

# Empirical And Molecular Formula Worksheet Answer Key PDF

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## Part 1: Building a Foundation

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### What is the empirical formula?

undefined. A) The exact number of atoms of each element in a compound

**undefined. B) The simplest whole-number ratio of atoms of each element in a compound ✓**

undefined. C) The percentage composition of each element in a compound

undefined. D) The structural arrangement of atoms in a compound

The empirical formula represents the simplest whole-number ratio of atoms of each element in a compound.

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The empirical formula is the simplest whole-number ratio of atoms of each element in a compound.

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undefined. D) The structural arrangement of atoms in a compound

The empirical formula is the simplest whole-number ratio of atoms of each element in a compound.

### Which of the following statements about empirical formulas are true?

**undefined. A) They provide the simplest ratio of elements. ✓**

undefined. B) They indicate the exact number of atoms in a molecule.

**undefined. C) They can be derived from percent composition. ✓**

undefined. D) They are unique for each compound.

Empirical formulas provide the simplest ratio of elements and can be derived from percent composition.

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undefined. D) They are unique for each compound.

Empirical formulas provide the simplest ratio of elements and can be derived from percent composition.

**Explain the difference between an empirical formula and a molecular formula.**

**An empirical formula shows the simplest ratio of elements, while a molecular formula shows the actual number of atoms of each element in a molecule.**

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## Part 2: Comprehension and Application

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**Why is it important to convert percentage composition to grams when calculating an empirical formula?**

- undefined. A) To simplify the calculation process
- undefined. B) To ensure accuracy in determining the molecular formula
- undefined. C) To facilitate conversion to moles ✓**
- undefined. D) To verify the chemical structure

Converting to grams is essential to facilitate conversion to moles, which is necessary for determining the empirical formula.

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- undefined. C) To facilitate conversion to moles ✓**
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Converting percentage composition to grams is essential to facilitate conversion to moles for determining the empirical formula.

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- undefined. C) To facilitate conversion to moles ✓**
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Converting percentage composition to grams is essential to facilitate conversion to moles for determining the empirical formula.

**Which of the following are limitations of empirical formulas?**

**undefined. A) They do not provide the exact number of atoms. ✓**

**undefined. B) They cannot distinguish between isomers. ✓**

undefined. C) They are not useful for determining molecular weight.

**undefined. D) They do not indicate the arrangement of atoms. ✓**

Empirical formulas do not provide the exact number of atoms, cannot distinguish between isomers, and do not indicate the arrangement of atoms.

**Which of the following are limitations of empirical formulas?**

**undefined. A) They do not provide the exact number of atoms. ✓**

**undefined. B) They cannot distinguish between isomers. ✓**

undefined. C) They are not useful for determining molecular weight.

**undefined. D) They do not indicate the arrangement of atoms. ✓**

Empirical formulas do not provide the exact number of atoms and cannot distinguish between isomers.

**Which of the following are limitations of empirical formulas?**

**undefined. A) They do not provide the exact number of atoms. ✓**

**undefined. B) They cannot distinguish between isomers. ✓**

undefined. C) They are not useful for determining molecular weight.

**undefined. D) They do not indicate the arrangement of atoms. ✓**

Empirical formulas do not provide the exact number of atoms and cannot distinguish between isomers.

**Describe a scenario where two different compounds might have the same empirical formula but different molecular formulas.**

**Two compounds can have the same empirical formula but different molecular formulas if they are isomers, such as  $C_2H_6$  and  $C_3H_{12}$ .**

**Describe a scenario where two different compounds might have the same empirical formula but different molecular formulas.**

**Two compounds can have the same empirical formula if they contain the same ratio of elements but differ in the number of atoms, such as glucose and fructose, which both have the empirical formula  $CH_2O$ .**

**Describe a scenario where two different compounds might have the same empirical formula but different molecular formulas.**

**Two compounds can have the same empirical formula but different molecular formulas if they are isomers, such as glucose and fructose.**

**A compound has a percent composition of 40% carbon, 6.7% hydrogen, and 53.3% oxygen. What is its empirical formula?**

undefined. A) CHO

**undefined. B) CH<sub>2</sub>O ✓**

undefined. C) C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>

undefined. D) C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>

The empirical formula can be determined by converting the percent composition to moles and simplifying the ratio, which results in CH<sub>2</sub>O.

**A compound has a percent composition of 40% carbon, 6.7% hydrogen, and 53.3% oxygen. What is its empirical formula?**

undefined. A) CHO

**undefined. B) CH<sub>2</sub>O ✓**

undefined. C) C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>

undefined. D) C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>

The empirical formula for the compound is CH<sub>2</sub>O.

**A compound has a percent composition of 40% carbon, 6.7% hydrogen, and 53.3% oxygen. What is its empirical formula?**

undefined. A) CHO

**undefined. B) CH<sub>2</sub>O ✓**

undefined. C) C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>

undefined. D) C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>

The empirical formula can be determined by converting the percentages to moles and finding the simplest ratio.

