Heat Transfer Calculations Name_____ Block_____ Date____

Heat (Q) is the transfer of energy from the higher temperature object to a lower temperature object. An object decreases its temperature by releasing energy in the form of heat to its surroundings. An object increases its temperature by gaining energy in the form of heat from its surroundings. Both the *warming up* and the *cooling down* of objects works in the same way - by heat transfer from the higher temperature object to the lower temperature object. Eventually, the system and the surroundings reach the same temperature and the heat transfer ceases. It is at this point, that the two objects are said to have reached thermal equilibrium. The amount of heat lost or gained (Q) is equal to the mass if the substance (in grams) times the specific heat of the substance (in J/g°C) times the change in temperature (ΔT) in (°C).

$$Q = mc\Delta T$$

Show your work for full credit (G.U.E.S.S.) and don't forget your units.

1. Find the heat energy needed to raise the temperature of 25 grams of water from 40° to 61°C.
   Q =
   m =
   c =
   T_i =
   T_f =
   ΔT=

2. Find the heat energy needed to raise the temperature of 100 grams of aluminum from 22° to 41°C.
   Q =
   m =
   c =
   T_i =
   T_f =
   ΔT=

3. Find the heat energy absorbed when 15.5 g of Gold is heated from 22° to 54°C.
   Q =
   m =
   c =
   T_i =
   T_f =
   ΔT=

4. How much heat is absorbed by 42 grams of benzene when it is heated from 25° to 40°C?
   Q =
   m =
   c =
   T_i =
   T_f =
   ΔT=

5. Calculate the heat energy absorbed by 6.2 grams of ethanol as it is heated from 4° to 14°C.
   Q =
   m =
   c =
   T_i =
   T_f =
   ΔT=

6. How much heat energy is released when 40 grams of water is cooled from 100° to 0°C?

Q =
m =
c =
T_i =
T_f =
ΔT=

7. Find the specific heat of a substance if 145 grams absorb 376 joules when heated from 30° to 55°C.

Q =
m =
c =
T_i =
T_f =
ΔT=

8. Find the specific heat of copper if 85 g absorbs 490.8 joules when heated from 30° to 45°C.

Q =
m =
c =
T_i =
T_f =
ΔT=

a. Is this higher or lower than the specific heat of water?

b. Will Cu or H_2O heat up or cool down more quickly?

9. What mass of water can be raised from 25° to 100°C by adding 2511 Joules of heat?

Q =
m =
c =
T_i =
T_f =
ΔT=

Specific Heats of Common Substances		
Substance	**calorie /gram °Celsius**	**Joule/gram °Celsius**
Water	1.0 c/g°C	4.186 J/g °C
Water (solid)	0.51 c/g°C	2.13 J/g °C
Water (gas)	0.48 c/g°C	2.00 J/g °C
Glass	0.20 c/g°C	0.83 J/g °C
Aluminum	0.215 c/g°C	0.90 J/g °C
Silver	0.056 c/g°C	0.234 J/g °C
Copper	0.092 c/g°C	0.385 J/g °C
Graphite	0.170 c/g°C	0.711 J/g °C
Gold	0.0301 c/g°C	0.13 J/g °C
Benzene	0.48 c/g°C	2.0 J/g °C
Ethanol	0.50 c/g°C	2.09 J/g °C