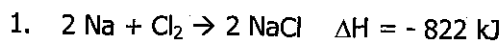


Bob's Calorimetry Problems Review Worksheet

Name _____



a) How much heat is released when 46.0 g of Na reacts?

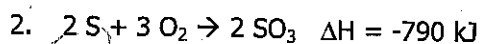
$$\frac{46 \text{ g Na} \mid 1 \text{ mol Na} \mid -822 \text{ kJ}}{22.99 \text{ g} \mid 2 \text{ mol Na}} = -822 \text{ kJ}$$

b) If 1200 kJ of heat was produced, how much Cl_2 reacted?

$$\frac{-1200 \text{ kJ} \mid 1 \text{ mol Cl}_2 \mid 70.9 \text{ g Cl}_2}{-822 \text{ kJ} \mid 1 \text{ mol Cl}_2} = 104 \text{ g} = 1.0 \times 10^2 \text{ g}$$

c) How much heat is produced if 35.5 g of NaCl is produced?

$$\frac{35.5 \text{ g NaCl} \mid 1 \text{ mol NaCl} \mid -822 \text{ kJ}}{58.44 \text{ g} \mid 2 \text{ mol NaCl}} = -250. \text{ kJ}$$

a) If 250 mol of SO_3 is produced, how much heat is released?

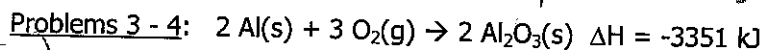
$$\frac{250 \text{ mol SO}_3 \mid -790 \text{ kJ}}{2 \text{ mol SO}_3} = -98,800 \text{ kJ} = -9.88 \times 10^4 \text{ kJ}$$

b) How much heat is produced when 64.0 g of O_2 is reacted?

$$\frac{64 \text{ g O}_2 \mid 1 \text{ mol O}_2 \mid -790 \text{ kJ}}{32 \text{ g O}_2 \mid 3 \text{ mol O}_2} = -527 \text{ kJ}$$

c) If 723 kJ of heat was produced, what mass of SO_3 was produced?

$$\frac{-723 \text{ kJ} \mid 2 \text{ mol SO}_3 \mid 80.07 \text{ g SO}_3}{-790 \text{ kJ} \mid 2 \text{ mol SO}_3} = 147 \text{ g}$$

3. Calculate the amount of heat produced when 75.0 g of $\text{O}_2(\text{g})$ reacts.

$$\frac{75 \text{ g O}_2 \mid 1 \text{ mol O}_2 \mid -3351 \text{ kJ}}{32 \text{ g O}_2 \mid 3 \text{ mol O}_2} = -2617 = -2620 \text{ kJ}$$

4. What mass of Al_2O_3 is produced if 2250 kJ of heat is produced?

$$\frac{-2250 \text{ kJ} \mid 2 \text{ mol Al}_2\text{O}_3 \mid 102.0 \text{ g}}{-3351 \text{ kJ} \mid 1 \text{ mol Al}_2\text{O}_3} = 137 \text{ g}$$

5. A 36.0 g sample of metal with a temperature of 100.0°C is placed in a calorimeter holding 80.0 g of water at 20.0°C . The temperature of the water rises to 25.0°C . What is the specific heat of the metal?

$$(36 \text{ g})c(25 - 100) = - (80 \text{ g})(4.184 \text{ J/g}^\circ\text{C})(25 - 20)$$

$$c = 0.620 \text{ J/g}^\circ\text{C}$$

6. 2.50 grams of a substance loses 14.4 Joules of heat as its temperature drops from 25.0 °C to 20.0 °C. What is the substance's specific heat?

$$c = \frac{-14.4 \text{ J}}{(2.5 \text{ g})(20 - 25^\circ\text{C})} = 1.15 \text{ J/g}^\circ\text{C}$$

7. Lead has a specific heat of 0.128 J/g°C. How much heat would a 150.0 g piece of lead give off as its temperature drops from 85.0 °C to 50.0 °C?

$$\text{heat} = (150 \text{ g})(0.128 \text{ J/g}^\circ\text{C})(50 - 85^\circ\text{C}) = -672 \text{ J}$$

8. A chemical reaction takes place inside a calorimeter which contains 75.0 grams of water. The temperature of the water rises from 21.0 °C to 23.0 °C. Calculate the heat given off by the reaction. Is the rxn endothermic or exothermic?

$$\text{heat} = -(75 \text{ g})(4.184 \text{ J/g}^\circ\text{C})(23 - 21^\circ\text{C}) = -628 \text{ J} \quad \text{EXO}$$

9. A chemical reaction takes place inside a calorimeter which contains 50.0 grams of water. The temperature of the water drops from 23.0 °C to 19.0 °C. Calculate the heat given off by the reaction. Is the rxn endothermic or exothermic?

$$\text{heat} = -(50 \text{ g})(4.184 \text{ J/g}^\circ\text{C})(19 - 23^\circ\text{C}) = +837 \text{ J} \quad \text{Endo}$$

10. A 10.0 gram piece of metal is heated to 100.°C. It is placed in a calorimeter containing 75.0 grams of water at 25.0 °C. The final temperature of the metal and water is 27.0 °C. What is the specific heat of the metal?

$$(10 \text{ g})c(27 - 100^\circ\text{C}) = -(75 \text{ g})(4.184 \text{ J/g}^\circ\text{C})(27 - 25^\circ\text{C})$$

$$c = .860 \text{ J/g}^\circ\text{C}$$

11. A 36.0 g sample of metal with a temperature of 100.0 °C is placed in a calorimeter holding 80.0 g of water at 20.0 °C. The temperature of the metal and water is 25.0 °C. What is the specific heat of the metal?

$$(36 \text{ g})c(25 - 100^\circ\text{C}) = -(80 \text{ g})(4.184 \text{ J/g}^\circ\text{C})(25 - 20^\circ\text{C})$$

$$c = .620 \text{ J/g}^\circ\text{C}$$