Name: _____ Date: _____

1. How much energy is needed to raise the temperature of 6.30 g of water by 21.0 degrees?

   $q = mC_p\Delta T$
   $q = (6.30)(4.184)(21.0)$
   $q = 554$ J

2. How much heat is added to a copper cube (mass = 214.6 g) that is warmed from 10.0°C to 75.0°C? Convert your answer to calories (1 calorie = 4.184 J).

   $q = mC_p\Delta T$
   $q = (214.6)(0.385)(75.0 - 10.0)$
   $q = 5370 \text{ J} \div 4.184 = 1284$ cal

3. A lead cube is heated to 96.5°C and placed into a calorimeter filled with 725.0 g of 25.0°C water. The final temperature of the system is 36.5°C. What is the mass of the cube?

   $-mC_p\Delta T = mC_p\Delta T$
   $-(m)(0.129)(36.5 - 96.5) = (725.0)(4.184)(36.5 - 25.0)$
   $7.74m = 34884.1$
   $m = 4507$ g

4. The Pacific Ocean is 6.22×10^{26} mL. How much energy is needed to raise the temperature of the ocean by 2°C?

   $q = mC_p\Delta T$
   $q = (6.22\times10^{26})(3.9939)(2)$
   $q = 4.97\times10^{27}$ J

5. What is the mass of benzene that requires 5368 J to lower its temperature from 48.5°C to 32.1°C?

   $q = mC_p\Delta T$
   $-5368 = (m)(1.74)(32.1 - 48.5)$
   $m = 188$ g

6. A 58.5 g sample of iodine crystals at 15.4°C are heated by adding 4.757 kJ of energy. What will be the final temperature of the iodine?

   $q = mC_p\Delta T$
   $4757 = (58.5)(0.145)(T_f - 15.4)$
   $560.8 = T_f - 15.4$
   $T_f = 576.2°C$

7. 120 500 J of energy is transferred to a 16000 g block of lead that has a temperature of 102.4°C. What will be the final temperature of the lead? Is this enough energy to raise the block to its melting point? The melting point of lead is 327.46°C.

   $q = mC_p\Delta T$
   $120500 = (16000)(0.129)(T_f - 102.4)$
   $58.4 = T_f - 102.4$
   $T_f = 160.8°C/No$

8. An unknown metal sample has a mass of 641.3 g. Its temperature is lowered from 71.0°C to 34.5°C. 3187 J of energy are liberated in this process. What is the specific heat of the metal? In all likelihood, what is the unknown metal?

   $q = mC\Delta T$
   $-3187 = (641.3)Cp(34.5-71.0)$
   $Cp = 0.136$ J/g°C closest to tungsten

9. A block of aluminum (mass = 258.63 g) is warmed to 53.2°C. This block is placed into a beaker containing 350.0 g of water. The water's initial temperature is 23.0°C. What will be the final temperature of the system? Assume no heat is lost to surroundings.

   $-mC_p\Delta T = mC_p\Delta T$
   $-(258.63)(0.897)(T_f - 53.2) = (350.0)(4.184)(T_f - 23.0)$
   $-231.99(T_f - 53.2) = 1464,4(T_f - 23.0)$
   $-231.99T_f + 12341.9 = 1464.4T_f - 33681.2$
   $46023.1 = 1696.39T_f$
   $T_f = 27.1ºC$

10. A block of copper (mass = 315.43 g) is warmed to 115.2°C. This block is placed into a beaker containing 450.0 g of water. The water's initial temperature is 22.7°C. What will be the final temperature of the system? Assume no heat is lost to surroundings.

$-mC_p\Delta T = mC_p\Delta T$
$-(315.43)(0.385)(T_f - 115.2) = (450.0)(4.184)(T_f - 22.7)$
$-231.99(T_f - 115.2) = 1882.8(T_f - 22.7)$
$-231.99T_f + 13990 = 1882.8T_f - 42739.6$
$56729.6 = 2114.8T_f$
$T_f = 26.8^oC$