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 470. pg of Ethyl Chloride from 45.3 °C to 87.5 °C? 2. _____

3. How much heat energy (in J) is required to raise the temperature of 211 grams of H_2O from 92.4 °C to 98.9 °C? 3. _____

4. How much heat energy (in cJ) is required to raise the temperature of 510 pg of Ethyl Ether from 15.6 °C to 20.3 °C? 4. _____

5. What is the specific heat(in J/g°C) of an unknown compound if it takes 2,380 J to raise 210. g of the unknown from 26.2 °C to 50.2 °C? 5. _____

6. How much heat energy (in KJ) is required to raise the temperature of 940. grams of Zn from 12.7 °C to 95.1 °C? 6. _____

7. Convert 8.21 mL of H_2SO_4 to mols of H_2SO_4 7. _____

8. Convert $9.96x10^{23}$ of molecules of TiO_2 to grams of TiO_2 8. _____

9. Convert 8.5 dag of C_3I_7 to mols of C_3I_7 9. _____

10. Convert 9.15 mols of $Pb(HS)_3$ to grams of $Pb(HS)_3$ 10. _____

11. Convert 5.6 grams of C_3F_5 to molecules of C_3F_5 11. _____

12. Convert 3.67 grams of $Si_{10}Cl_8$ to mols of $Si_{10}Cl_8$ 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:

$$\underline{470.\ g} \times \frac{1x10^{-12}\ g}{1\ pg} \times \frac{1.687\ J}{g°C} \times \underline{(87.5 - 45.3)\ °C} = \begin{array}{c} 0.0000000335\ J \\ or\ 3.35x10^{-8}\ J \end{array}$$

Question 3:

$$\underline{211\ g} \times \frac{4.184\ J}{g°C} \times \underline{(98.9 - 92.4)\ °C} = \begin{array}{c} 5,700\ J \\ or\ 5.7x10^{3}\ J \end{array}$$

Question 4:

$$\underline{510\ g} \times \frac{1x10^{-12}\ g}{1\ pg} \times \frac{2.22\ J}{g°C} \times \underline{(20.3 - 15.6)\ °C} \times \frac{1\ cJ}{1x10^{-2}\ J} = \begin{array}{c} 0.00000053\ cJ \\ or\ 5.3x10^{-7}\ cJ \end{array}$$

Question 5:

$$\underline{2,380\ J} \times \frac{1}{210.\ g} \times \frac{1}{(50.2 - 26.2)\ °C} = \begin{array}{c} 0.473\ J/g°C \\ or\ 4.73x10^{-1}\ J/g°C \end{array}$$

Question 6:

$$\underline{940.\ g} \times \frac{0.39\ J}{g°C} \times \underline{(95.1 - 12.7)\ °C} \times \frac{1\ kJ}{1000\ J} = \begin{array}{c} 30.\ kJ \\ or\ 3.0x10^{1}\ kJ \end{array}$$

Question 7:

$$\underline{8.21\ mL\ H_2SO4} \times \frac{1.84\ g\ H_2SO4}{1\ mL\ H_2SO4} \times \frac{1\ mol\ H_2SO4}{291.74\ g\ H_2SO4} = \begin{array}{c} 0.0518\ mols\ H_2SO4 \\ 5.18x10^{-2}\ mols\ H_2SO4 \end{array}$$

Question 8:

$$\underline{9.96x10^{23}\ molecules\ TiO_2} \times \frac{1\ mol\ TiO_2}{6.02 \times 10^{23} molecules} = \begin{array}{c} 132\ g\ TiO_2 \\ 1.32x10^{2}\ g\ TiO_2 \end{array}$$

Question 9:

$$\underline{8.5\ dag\ C_3I_7} \times \frac{1x10^{1}\ g}{1\ dag} \times \frac{1\ mol\ C_3I_7}{924.40\ g\ C_3I_7} = \begin{array}{c} 0.092\ mols\ C_3I_7 \\ 9.2x10^{-2}\ mols\ C_3I_7 \end{array}$$

Question 10:

$$\underline{9.15\ mol\ Pb(HS)_3} \times \frac{306.44\ g\ Pb(HS)_3}{1\ mol\ Pb(HS)_3} = \begin{array}{c} 2.80x10^{3}\ grams\ Pb(HS)_3 \\ 2.80x10^{3}\ grams\ Pb(HS)_3 \end{array}$$

Question 11:

$$\underline{5.6\ g\ C_3F_5} \times \frac{1\ mol\ C_3F_5}{131.03\ g\ C_3F_5} \times \frac{6.02 \times 10^{23} molecules}{1\ mol\ C_3F_5} = \begin{array}{c} 26,000,000,000,000,000,000,000\ molecules\ C_3F_5 \\ 2.6x10^{22}\ molecules\ C_3F_5 \end{array}$$

Question 12:

$$\underline{3.67\ g\ Si_{10}Cl_8} \times \frac{1\ mol\ Si_{10}Cl_8}{564.50\ g\ Si_{10}Cl_8} = \begin{array}{c} 0.00650\ mols\ Si_{10}Cl_8 \\ 6.50x10^{-3}\ mols\ Si_{10}Cl_8 \end{array}$$