

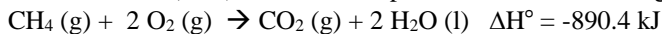
Energy Stoichiometry Answers

1. Calculate the amount of heat absorbed when 5.66 grams of carbon disulfide form from the synthesis of C (s) and S (s).



$$\frac{5.66 \text{ grams CS}_2}{x} = \frac{76.2 \text{ grams CS}_2}{89.3 \text{ kJ}} = 6.63 \text{ kJ}$$

2. How many grams of methane (CH₄) are needed to produce 2100. kJ of energy?



$$\frac{-2100. \text{ kJ}}{x} = \frac{-890.4 \text{ kJ}}{16.05 \text{ grams CH}_4} = 37.85 \text{ grams CH}_4$$

3. How much heat is given off when 1106 grams of phosphorus trichloride are formed?



$$\frac{1106 \text{ grams PCl}_3}{x} = \frac{274.64 \text{ grams PCl}_3}{-574 \text{ kJ}} = -2311.5 \rightarrow -2310 \text{ kJ}$$

4. How many grams of magnesium oxide are produced when 350 kJ of energy is released?



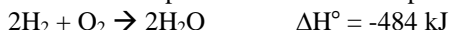
$$\frac{-350 \text{ kJ}}{x} = \frac{-1204 \text{ kJ}}{80.60 \text{ grams MgO}} = 23.43 \rightarrow 23 \text{ grams MgO}$$

5. How much energy is required to break down 300.0 grams of phosphorus pentachloride?



$$\frac{300.0 \text{ grams PCl}_5}{x} = \frac{208.22 \text{ grams PCl}_5}{-87.9 \text{ kJ}} = -126.64 = -127 \text{ kJ}$$

6. How many grams of water vapor are released in the production of 3000. kilocalories of energy?



$$3000 \text{ kcal} \times 4.184 = 12552 \text{ kJ}$$

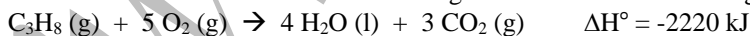
$$\frac{-12552 \text{ kJ}}{x} = \frac{-484 \text{ kJ}}{36.04 \text{ grams H}_2\text{O}} = 935 \text{ grams H}_2\text{O}$$

7. How much energy is released in the break down of 999 grams of iron(III) oxide?



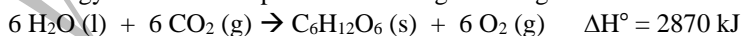
$$\frac{999 \text{ grams Fe}_2\text{O}_3}{x} = \frac{159.7 \text{ grams Fe}_2\text{O}_3}{-26.3 \text{ kJ}} = -164.5 = -165 \text{ kJ}$$

8. A mountain climber, wanting a drink of water, must melt the snow from the mountain with a propane burner. How many grams of propane (C₃H₈) would the mountain climber have to use to generate the 55.5 kJ of energy?



$$\frac{-55.5 \text{ kJ}}{x} = \frac{-2220 \text{ kJ}}{44.11 \text{ grams C}_3\text{H}_8} = 1.10 \text{ grams C}_3\text{H}_8$$

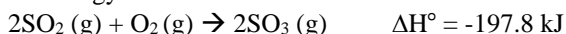
9. How many kJ of energy are needed to produce 2.0 kilograms of glucose?



$$2.0 \text{ kilograms} \times 1000 = 2.0 \times 10^3 \text{ grams}$$

$$\frac{2.0 \times 10^3 \text{ grams C}_6\text{H}_{12}\text{O}_6}{x} = \frac{180.18 \text{ grams C}_6\text{H}_{12}\text{O}_6}{2870 \text{ kJ}} = 31857.0 = 32000 \text{ kJ}$$

10. How many kJ of energy are released when 560. liters of sulfur dioxide react with excess oxygen at STP?



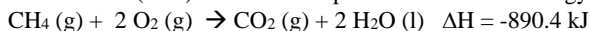
$$\frac{560 \text{ liters SO}_2}{x} = \frac{44.8 \text{ liters SO}_2}{-197.8 \text{ kJ}} = -2472.5 = -2470 \text{ kJ}$$

1. Calculate the amount of heat absorbed when 5.66 grams of carbon disulfide form from the synthesis of C (s) and S (s).



$$\frac{5.66 \text{ grams CS}_2}{1} \times \frac{1 \text{ mole CS}_2}{76.2 \text{ grams CS}_2} \times \frac{89.3 \text{ kJ}}{1 \text{ mole CS}_2} = 6.63 \text{ kJ}$$

