Energy and Transfer

No quiero vivir mas

What is energy?

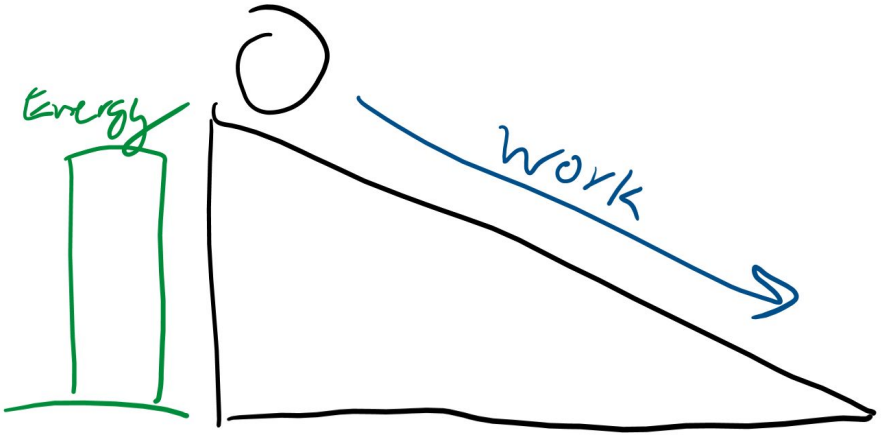
Energy is the ability to do work

If you've had a class with me, you've probably heard this a million times

It takes energy for you to get up in the morning

It takes energy to lift a box

Why does breaking bonds also count as work?

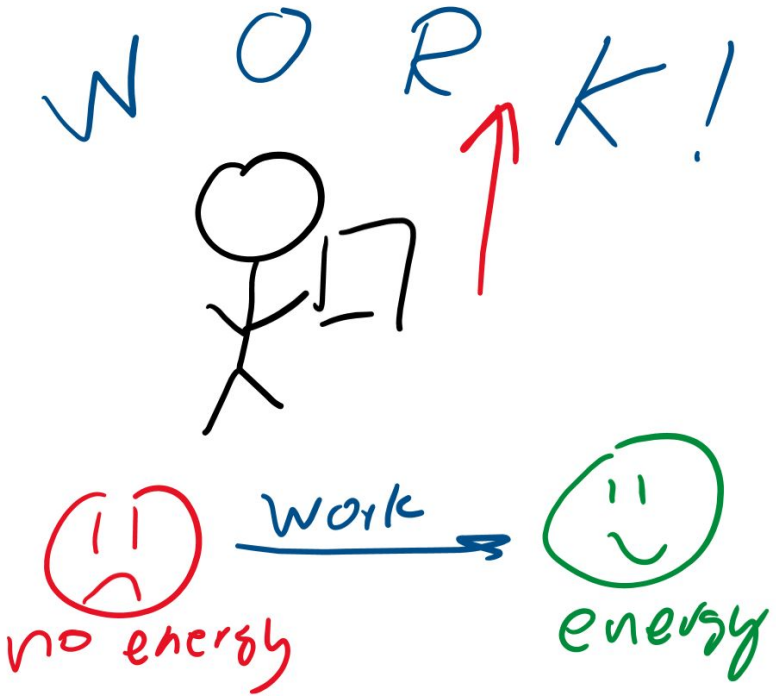


Ways to raise energy

Do work on something:

- Lifting a box gives it energy
- Kicking a ball gives it energy

Why would breaking bonds increase energy?



Energy in Thermodynamics

Two ways energy is transferred

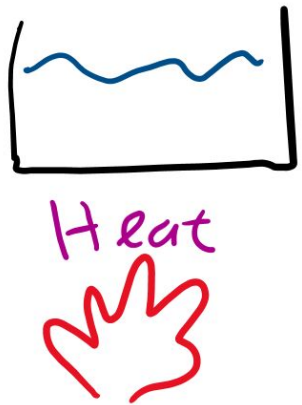
1. Heat (a form of energy)
2. Work

Heat

Heat-Temperature relationship

Three questions?

1. If you heat something up, what do you expect to happen to the temperature?
2. Would more massive things (a large pot of spaghetti water) or less massive things (a small glass of green tea) heat up faster?
3. Does the material you're heating up affect how much it's heated?



