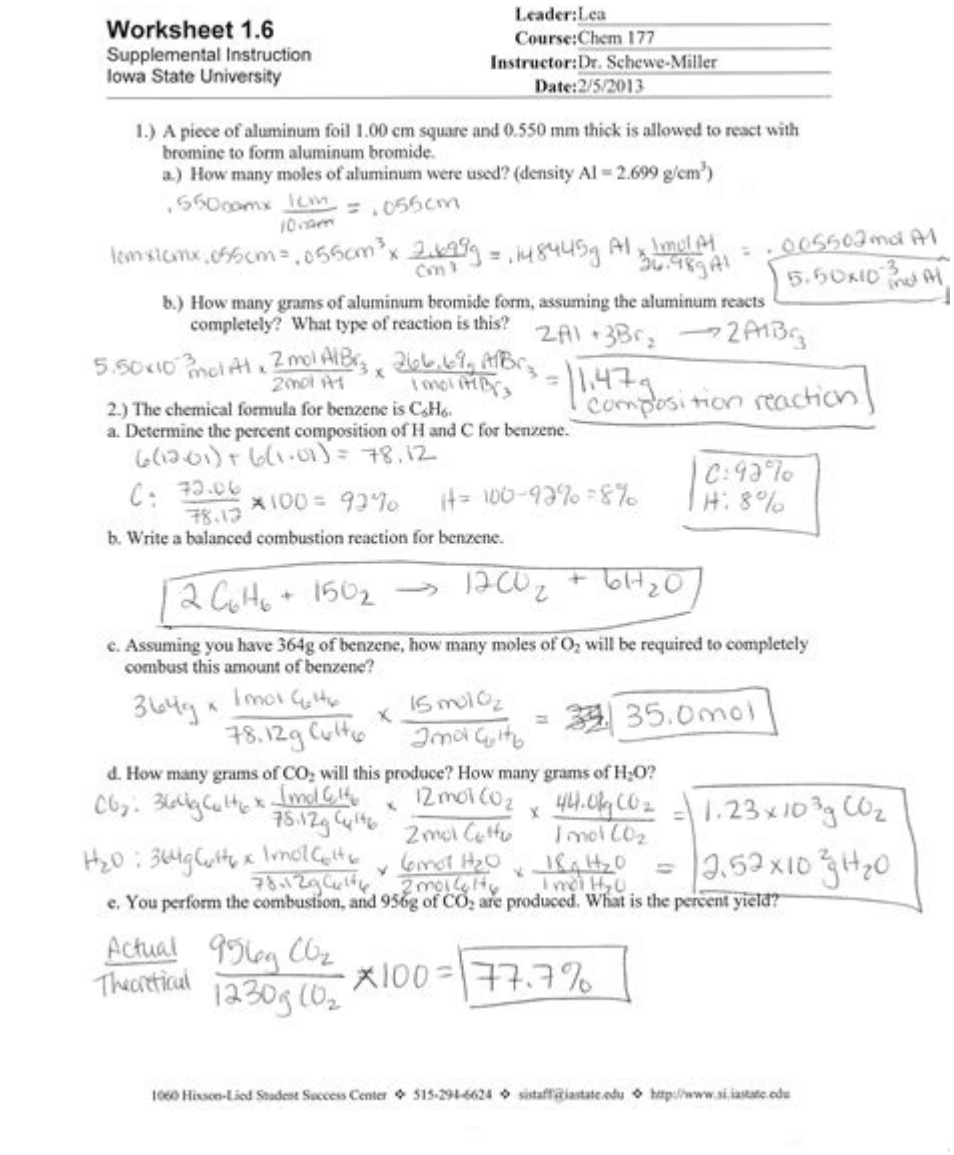
10 2 Practice Problems Chemistry Answers



Worksheet 1.6
Supplemental Instruction
Iowa State University

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Course: Chem 177
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Date: 2/5/2013

1.) A piece of aluminum foil 1.00 cm square and 0.550 mm thick is allowed to react with bromine to form aluminum bromide.

a.) How many moles of aluminum were used? (density Al = 2.699 g/cm^3)

$.550\text{mm} \times \frac{1\text{cm}}{10\text{mm}} = .055\text{cm}$

$1\text{cm} \times 1\text{cm} \times .055\text{cm} = .055\text{cm}^3 \times \frac{2.699\text{g}}{\text{cm}^3} = .148445\text{g Al} \times \frac{1\text{mol Al}}{26.98\text{g Al}} = .005502\text{mol Al}$

$5.50 \times 10^{-3}\text{ mol Al}$

b.) How many grams of aluminum bromide form, assuming the aluminum reacts completely? What type of reaction is this?

$2Al + 3Br_2 \rightarrow 2AlBr_3$

$5.50 \times 10^{-3}\text{mol Al} \times \frac{2\text{mol AlBr}_3}{2\text{mol Al}} \times \frac{266.69\text{g AlBr}_3}{1\text{mol AlBr}_3} = 1.47\text{g}$

composition reaction

2.) The chemical formula for benzene is C_6H_6.

a. Determine the percent composition of H and C for benzene.

