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 KJ) is required to raise the temperature of 220. grams of Tin from 29.7 °C to 33.3 °C? 2. _____

3. What is the specific heat(in J/g°C) of an unknown compound if it takes 5,700 J to raise 534 g of the unknown from 90.5 °C to 96.8 °C? 3. _____

4. How much heat energy (in J) is required to raise the temperature of 530. grams of Gold from 30.7 °C to 57.9 °C? 4. _____

5. How much heat energy (in J) is required to raise the temperature of 250. pg of Cu from 59.0 °C to 77.4 °C? 5. _____

6. How much heat energy (in MJ) is required to raise the temperature of 280. ag of Lead from 37.5 °C to 51.3 °C? 6. _____

7. Convert 3.13 grams of $Mg(IO_2)_2$ to mols of $Mg(IO_2)_2$ 7. _____

8. Convert 5.78 grams of H_3PO_4 to molecules of H_3PO_4 8. _____

9. Convert 3.27 mL of Ag to mols of Ag 9. _____

10. Convert 2.27 Tg of $Cu_3(AsO_4)_2$ to mols of $Cu_3(AsO_4)_2$ 10. _____

11. Convert $6.89x10^{23}$ of molecules of Cu_3N_2 to grams of Cu_3N_2 11. _____

12. Convert 0.85 mols of Si_5Br_{10} to grams of Si_5Br_{10} 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:

$$\underline{220.\ g} \times \frac{0.222\ J}{g°C} \times \underline{(33.3 - 29.7)\ °C} \times \frac{1\ kJ}{1000\ J} = \begin{array}{c} 0.18\ kJ \\ or\ 1.8x10^{-1}\ kJ \end{array}$$

Question 3:

$$\underline{5,700\ J} \times \frac{1}{534\ g} \times \frac{1}{\underline{(96.8 - 90.5)\ °C}} = \begin{array}{c} 1.7\ J/g°C \\ or\ 1.7x10^{0}\ J/g°C \end{array}$$

Question 4:

$$\underline{530.\ g} \times \frac{0.131\ J}{g°C} \times \underline{(57.9 - 30.7)\ °C} = \begin{array}{c} 1,890\ J \\ or\ 1.89x10^{3}\ J \end{array}$$

Question 5:

$$\underline{250.\ g} \times \frac{1x10^{-12}\ g}{1\ pg} \times \frac{0.385\ J}{g°C} \times \underline{(77.4 - 59.0)\ °C} = \begin{array}{c} 0.00000000177\ J \\ or\ 1.77x10^{-9}\ J \end{array}$$

Question 6:

$$\underline{280.\ g} \times \frac{1x10^{-18}\ g}{1\ ag} \times \frac{0.128\ J}{g°C} \times \underline{(51.3 - 37.5)\ °C} \times \frac{1\ MJ}{1x10^{6}\ J} = \begin{array}{c} 0.00000000000000000000495\ MJ \\ or\ 4.95x10^{-22}\ MJ \end{array}$$

Question 7:

$$\underline{3.13\ g\ Mg(IO_2)_2} \times \frac{1\ mol\ Mg(IO_2)_2}{342.13\ g\ Mg(IO_2)_2} = \begin{array}{c} 0.00915\ mols\ Mg(IO_2)_2 \\ 9.15x10^{-3}\ mols\ Mg(IO_2)_2 \end{array}$$

Question 8:

$$\underline{5.78\ g\ H_3PO_4} \times \frac{1\ mol\ H_3PO_4}{97.994\ g\ H_3PO_4} \times \frac{6.02 \times 10^{23} molecules}{1\ mol\ H_3PO_4} = \begin{array}{c} 35,500,000,000,000,000,000,000\ molecules\ H_3PO_4 \\ 3.55x10^{22}\ molecules\ H_3PO_4 \end{array}$$

Question 9:

$$\underline{3.27\ mL\ Ag} \times \frac{10.5\ g\ Ag}{1\ mL\ Ag} \times \frac{1\ mol\ Ag}{405.20\ g\ Ag} = \begin{array}{c} 0.0847\ mols\ Ag \\ 8.47x10^{-2}\ mols\ Ag \end{array}$$

Question 10:

$$\underline{2.27\ Tg\ Cu_3(AsO_4)_2} \times \frac{1x10^{12}\ g}{1\ Tg} \times \frac{1\ mol\ Cu_3(AsO_4)_2}{468.49\ g\ Cu_3(AsO_4)_2} = \begin{array}{c} 4,850,000,000\ mols\ Cu_3(AsO_4)_2 \\ 4.85x10^{9}\ mols\ Cu_3(AsO_4)_2 \end{array}$$

Question 11:

$$\underline{6.89x10^{23}\ molecules\ Cu_3N_2} \times \frac{1\ mol\ Cu_3N_2}{6.02 \times 10^{23} molecules} = \begin{array}{c} 250.\ g\ Cu_3N_2 \\ 2.50x10^{2}\ g\ Cu_3N_2 \end{array}$$

Question 12:

$$\underline{0.85\ mol\ Si_5Br_{10}} \times \frac{939.45\ g\ Si_5Br_{10}}{1\ mol\ Si_5Br_{10}} = \begin{array}{c} 8.0x10^{2}\ grams\ Si_5Br_{10} \\ 8.0x10^{2}\ grams\ Si_5Br_{10} \end{array}$$