Temperature, Heat, and System Knowledge Check

1. What is temperature a measurement of?
2. How is heat different from temperature?
3. Which would have a greater amount of heat energy; a 2 qt pot of boiling water or a 27 kiloton iceberg?
4. Draw an energy diagram for the following scenarios, identifying the direction of energy flow, the system, the surroundings, and whether the process is endo or exothermic.
5. Microwaving a TV dinner
6. Your desk leg feels cold to the touch.

Key concepts covered in questions 1-4.

* Temperature and heat are related, but ***are not*** the same thing!
  + Temperature is a measure of the average KE of the molecules in a substance, therefore the amount of substance you have has no effect on temperature

I.e. – A cup of water and a bathtub of water exposed to the same surroundings will have equal temperatures (equal average molecular KE & molecular speed)

* + Heat is a measure of the total amount of energy in a substance, therefore speed of the particles and the number of particles affect the heat energy of a substance. The more substance you have, the more thermal energy it contains.

I.e. – The bathtub of water will contain more energy overall than the cup of water at the same temperature. (equal average molecular KE & molecular speed, unequal moles of molecules)

* Heat energy always flows from regions of high energy to regions of low energy.
  + Systems eventually reach thermodynamic equilibrium with their surroundings.
* Identifying a process as endothermic (taking in/receiving thermal energy) or exothermic (giving off thermal energy) is dependent upon what you identify as your system vs your surroundings.
  + Ex: A pot of boiling water is heated on the stove.
    - If the water is your system, the process is endothermic as the system is receiving thermal energy from the surroundings (pot/stove)
    - If the metal stove coil is the system, the process is exothermic as the system is giving off thermal energy to the surroundings (pot/water/air)