$6(12.01) + 6(1.01) = 78.12$

$C: \frac{72.06}{78.12} \times 100 = 92\%$ $\quad H = 100 - 92\% = 8\%$

C: 92%
H: 8%

b. Write a balanced combustion reaction for benzene.

$2C_6H_6 + 15O_2 \rightarrow 12CO_2 + 6H_2O$

c. Assuming you have 364g of benzene, how many moles of O_2 will be required to completely combust this amount of benzene?

$364\text{g} \times \frac{1\text{mol } C_6H_6}{78.12\text{g } C_6H_6} \times \frac{15\text{mol } O_2}{2\text{mol } C_6H_6} = 35.0\text{mol}$

d. How many grams of CO_2 will this produce? How many grams of H_2O?

$CO_2: 364\text{g } C_6H_6 \times \frac{1\text{mol } C_6H_6}{78.12\text{g } C_6H_6} \times \frac{12\text{mol } CO_2}{2\text{mol } C_6H_6} \times \frac{44.01\text{g } CO_2}{1\text{mol } CO_2} = 1.23 \times 10^3\text{g } CO_2$

$H_2O: 364\text{g } C_6H_6 \times \frac{1\text{mol } C_6H_6}{78.12\text{g } C_6H_6} \times \frac{6\text{mol } H_2O}{2\text{mol } C_6H_6} \times \frac{18\text{g } H_2O}{1\text{mol } H_2O} = 2.52 \times 10^2\text{g } H_2O$

e. You perform the combustion, and 956g of CO_2 are produced. What is the percent yield?

$\frac{\text{Actual}}{\text{Theoretical}} \quad \frac{956\text{g } CO_2}{1230\text{g } CO_2} \times 100 = 77.7\%$

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10 2 practice problems chemistry answers are essential for students looking to solidify their understanding of key concepts in chemistry. Mastering these problems aids in enhancing problem-solving skills, reinforces theoretical knowledge, and prepares students for both exams and real-world applications. This article will present ten practice problems along with detailed solutions, covering various topics such as stoichiometry, chemical equations, thermochemistry, and acid-base reactions.

Understanding the Importance of Practice Problems

Practice problems in chemistry serve as a bridge between theoretical concepts and practical applications. They help students:

- Develop critical thinking skills.

- Gain confidence in applying chemical principles.
- Prepare for laboratory work and real-life chemical applications.
- Enhance their ability to analyze and interpret data.

Working through a variety of problems ensures that students not only memorize formulas but also understand the underlying principles of chemistry.

Practice Problems

Below are ten carefully curated practice problems along with their solutions, covering a range of topics pertinent to introductory chemistry courses.

Problem 1: Balancing Chemical Equations

Question: Balance the following chemical equation:
$$ C_3H_8 + O_2 \rightarrow CO_2 + H_2O $$

Answer:
1. Write the unbalanced equation:
$$ C_3H_8 + O_2 \rightarrow CO_2 + H_2O $$

2. Count the number of atoms of each element on both sides:
- Reactants: C = 3, H = 8, O = 2
- Products: C = 1 (from CO_2), H = 2 (from H_2O), O = 3 (2 from CO_2 and 1 from H_2O)

3. Begin balancing one element at a time. Start with Carbon:
$$ C_3H_8 + O_2 \rightarrow 3CO_2 + H_2O $$

4. Now, balance Hydrogen:
$$ C_3H_8 + O_2 \rightarrow 3CO_2 + 4H_2O $$

5. Count the O atoms needed:
- From products: $3 \times 2 + 4 \times 1 = 6 + 4 = 10$ O atoms needed.

6. Adjust O_2:
$$ C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O $$

The balanced equation is:
$$ C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O $$

Problem 2: Stoichiometry Calculation

Question: How many grams of water are produced when 10 grams of hydrogen react with excess oxygen? (Molar mass of H_2 = 2 g/mol, H_2O = 18 g/mol)

Answer:
1. Calculate moles of hydrogen:
$$\text{Moles of } H_2 = \frac{10 \text{ g}}{2 \text{ g/mol}} = 5 \text{ moles}$$

2. The balanced equation is:
$$2H_2 + O_2 \rightarrow 2H_2O$$

3. From the equation, 2 moles of H_2 produce 2 moles of H_2O. Thus, 5 moles of H_2 produce 5 moles of H_2O.

4. Calculate grams of water produced:
$$\text{Grams of } H_2O = 5 \text{ moles} \times 18 \text{ g/mol} = 90 \text{ g}$$

Problem 3: Molarity Calculation

Question: What is the molarity of a solution that contains 5 moles of NaCl in 2 liters of solution?

