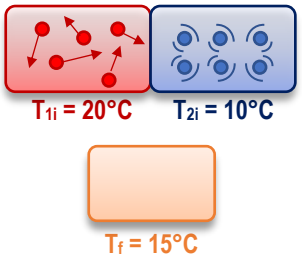
CONCEPT: SPECIFIC HEAT & TEMPERATURE CHANGE

● ***Heat*** and ***Temperature*** are used interchangeably in everyday life but have specific definitions in Physics.

- Temperature (T) = measure of avg. kinetic energy, how "hot" or "cold" something is/feels.
- Heat (Q) = _____ of energy (like Work!) *CAUSED BY* difference in Temperature.
  - Heat ALWAYS flows from _____er → _____er materials until they reach Equilibrium.



● You'll need to know the equation relating **Q** and **ΔT.**

- When a material *absorbs* heat (+Q) or *loses* heat (–Q), it changes _____ OR _____ (solid/liquid/gas)
  (water from 0°C→10°C) (melting ice → water)

Q = _____ **[** Units: **J** or **calories** (1 cal = 4.186 J) **]**

m = mass of object

c = **Specific Heat** of material **[** Units: $\frac{J}{K \cdot kg}$ **]**

- Specific Heat is like "thermal inertia", or how *hard* it is to change temp. from heat gained/lost.

EXAMPLE: Calculate the heat required to raise the temperature of 50g of water from 40°C to 55°C?

Substance	Specific Heat (c) (J/kg·K)
Copper	387
Iron	452
Lead	128
Ice	2000
Water	4186

PROBLEM: You are given a sample of an unknown metal. You weigh the sample and find that its weight is 29.4N. You add 1.25×10^4 J of heat energy to the sample and find that its temperature increases from 52°C to 70°C. What is the specific heat of this unknown metal?

A) 23.6 J/(kg·K)
B) 231.5 J/(kg·K)
C) 14.3 J/(kg·K)
D) 1.20×10^4 J/(kg·K)

SPECIFIC HEAT
$Q = mc\Delta T$

PROBLEM: You put a cup containing 0.3kg of water on an electric hot plate which is rated at 200W. If all the energy of the hot plate goes into heating the water, how long will it take to warm the water from 10°C to 90°C?

SPECIFIC HEAT
$Q = mc\Delta T$
c_{water} = 4186 J/(kg·K)
$P = \frac{W}{\Delta t} = \frac{E}{\Delta t}$