Answers

1. Temperature should raise!
2. More massive means it heats up slower because there's more stuff to heat up.
3. Some materials, like air, can heat up super quickly while things like water heat up slower.
    a. Because water heats up slower, it's colder near a coastline because you're closer to it

Spooky time, equation time

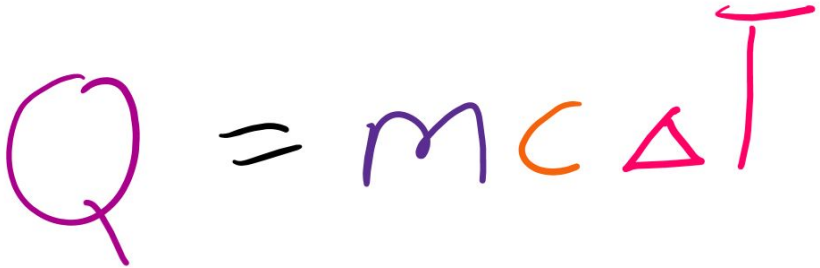
Q is heat (as you can see the word heat clearly starts with Q, so very easy to remember)

m is mass

c is specific heat capacity, which just represents how much an object resists temperature change

ΔT is the change in temperature

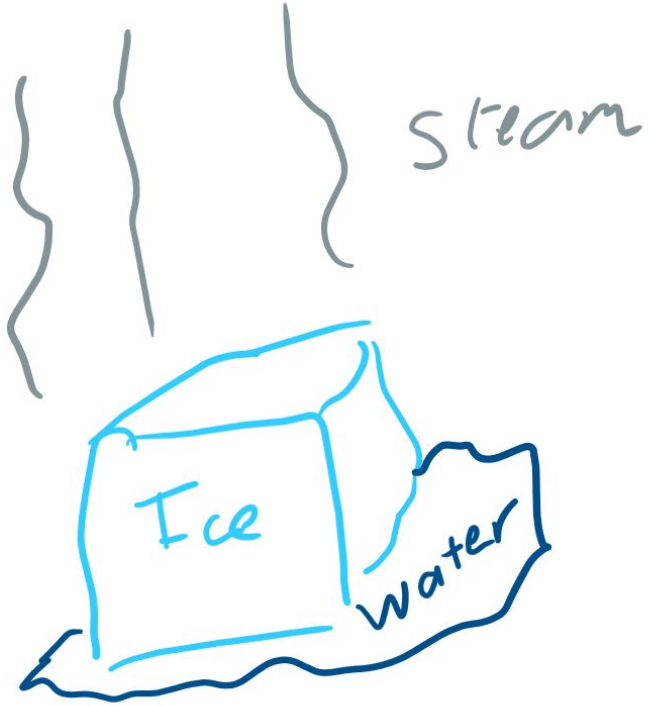
If anything on the right is bigger, more heat is needed



