$.

ASSESS The final temperature should be in the middle of the initial temperatures. A T_f that is higher or lower than all initial temperatures is an indication that something is wrong, usually a sign error.

20 g of ice at 0°C is added to 100 g of room temp water (20°C).

T_f will be

A. < 0°C
B. 0°C
C. between 0°C and 20°C
D. > 20°C
E. B or C

20 g of ice at 0°C is added to 100 g of room temp water (20°C). Find the final temperature.

—Melt ice $Q_{melt} = M_{ice}L_f$

6,660 J

—Cool water to 0°C $Q_{cool} = M_w c_w \Delta T$

-8,372 J

T_f will be

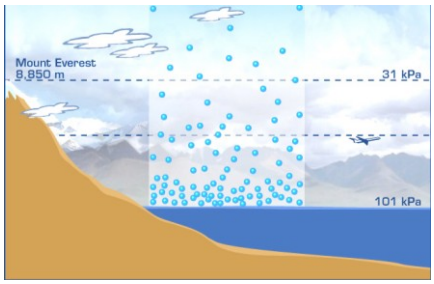
A. < 0°C
B. 0°C
C. between 0°C and 20°C
D. > 20°C
E. B or C

Pressure

When you squeeze a thumbtack, the same force is applied to both sides. Why does the pointy end hurt and the flat end doesn't?

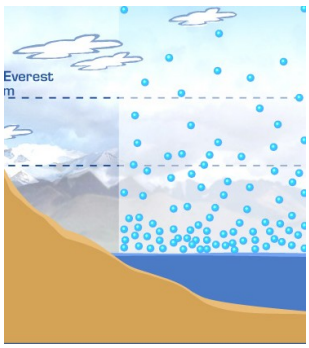
A. It's sharp – sharp things will always hurt
B. Area is smaller than flat side so pressure is less
C. Area is smaller than flat side so pressure is more

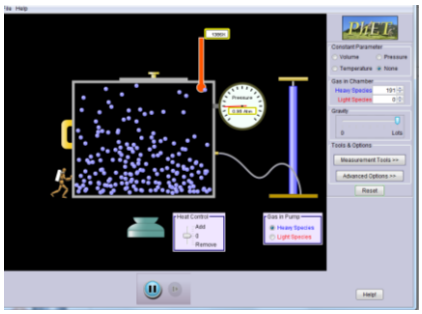
Atmospheric pressure w/ altitude



Why are there more molecules at lower altitudes?

A. Pressure
B. Gravity
C. Temperature



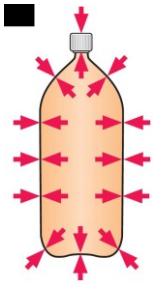


A sample of nitrogen gas is in a sealed container with a constant volume. Heat is added to the gas. The pressure

A. increases
B. stays the same
C. decreases
D. can't be determined with the information given

The Definition of Pressure

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



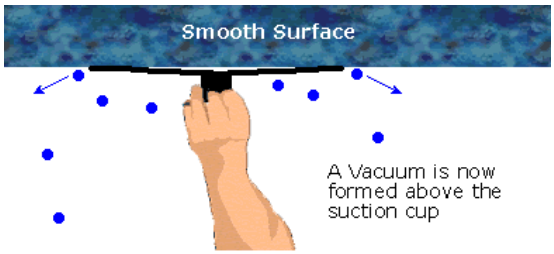
Suction Cup

What holds a suction cup on the wall?

A. There is a force between the suction cup and wall that holds them together.
B. There is a force outside the suction cup pushing it against the wall.
C. Magic

Suction Cup

- Less air inside
- Pull cup to make space bigger but no more air
- Less collisions on the inside than on the outside
- Outside air molecules push it to the wall harder than inside push back.



Pressure change

- I have heated the pop can which has a little bit of liquid in the bottom.
- Then I'll dip it upside down in ice water.

Write a brief description of why the can is crushed based on what you know about suction cups and the phases of matter.