2. How many grams of methane (CH₄) are needed to produce 2100 kJ of energy?



$$\frac{2100 \text{ kJ}}{1} \times \frac{1 \text{ mole CH}_4}{-890.4 \text{ kJ}} \times \frac{16.0 \text{ grams CH}_4}{1 \text{ mole CH}_4} = 37.7 \rightarrow 38 \text{ grams CH}_4$$

3. How much heat is given off when 1106 grams of phosphorus trichloride are formed?



$$\frac{1106 \text{ grams PCl}_3}{1} \times \frac{1 \text{ mole PCl}_3}{137.2 \text{ grams PCl}_3} \times \frac{-574 \text{ kJ}}{2 \text{ mole PCl}_3} = -2313.6 = -2310 \text{ kJ}$$

4. How many grams of magnesium oxide are produced when 350 kJ of energy is released?



$$\frac{350 \text{ kJ}}{1} \times \frac{2 \text{ moles MgO}}{-1204 \text{ kJ}} \times \frac{40.3 \text{ grams MgO}}{1 \text{ mole MgO}} = 23.4 \rightarrow 23 \text{ grams MgO}$$

5. How much energy is required to break down 300.0 grams of phosphorus pentachloride?



$$\frac{300.0 \text{ grams PCl}_5}{1} \times \frac{1 \text{ mole PCl}_5}{208.5 \text{ grams PCl}_5} \times \frac{-87.9 \text{ kJ}}{1 \text{ mole PCl}_5} = -126.47 = -126 \text{ kJ}$$

6. How many liters of water vapor are released in the production of 3000. kilocalories of energy?



$$3000 \text{ kcal} \times 4.184 = 12552 \text{ kJ}$$

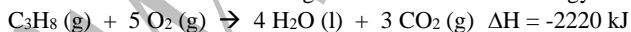
$$\frac{12552 \text{ kJ}}{1} \times \frac{2 \text{ moles H}_2\text{O}}{-572 \text{ kJ}} \times \frac{22.4 \text{ liters H}_2\text{O}}{1 \text{ mole H}_2\text{O}} = 983 \text{ liters H}_2\text{O}$$

7. How much energy is released in the break down of 999 grams of iron(III) oxide?



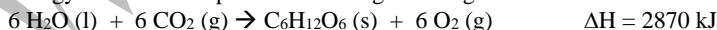
$$\frac{999 \text{ grams Fe}_2\text{O}_3}{1} \times \frac{1 \text{ mole Fe}_2\text{O}_3}{159.6 \text{ grams Fe}_2\text{O}_3} \times \frac{-26.3 \text{ kJ}}{1 \text{ mole Fe}_2\text{O}_3} = -164.6 = -165 \text{ kJ}$$

8. A mountain climber, wanting a drink of water, must melt the snow from the mountain with a propane burner. How many grams of propane (C₃H₈) would the mountain climber have to use to generate the 55.5 kJ of energy?



$$\frac{55.5 \text{ kJ}}{1} \times \frac{1 \text{ mole C}_3\text{H}_8}{2220 \text{ kJ}} \times \frac{44.0 \text{ grams C}_3\text{H}_8}{1 \text{ mole C}_3\text{H}_8} = 1.10 \text{ grams C}_3\text{H}_8$$

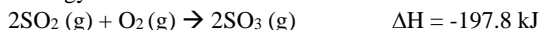
9. How many kJ of energy are needed to produce 2.0 kilograms of glucose?



$$2.0 \text{ kilograms} \times 1000 = 2.0 \times 10^3 \text{ grams} \quad \leftarrow 3/25/2009 \text{ Elisha Johnson}$$

$$\frac{2.0 \times 10^3 \text{ grams C}_6\text{H}_{12}\text{O}_6}{1} \times \frac{1 \text{ mole C}_6\text{H}_{12}\text{O}_6}{180.0 \text{ grams C}_6\text{H}_{12}\text{O}_6} \times \frac{2870 \text{ kJ}}{1 \text{ mole C}_6\text{H}_{12}\text{O}_6} = 31888.9 = 32000 \text{ kJ}$$

10. How many kJ of energy are released when 560 liters of sulfur dioxide react with excess oxygen?



$$\frac{560 \text{ liters SO}_2}{1} \times \frac{1 \text{ mole SO}_2}{22.4 \text{ liters SO}_2} \times \frac{-197.8 \text{ kJ}}{2 \text{ mole SO}_2} = -2472.5 = -2500 \text{ kJ}$$