Ch 9: heat *the key to KE and TE of tea* name:

Study Guide test format: 33 multiple choice; 5 bonuses

**Vocab**

*Thermal E*

*kinetic E*

*potential E*

*calorie*

*1st law of thermodynamics*

*2nd law of thermodynamics*

*3rd law of thermodynamics*

*Thermal equilibrium*

*absolute zero*

*thermal expansion*

*specific heat capacity*

*Calorie (kilocalorie) entropy*

**Formulae**; (units)

Q=*cm*t ; where Q (heat)= *c* (specific heat capacity) x mass substance x T (change in T)

**Things you MUST know:**

1. In which direction does thermal E always flow? Higher T to lower T.
2. Relationship between specific heat capacities and corresponding rates of heating:
   1. Low *c*: heats up quickly
   2. High *c*: heats up slowly
   3. Eg. Water has a high specific heat capacity, therefore it heats up slowly
3. Be able to categorize E sources as renewable or non-renewable.
4. Heat units: joule; 1 Calorie = 1000 calories; 1 Calorie = 4,184 J; 1 calorie = 4.184 J; 1 Calorie = 1 kilocalorie
5. Water's high *c* explains:
   1. Moderate island/coastal T
   2. Harsher/more extreme inland T (land has a low *c*)
6. Water's unique properties:
   1. Structure if ice & how it affects density & V (volume)
   2. Density differences from solid to liquid to gas (partic. 0 oC to 4 oC to 4+ oC); application: Why shouldn't we put full bottles of water or cans of coke in the freezer?
   3. Relate density with floating vs. sinking
   4. Application: Where does ice first form on lakes? Why?
7. Distinguish between thermal E & T (eg. boiling tsp water vs. lukewarm bathtub full of water)
8. Thermal expansion: relate concept to:
   1. Something, say a railroad rail or a metal bridge joint
   2. A sheet of metal with a hole in it.
   3. A tea kettle

What happens to them as they heat up? What happens as they cool?

1. Relate c (specific heat capacity) to the eating experience; which holds its heat the longest? Items high in water content--why? Water's high c!
2. Be able to categorize different forms of E as Kinetic or Potential
3. As you raise the T of a substance in a closed container, what happens to the pressure (P)?

12. Why doesn't the proposed Ice Cream Diet work? What precious piece of info would a supporter of this (albeit delicious yet egregious-for-the-body) experiment be missing?

13. Be able to calculate a Qlost = Qgained scenario. (eg. Resulting T of mixing so much of two liquids at different original T's)

14. Why don't sparklers hurt you more than they do--after all, they are white hot?

15. Remember: Absolute zero is a theoretical concept---we can get really, really close… but reaching it is not experimentally possible because the very lab equipment/environment we use adds enough E to the system that 0 K is not experimentally reachable.

16. Which two factors determine how much heat a substance will transfer?

a. **identity** of substance (what is it?)

b. **mass** of a substance (how much do you have?)

17. U.S. gains most of its E from which source?