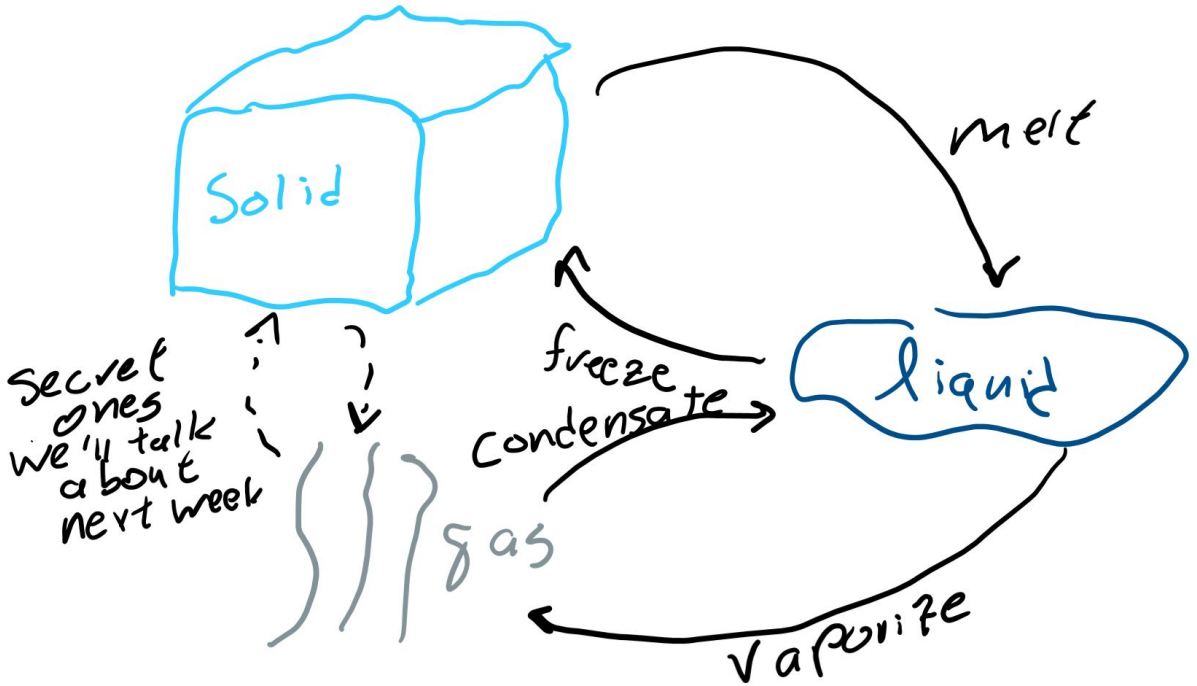
Phases

What are the phases of matter?

(Just the three main ones)



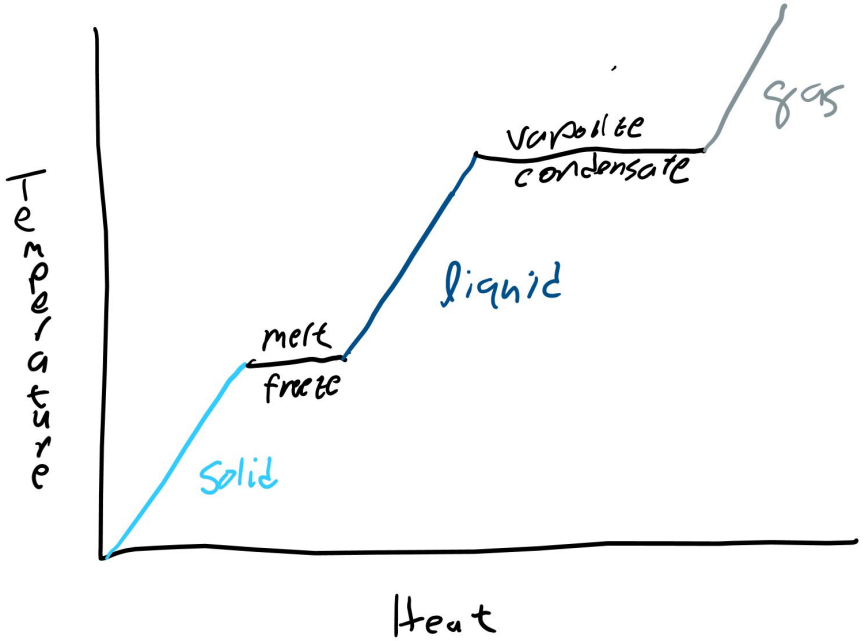
Phase changes



Phase change diagrams

When substances change from one phase to another, temperature does not change

Thus, if you heat ice up, it'll get warmer and warmer until it hits 0 degrees Celsius where it melts, and then

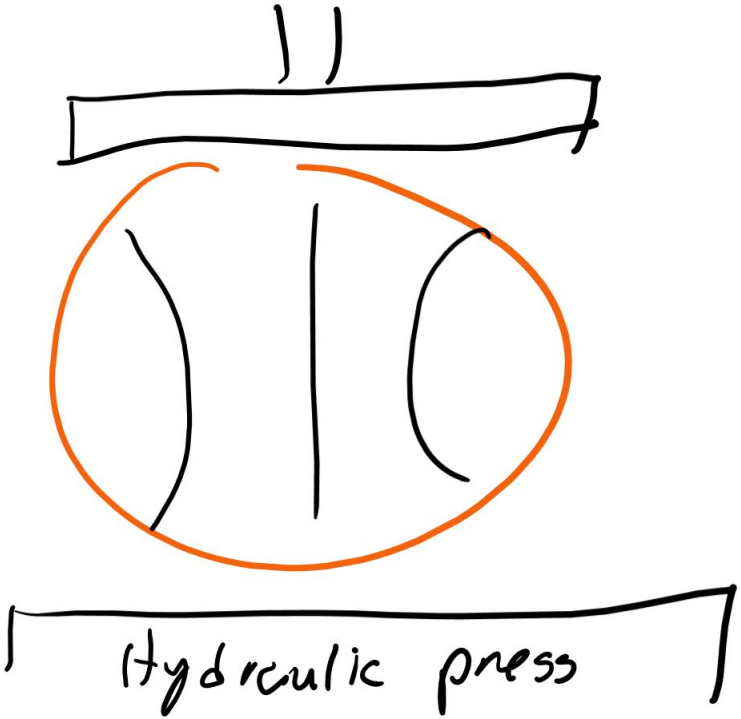


Work

How to work

If you squeeze a ball, what're you doing on it? (Hint: the answer is work)

If you do work on the ball, how will this affect the energy of the ball?



