CW/HW – Heat Problems Key **q = mCΔT**

Name_____ Period: 1 2 3

1. Temperature conversions:
   a. Convert 70.00°F to °C. $70.00°F = 1.8(T_{oC}) + 32°$

   $-32°$ $-32°$

   $\frac{38.00°}{1.8} = \frac{1.8(T_{oC})}{1.8}$ $T_{oC} = 21.11°C$

   b. Convert 100.0°C to °F.

   $T_{oF} = 1.8(100.0°C) + 32°$

   $T_{oF} = 212.0°F$

   c. Convert -103.5°C to K.

   $TK = -103.5 + 273 = 169.5\ K$

   d. Convert -40.00°F to °C (1st) and to K. (2nd)

   $-40.00° = 1.8(T_{oC}) + 32°$

   $-32°$ $-32°$

   $\frac{-72.00°}{1.8} = \frac{1.8(T_{oC})}{1.8}$

   $T_{oC} = -40.00°C$

   $TK = -40.00° + 273$

   $TK = 233.0K$

2. Practice these conversions:
   a. Convert 50.0 calories (cal) to kilocalories (Cal)

   $50.0\ cal\left(\frac{1\ Cal}{1000\ cal}\right) = .0500\ Cal$

   b. A fun size Milky Way has 81 kilocalories (Cal). How many calories does it have?

   $81\ Cal\left(\frac{1000\ cal}{1\ Cal}\right) = 81{,}000\ cal$

   c. A 24oz. bottle of Coca Cola has 291 Cal. How many joules (J) is that?

   $291\ Cal\left(\frac{1000\ cal}{1\ Cal}\right) = 291000\ cal\left(\frac{4.184\ J}{1\ cal}\right)$

   $= 1217544\ J$

   $1220000\ J$

3. How much heat energy, in joules, is required to heat 100.0g of Al from 25.0°C to 100.°C?

$q = ?$ T_f T_i

$m = 100.0\,g$

$C = .897\,J/g°C$

$\Delta T = 100.°C - 25.0°C = 75°C$

$q = (100.0\,g)(.897\,J/g°C)(75°C)$

$q = 6727.5\,J$

$q = 6700\,J$

4. How much heat, in calories, is released when 65.0g of steam is cooled from 250.°F to 213°f?

$q = ?$

$m = 65.0\,g$

$C = 3.985\,J/g°C$

$\Delta T = 213° - 250°F =$

$-37°F = -38°C$

$q = (65.0\,g)(3.985\,J/g°C)(-38°C)$

$q = -9842.95\,J\left(\frac{1\,cal}{4.184\,J}\right) =$

$q = -2352.521511\,cal. = -2400\,cal.$

5. What mass of gold takes -78.00J of energy to change temperature from 80.00°C to 40.00°C? Is this process endothermic or exothermic?

$q = -78.00\,J$

$m = ?$

$C = .129\,J/g°C$

$\Delta T = 40.00°C - 80.00°C = -40.00°C$

$m = \frac{q}{(C \cdot \Delta T)} = \frac{-78.00\,J}{(.129\,J/g°C \cdot -40.00°C)}$

$m = 15.12\,g$

6. If 7240.0J of heat is added to a 952g block of metal, the temperature increases by 10.7°C. Calculate the specific heat capacity of the metal.

$q = 7240.0\,J$

$m = 952\,g$

$C = ?$

$\Delta T = 10.7°C$

$C = \frac{q}{(m \cdot \Delta T)} = \frac{7240.0\,J}{(952\,g \cdot 10.7°C)} = .711\,J/g°C$

7. Three 75.0g samples of copper, silver, and gold are available. Each of these samples is initially at 24°C, and then 2.00kJ of heat is applied to each sample. Which sample will end up with the highest temperature

Gold, it has the lowest heat capacity which means it easily changes temp.

8. Determine the change in temperature when 55.0g of diamond is heated using 240 calories. If the original temperature of the diamond was 80.55°C, what is the final temperature?

$q = 240\,cal.\left(\frac{4.184\,J}{1\,cal}\right) = 1004.16\,J$

$m = 55.0\,g$

$C = .516\,J/g°C$

$\Delta T = ?$

$\Delta T = \frac{1004.16\,J}{(55.0\,g \cdot .516\,J/g°C)}$

$\Delta T = 35.4°C$

$\Delta T = T_f - T_i$

$35.4°C = T_f - 80.55°C$

$+80.55°C \quad +80.55°C$

$T_f = 115.95°C = 116.0°C$