

Unit 7, Stoichiometry

Note: You must have a balanced equation before solving the problems! And you MUST show the Hup, Two, Three, Four for all calculations!

1. How many grams of H₂ can be produced from the reaction of 11.5 grams of sodium with an excess of water? Hint: $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$. Ans: 0.505g .

2. Nitrogen reacts with 2.00 grams of hydrogen. How many grams of ammonia are produced? Hint: Ammonia is NH₃. Nitrogen is diatomic (honorific). Ans: 11.2g.

3. How many grams of oxygen are required to oxidize 85.6 grams of carbon? Hint: Oxygen is diatomic,
 $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$. Ans: 228g.

4. The action of carbon monoxide on iron(III) oxide (ferric oxide) can be represented by the equation, $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$. What would be the amount of carbon monoxide used if 18.7 grams of iron were produced? Ans: 14.1g.

5. How many grams of hydrochloric acid (HCl) are required to react with 75.1 grams of calcium hydroxide? Remember the rules for parentheses for calcium hydroxide. Ans: 74.6g.

6. How many grams of hydrogen gas are produced when 5.62 grams of aluminum react with hydrochloric acid? Hint: hydrochloric acid is hydrogen chloride, hydrogen gas is diatomic. Ans: 0.631g.

7. How much heat is required to raise the temperature of 91.4 g of PCl_3 from 25.0°C to 76.1°C ? From Table A-5, $c = 0.874 \text{ J/g}\cdot\text{C}^\circ$. Ans. = 4080 J.

8. How much heat is required to raise the temperature of 4.66 g CCl_4 from 20.9°C to 76.8°C ? From Table A-5, $c = 0.856 \text{ J/g}\cdot\text{C}^\circ$. Ans. = 223 J

9. How much heat is required to raise the temperature of 787 g of H_2O from 18.0°C to 100.0°C ? From Table A-5, $c = 4.18 \text{ J/g}\cdot\text{C}^\circ$. Ans. = 270,000 J.

10. Compute the change in enthalpy for the formation of 193 grams of ammonium bromide from ammonia and hydrogen bromide. Hint: Remember the difference between ammonia and ammonium (nevaah forget!), and find ΔH then multiply by the moles of ammonium bromide. From Table A-6, ΔH in kJ/mol: $\text{NH}_3 = -46.2$, $\text{NH}_4\text{Br} = -270$, $\text{HBr} = -36.2$.

Ans: $\Delta H = -188 \text{ kJ/mol}$, -370 kJ.

11. Compute the change in enthalpy for the displacement of 0.0663 grams of bromine from the reaction of

$\text{Cl}_2 + 2\text{NaBr} \rightarrow 2\text{NaCl} + \text{Br}_2$. From Table A-6, ΔH in kJ/mol: $\text{Br}_2 = 0.0$, $\text{NaBr} = -360$, $\text{Cl}_2 = 0.0$, $\text{NaCl} = -411$.

Ans: $\Delta H = -102 \text{ kJ/mol}$, -0.0423 kJ.

12. What is the difference between endothermic reactions and exothermic reactions?

13. Give an example of the use of activation energy in everyday life.