Answer:
1. Use the formula for molarity:
$$M = \frac{\text{moles of solute}}{\text{liters of solution}}$$

2. Substitute the values:
$$M = \frac{5 \text{ moles}}{2 \text{ L}} = 2.5 \text{ M}$$

Problem 4: Thermochemistry

Question: Calculate the heat absorbed when 50 g of water is heated from 25 °C to 75 °C. (Specific heat capacity of water = 4.18 J/g°C)

Answer:
1. Use the formula:
$$q = m \cdot c \cdot \Delta T$$

2. Calculate ΔT:
$$\Delta T = 75 °C - 25 °C = 50 °C$$

3. Substitute the values:
$$q = 50 \text{ g} \cdot 4.18 \text{ J/g°C} \cdot 50 °C = 10450 \text{ J}$$

Problem 5: Gas Laws

Question: A gas occupies a volume of 10 L at a pressure of 2 atm. What will be its volume at 1 atm, assuming temperature remains constant?

Answer:

1. Use Boyle's Law:
$$ P_1V_1 = P_2V_2 $$

2. Substitute the values:
$$ (2 \text{ atm})(10 \text{ L}) = (1 \text{ atm})(V_2) $$

3. Solving for V_2:
$$ V_2 = \frac{20 \text{ atm·L}}{1 \text{ atm}} = 20 \text{ L} $$

Problem 6: Acid-Base Neutralization

Question: How many moles of NaOH are needed to neutralize 0.5 moles of HCl?

Answer:
1. The reaction equation is:
$$ HCl + NaOH \rightarrow NaCl + H_2O $$

2. From the equation, 1 mole of HCl reacts with 1 mole of NaOH.

3. Therefore, to neutralize 0.5 moles of HCl, 0.5 moles of NaOH are needed.

Problem 7: Concentration Dilution

Question: If you dilute 100 mL of a 6 M HCl solution to a final volume of 500 mL, what is the new concentration?

Answer:
1. Use the dilution equation:
$$ C_1V_1 = C_2V_2 $$

2. Substitute the values:
$$ (6 \text{ M})(100 \text{ mL}) = C_2(500 \text{ mL}) $$

3. Solve for C_2:
$$ C_2 = \frac{600 \text{ M·mL}}{500 \text{ mL}} = 1.2 \text{ M} $$

Problem 8: Empirical Formula Calculation

Question: A compound contains 40% carbon, 6.7% hydrogen, and 53.3% oxygen by mass. Determine its empirical formula.

Answer:
1. Assume 100 g of the compound:
- 40 g C, 6.7 g H, 53.3 g O.

2. Convert grams to moles:
- C: $\frac{40 \text{ g}}{12 \text{ g/mol}} = 3.33 \text{ moles}$
- H: $\frac{6.7 \text{ g}}{1 \text{ g/mol}} = 6.7 \text{ moles}$
- O: $\frac{53.3 \text{ g}}{16 \text{ g/mol}} = 3.33 \text{ moles}$

3. Determine the simplest ratio:
- Divide by the smallest number of moles (3.33):
- C: 1, H: 2, O: 1.

4. The empirical formula is CH_2O.

Problem 9: Reaction Yield Calculation

Question: If 10 g of $CaCO_3$ decomposes to produce CaO and CO_2, what is the theoretical yield of CaO? (Molar mass of $CaCO_3$ = 100 g/mol, CaO = 56 g/mol)

Answer:
1. Write the balanced equation:
$$CaCO_3 \rightarrow CaO + CO_2$$

2. Calculate moles of $CaCO_3$:
$$\frac{10 \text{ g}}{100 \text{ g/mol}} = 0.1 \text{ moles}$$

3. From the equation, 1 mole of $CaCO_3$ produces 1 mole of CaO. Therefore, 0.1 moles of $CaCO_3$ will produce 0.1 moles

Frequently Asked Questions

What are the typical topics covered in '10 2 practice problems' in chemistry?

The '10 2 practice problems' usually cover topics such as stoichiometry, chemical reactions, balancing equations, molarity, and gas laws.

Where can I find the answers to the '10 2 practice problems' in chemistry?

Answers to '10 2 practice problems' can typically be found in the accompanying textbook, teacher's resources, or educational websites that focus on chemistry practice problems.

How can I effectively use '10 2 practice problems' to study for my chemistry exam?

To effectively use '10 2 practice problems', practice regularly, ensure you understand the underlying concepts, and review explanations for any mistakes you make on the problems.

Are there any online resources that provide solutions to '10 2 practice problems' in chemistry?

Yes, many educational websites, forums, and tutoring services provide solutions and step-by-step explanations for '10 2 practice problems' in chemistry.

What is the importance of practicing problems like '10 2 practice problems' in chemistry?

Practicing problems like '10 2 practice problems' is crucial for reinforcing concepts, improving problem-solving skills, and preparing for exams by applying theoretical knowledge.

Can I find video tutorials that explain the solutions to '10 2 practice problems' in chemistry?

Yes, many educational platforms like Khan Academy, YouTube, and other tutoring sites offer video tutorials that explain the solutions to '10 2 practice problems' in chemistry.

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