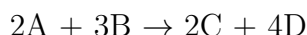


Module 2: Introduction to Quantitative Chemistry

Topic 2.2: The Mole Concept

————— **Development** —————

1. Consider the following reaction:



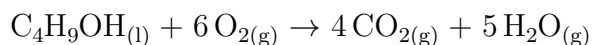
How many moles of B is required to completely react with 2.50 moles of A?

- (a) 2.50 mol
- (b) 3.00 mol
- (c) 3.75 mol
- (d) 7.50 mol

2. For the same reaction in Question 1, if 5.00 moles of A is mixed with 6.00 moles of B, how many moles of C is produced?

- (a) 4.00 mol
- (b) 5.00 mol
- (c) 6.00 mol
- (d) 12.0 mol

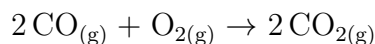
3. Butanol burns in oxygen according to the following equation:



How many moles of carbon dioxide would form if exactly 12 moles of oxygen was consumed in this reaction?

- (a) 2 mol
- (b) 4 mol
- (c) 8 mol
- (d) 10 mol

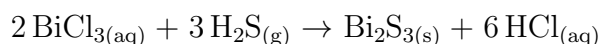
4. Carbon monoxide can be oxidised according to the following equation:



How many moles of oxygen is required to combust 28 g of carbon monoxide?

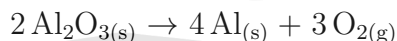
- (a) 0.40 mol
- (b) 0.50 mol
- (c) 0.60 mol
- (d) 0.70 mol

5. Consider the following reaction:



What volume of hydrogen sulfide gas at 25°C and 100 kPa is required to convert 0.600 moles of bismuth chloride into bismuth sulfide?

- (a) 7.40 L
  - (b) 14.7 L
  - (c) 20.2 L
  - (d) 22.3 L
6. Aluminum can be extracted from aluminum oxide through the following electrolytic process:



What mass of aluminum oxide needs to be electrolysed to produce 500.0 L of oxygen at 0°C and 100 kPa?

- (a) 1020 g
  - (b) 1327 g
  - (c) 1497 g
  - (d) 2275 g
7. What volume of carbon dioxide gas is produced at 25°C and 100 kPa when 200.0 g of calcium carbonate is thermally decomposed?
- (a) 22.20 L
  - (b) 24.50 L
  - (c) 44.42 L
  - (d) 49.54 L
8. What is the mass of calcium oxide produced when 25 g of calcium carbonate is thermally decomposed?
- (a) 10 g
  - (b) 14 g
  - (c) 16 g
  - (d) 25 g

9. (a) Write a chemical equation for the reaction between magnesium and hydrochloric acid. **1**

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(b) Calculate the mass of hydrochloric acid that is required to completely dissolve 6.00 g of magnesium. **2**

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★ 18.0 g ★

10. (a) Write a chemical equation for the complete combustion of methane ( $\text{CH}_4$ ) gas. **1**

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(b) Calculate the mass AND volume of oxygen gas at  $0^\circ\text{C}$  and 100 kPa required to completely combust 10.0 g of methane. **3**

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★ 39.9 g, 28.3 L ★

11. (a) Write a chemical equation for the reaction between aluminum and oxygen gas. 1

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(b) Calculate the mass of the salt produced when 0.89 g of aluminum is reacted with excess oxygen gas. 2

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★ 1.7 g ★

12. During a class demonstration, Mr Geerling mixed 1.50 g of sodium with excess sulfuric acid.

(a) Write a chemical equation for the reaction between sodium and sulfuric acid. 1

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(b) Calculate the mass of the salt produced from this reaction. 2

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(c) Calculate the volume of the gas produced from this reaction at 25°C and 100 kPa. 1

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★ 4.63 g, 0.809 L ★

13. (a) Write a chemical equation for the reaction between nitric acid and barium hydroxide. 1

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- (b) Calculate the mass of the salt produced when 1.60 g of nitric acid is mixed with excess barium hydroxide. 2

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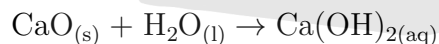
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★ 3.32 g ★

14. Calcium hypochlorite ( $\text{Ca}(\text{OCl})_2$ ) is often used to disinfect swimming pools. It can be prepared from calcium carbonate with the following series of reactions: 3



Calculate the mass of calcium hypochlorite that can be produced from 2.50 kg of calcium carbonate.

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★ 1790 g ★

15. (a) Write a chemical equation for the reaction between zinc and sulfuric acid. 1

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(b) Calculate the volume of the gas produced at 25°C and 100 kPa when 1.50 g of zinc is reacted with 1.70 g of sulfuric acid. 3

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★ 0.430 L ★

16. (a) Write a chemical equation for the reaction between potassium and oxygen. 1

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(b) Calculate the mass of the salt produced when 5.00 g of potassium is reacted with 0.70 L of oxygen gas at 0°C and 100 kPa. 3

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★ 5.8 g ★

17. Sodium carbonate can be used to neutralise acid spills. In a particular incident, a university student added 9.00 g of solid sodium carbonate to a spill containing 8.50 g of hydrochloric acid.

(a) Write a chemical equation for the reaction that occurs. 1

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(b) Calculate the mass of the salt produced from this reaction. 3

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(c) Calculate the volume of the gas produced from this reaction at 25°C and 100 kPa. 1

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(d) Calculate the mass of the leftover reactant at the end of the reaction. 1

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★ 9.92 g, 2.11 L, 2.31 g ★



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