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 aJ) is required to raise the temperature of 550. Mg of Silver from 41.1 °C to 73.3 °C? 2. _____

3. How much heat energy (in KJ) is required to raise the temperature of 565 grams of Tin from 47.0 °C to 57.8 °C? 3. _____

4. What is the specific heat(in J/g°C) of an unknown compound if it takes $1,700$ J to raise 990. g of the unknown from 29.2 °C to 33.6 °C? 4. _____

5. How much heat energy (in J) is required to raise the temperature of 130. grams of Fe from 53.1 °C to 75.3 °C? 5. _____

6. How much heat energy (in J) is required to raise the temperature of 387 Pg of Zn from 50.6 °C to 69.1 °C? 6. _____

7. Convert $3.53x10^{23}$ of molecules of S_9F_3 to grams of S_9F_3 7. _____

8. Convert 0.5 Tg of $Hg(OH)_2$ to mols of $Hg(OH)_2$ 8. _____

9. Convert 3.09 grams of Si_6O_2 to molecules of Si_6O_2 9. _____

10. Convert 4.07 mL of Pb to mols of Pb 10. _____

11. Convert 4.15 mols of $N_{10}Br_8$ to grams of $N_{10}Br_8$ 11. _____

12. Convert 1.83 grams of Na_2CO_3 to mols of Na_2CO_3 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:

$$\underline{550.\ g} \times \frac{1x10^{6}\ g}{1\ Mg} \times \frac{0.237\ J}{g°C} \times \underline{(73.3 - 41.1)\ °C} \times \frac{1\ aJ}{1x10^{-18}\ J} = \begin{array}{c} 4.20x10^{27}\ aJ \\ or\ 4.20x10^{27}\ aJ \end{array}$$

Question 3:

$$\underline{565\ g} \times \frac{0.222\ J}{g°C} \times \underline{(57.8 - 47.0)\ °C} \times \frac{1\ kJ}{1000\ J} = \begin{array}{c} 1.35\ kJ \\ or\ 1.35x10^{0}\ kJ \end{array}$$

Question 4:

$$\underline{1,700\ J} \times \frac{1}{990.\ g} \times \frac{1}{(33.6 - 29.2)\ °C} = \begin{array}{c} 0.38\ J/g°C \\ or\ 3.8x10^{-1}\ J/g°C \end{array}$$

Question 5:

$$\underline{130.\ g} \times \frac{0.473\ J}{g°C} \times \underline{(75.3 - 53.1)\ °C} = \begin{array}{c} 1,370\ J \\ or\ 1.37x10^{3}\ J \end{array}$$

Question 6:

$$\underline{387\ g} \times \frac{1x10^{15}\ g}{1\ Pg} \times \frac{0.39\ J}{g°C} \times \underline{(69.1 - 50.6)\ °C} = \begin{array}{c} 2,800,000,000,000,000,000\ J \\ or\ 2.8x10^{18}\ J \end{array}$$

Question 7:

$$\underline{3.53x10^{23}\ molecules\ S_9F_3} \times \frac{1\ mol\ S_9F_3}{6.02 \times 10^{23} molecules} = \begin{array}{c} 203\ g\ S_9F_3 \\ 2.03x10^{2}\ g\ S_9F_3 \end{array}$$

Question 8:

$$\underline{0.5\ Tg\ Hg(OH)_2} \times \frac{1x10^{12}\ g}{1\ Tg} \times \frac{1\ mol\ Hg(OH)_2}{234.61\ g\ Hg(OH)_2} = \begin{array}{c} 2,000,000,000\ mols\ Hg(OH)_2 \\ 2x10^{9}\ mols\ Hg(OH)_2 \end{array}$$

Question 9:

$$\underline{3.09\ g\ Si_6O_2} \times \frac{1\ mol\ Si_6O_2}{200.54\ g\ Si_6O_2} \times \frac{6.02 \times 10^{23} molecules}{1\ mol\ Si_6O_2} = \begin{array}{c} 9,280,000,000,000,000,000,000\ molecules\ Si_6O_2 \\ 9.28x10^{21}\ molecules\ Si_6O_2 \end{array}$$

Question 10:

$$\underline{4.07\ mL\ Pb} \times \frac{11.34\ g\ Pb}{1\ mL\ Pb} \times \frac{1\ mol\ Pb}{386.91\ g\ Pb} = \begin{array}{c} 0.119\ mols\ Pb \\ 1.19x10^{-1}\ mols\ Pb \end{array}$$

Question 11:

$$\underline{4.15\ mol\ N_{10}Br_8} \times \frac{779.30\ g\ N_{10}Br_8}{1\ mol\ N_{10}Br_8} = \begin{array}{c} 3,230\ grams\ N_{10}Br_8 \\ 3.23x10^{3}\ grams\ N_{10}Br_8 \end{array}$$

Question 12:

$$\underline{1.83\ g\ Na_2CO_3} \times \frac{1\ mol\ Na_2CO_3}{105.99\ g\ Na_2CO_3} = \begin{array}{c} 0.0173\ mols\ Na_2CO_3 \\ 1.73x10^{-2}\ mols\ Na_2CO_3 \end{array}$$