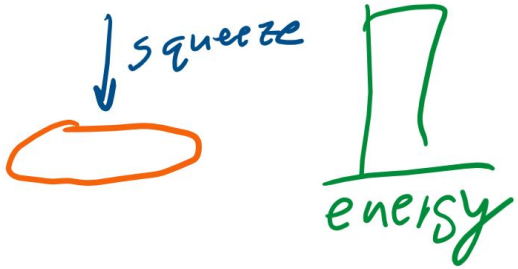
Work in thermodynamics

One of the only ways to do work is the squeeze things.

What happens to the volume of the ball when you squeeze it?

But what happened to the energy?

If volume goes down, what should happen to energy?



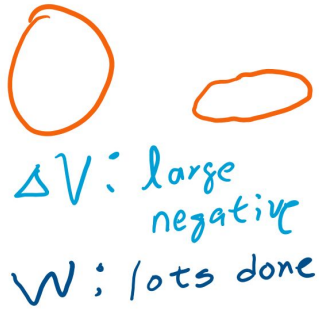
Change in volume

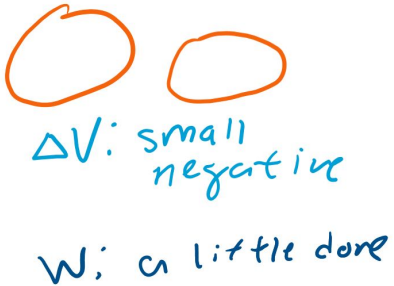
ΔV is change in volume

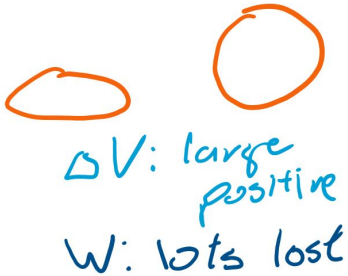
If change in volume is higher, more work is done, but only if we squeeze the ball

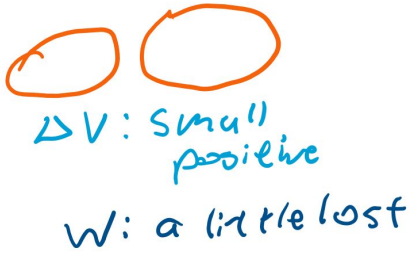
If the ball pushes on us, the gasses inside are doing work on us (they're pushing us)

So ΔV has to be negative for us to do work on the system









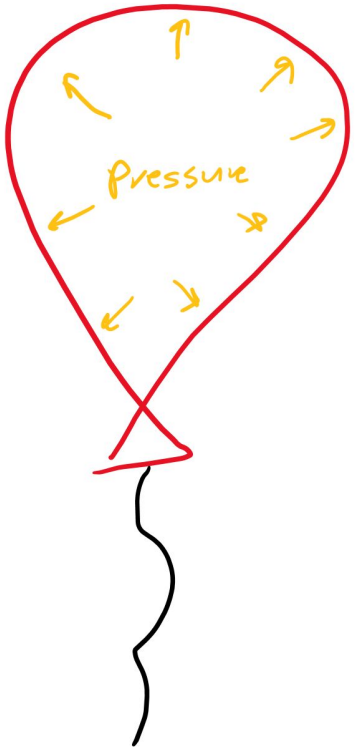
Pressure

Pressure is how much the gasses are pushing against you.

Is it harder to squeeze a deflated tire (one with low pressure) or an inflated tire (one with high pressure)?

If you squeeze harder, are you doing more or less work?

If pressure is higher, what does that mean about work done during squeezing?



Equation

W is work (hard to remember because work doesn't start with W)

P is pressure, notice how if pressure is a bigger number, work is a bigger number

ΔV is change in volume

Combined?

Equation!

IE is internal energy (the energy inside the system)

All we do is add heat and work!