Name: _____ Class: _____ Date: _____

1. For each variable in the heat equation ($q = ms\Delta T$):
   (a) define the variable
   (b) give the standard units for the variable

Answer the following questions. Show work for full credit. Make sure your answer has the proper number of SF and proper units.

2. How much heat energy (in J) is required to raise the temperature of 437 ag of Tin from 10.6 °C to 35.7 °C? 2. _____

3. What is the specific heat(in J/g°C) of an unknown compound if it takes $7.0x10^3$ J to raise 670 g of the unknown from 33.0 °C to 37.9 °C? 3. _____

4. How much heat energy (in KJ) is required to raise the temperature of 950. grams of Fe from 17.4 °C to 81.9 °C? 4. _____

5. How much heat energy (in J) is required to raise the temperature of 180. grams of Tin from 68.3 °C to 70.5 °C? 5. _____

6. How much heat energy (in EJ) is required to raise the temperature of 560 Tg of Ethyl Alcohol from 50.5 °C to 54.9 °C? 6. _____

7. Convert 2.13 mL of H_2SO_4 to mols of H_2SO_4 7. _____

8. Convert 4.06 mols of $Co_2(S_2O_3)_5$ to grams of $Co_2(S_2O_3)_5$ 8. _____

9. Convert 5.59 Gg of $HgBr_3$ to mols of $HgBr_3$ 9. _____

10. Convert 4.44 grams of H_3PO_4 to mols of H_3PO_4 10. _____

11. Convert $8.51x10^{23}$ of molecules of Au_2S_5 to grams of Au_2S_5 11. _____

12. Convert 7.97 grams of $AlAsO_4$ to molecules of $AlAsO_4$ 12. _____

Question 1: q = heat (J) m = mass (g) s = specific heat ($\frac{J}{g°C}$) ΔT = change in temperature ($T_{final} - T_{initial}$) ($°C$)

Question 2:

$$\frac{437\ g}{} \times \frac{1x10^{-18}\ g}{1\ ag} \times \frac{0.222\ J}{g°C} \times \frac{(35.7 - 10.6)\ °C}{} = \begin{array}{c} 0.00000000000000244\ J \\ or\ 2.44x10^{-15}\ J \end{array}$$

Question 3:

$$\frac{7.0x10^{3}\ J}{} \times \frac{1}{670\ g} \times \frac{1}{(37.9 - 33.0)\ °C} = \begin{array}{c} 2.1\ J/g°C \\ or\ 2.1x10^{0}\ J/g°C \end{array}$$

Question 4:

$$\frac{950.\ g}{} \times \frac{0.473\ J}{g°C} \times \frac{(81.9 - 17.4)\ °C}{} \times \frac{1\ kJ}{1000\ J} = \begin{array}{c} 2.90x10^{1}\ kJ \\ or\ 2.90x10^{1}\ kJ \end{array}$$

Question 5:

$$\frac{180.\ g}{} \times \frac{0.222\ J}{g°C} \times \frac{(70.5 - 68.3)\ °C}{} = \begin{array}{c} 88\ J \\ or\ 8.8x10^{1}\ J \end{array}$$

Question 6:

$$\frac{560\ g}{} \times \frac{1x10^{12}\ g}{1\ Tg} \times \frac{2.138\ J}{g°C} \times \frac{(54.9 - 50.5)\ °C}{} \times \frac{1\ EJ}{1x10^{18}\ J} = \begin{array}{c} 0.0053\ EJ \\ or\ 5.3x10^{-3}\ EJ \end{array}$$

Question 7:

$$\frac{2.13\ mL\ H_2SO4}{} \times \frac{1.84\ g\ H_2SO4}{1\ mL\ H_2SO4} \times \frac{1\ mol\ H_2SO4}{139.93\ g\ H_2SO4} = \begin{array}{c} 0.0280\ mols\ H_2SO4 \\ 2.80x10^{-2}\ mols\ H_2SO4 \end{array}$$

Question 8:

$$\frac{4.06\ mol\ Co_2(S_2O_3)_5}{} \times \frac{678.56\ g\ Co_2(S_2O_3)_5}{1\ mol\ Co_2(S_2O_3)_5} = \begin{array}{c} 2,760\ grams\ Co_2(S_2O_3)_5 \\ 2.76x10^{3}\ grams\ Co_2(S_2O_3)_5 \end{array}$$

Question 9:

$$\frac{5.59\ Gg\ HgBr_3}{} \times \frac{1x10^{9}\ g}{1\ Gg} \times \frac{1\ mol\ HgBr_3}{440.29\ g\ HgBr_3} = \begin{array}{c} 12,700,000\ mols\ HgBr_3 \\ 1.27x10^{7}\ mols\ HgBr_3 \end{array}$$

Question 10:

$$\frac{4.44\ g\ H_3PO_4}{} \times \frac{1\ mol\ H_3PO_4}{97.994\ g\ H_3PO_4} = \begin{array}{c} 0.0453\ mols\ H_3PO_4 \\ 4.53x10^{-2}\ mols\ H_3PO_4 \end{array}$$

Question 11:

$$\frac{8.51x10^{23}\ molecules\ Au_2S_5}{} \times \frac{1\ mol\ Au_2S_5}{6.02 \times 10^{23} molecules} = \begin{array}{c} 784\ g\ Au_2S_5 \\ 7.84x10^{2}\ g\ Au_2S_5 \end{array}$$

Question 12:

$$\frac{7.97\ g\ AlAsO_4}{} \times \frac{1\ mol\ AlAsO_4}{165.87\ g\ AlAsO_4} \times \frac{6.02 \times 10^{23} molecules}{1\ mol\ AlAsO_4} = \begin{array}{c} 28,900,000,000,000,000,000,000\ molecules\ AlAsO_4 \\ 2.89x10^{22}\ molecules\ AlAsO_4 \end{array}$$