**Given the empirical formula CH<sub>2</sub>O and a molar mass of 180 g/mol, what could be the molecular formula?**

undefined. A)  $C_2H_4O_2$

undefined. B)  $C_3H_6O_3$

**undefined. C)  $C_6H_{12}O_6$  ✓**

undefined. D)  $C_9H_{18}O_9$

The molecular formula can be determined by finding a multiple of the empirical formula that matches the molar mass, leading to  $C_6H_{12}O_6$ .

**Given the empirical formula  $CH_2O$  and a molar mass of 180 g/mol, what could be the molecular formula?**

undefined. A)  $C_2H_4O_2$

undefined. B)  $C_3H_6O_3$

**undefined. C)  $C_6H_{12}O_6$  ✓**

undefined. D)  $C_9H_{18}O_9$

The molecular formula could be  $C_6H_{12}O_6$ , as it is a multiple of the empirical formula.

**Given the empirical formula  $CH_2O$  and a molar mass of 180 g/mol, what could be the molecular formula?**

**undefined. A)  $C_2H_4O_2$  ✓**

**undefined. B)  $C_3H_6O_3$  ✓**

**undefined. C)  $C_6H_{12}O_6$  ✓**

undefined. D)  $C_9H_{18}O_9$

The molecular formula can be determined by multiplying the empirical formula by a whole number based on the molar mass.

**Calculate the empirical formula for a compound with the following percent composition: 27.29% carbon, 72.71% oxygen.**

**The empirical formula can be calculated by converting the percent composition to moles and simplifying the ratio, resulting in  $CO_2$ .**

**Calculate the empirical formula for a compound with the following percent composition: 27.29% carbon, 72.71% oxygen.**

The empirical formula can be calculated by converting the percent composition to moles and finding the simplest ratio.

Calculate the empirical formula for a compound with the following percent composition: 27.29% carbon, 72.71% oxygen.

To calculate the empirical formula, convert the percentages to moles and find the simplest ratio.

### Part 3: Analysis, Evaluation, and Creation

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Analyze the following compounds and identify which have the same empirical formula:

- undefined. A)  $C_2H_4$  ✓
- undefined. B)  $C_3H_6$  ✓
- undefined. C)  $C_4H_8$  ✓
- undefined. D)  $C_5H_{10}$  ✓

Compounds  $C_2H_4$ ,  $C_3H_6$ ,  $C_4H_8$ , and  $C_5H_{10}$  all share the same empirical formula of  $CH_2$ .

Analyze the following compounds and identify which have the same empirical formula:

- undefined. A)  $C_2H_4$  ✓
- undefined. B)  $C_3H_6$  ✓
- undefined. C)  $C_4H_8$  ✓
- undefined. D)  $C_5H_{10}$  ✓

Compounds  $C_2H_4$ ,  $C_3H_6$ ,  $C_4H_8$ , and  $C_5H_{10}$  all have the same empirical formula of  $CH_2$ .

Analyze the following compounds and identify which have the same empirical formula:

- undefined. A)  $C_2H_4$  ✓
- undefined. B)  $C_3H_6$  ✓
- undefined. C)  $C_4H_8$  ✓
- undefined. D)  $C_5H_{10}$  ✓

Compounds with the same empirical formula will have the same simplest ratio of elements.

**Explain how the empirical formula is used in the process of determining the molecular formula of a compound.**

The empirical formula provides the simplest ratio of elements, which can be multiplied by a whole number to obtain the molecular formula based on the molar mass.

**Explain how the empirical formula is used in the process of determining the molecular formula of a compound.**

The empirical formula is used as a starting point to determine the molecular formula by multiplying the empirical formula by a whole number based on the molar mass.

**Explain how the empirical formula is used in the process of determining the molecular formula of a compound.**

The empirical formula is used as a starting point to determine the molecular formula by multiplying the empirical formula by a whole number based on the molar mass.

**A chemist determines the empirical formula of a new compound to be CH<sub>2</sub>. If the molar mass is found to be 84 g/mol, what is the molecular formula?**

undefined. A) C<sub>2</sub>H<sub>4</sub>

undefined. B) C<sub>3</sub>H<sub>6</sub>

**undefined. C) C<sub>6</sub>H<sub>12</sub> ✓**

undefined. D) C<sub>7</sub>H<sub>14</sub>

The molecular formula can be determined by finding the multiple of the empirical formula that matches the molar mass, resulting in C<sub>6</sub>H<sub>12</sub>.

**A chemist determines the empirical formula of a new compound to be CH<sub>2</sub>. If the molar mass is found to be 84 g/mol, what is the molecular formula?**

undefined. A) C<sub>2</sub>H<sub>4</sub>

undefined. B) C<sub>3</sub>H<sub>6</sub>

**undefined. C) C<sub>6</sub>H<sub>12</sub> ✓**

undefined. D) C<sub>7</sub>H<sub>14</sub>

The molecular formula is C<sub>6</sub>H<sub>12</sub>, as it is a multiple of the empirical formula CH<sub>2</sub>.



**A chemist determines the empirical formula of a new compound to be CH<sub>2</sub>. If the molar mass is found to be 84 g/mol, what is the molecular formula?**

undefined. A) C<sub>2</sub>H<sub>4</sub>

undefined. B) C<sub>3</sub>H<sub>6</sub>

**undefined. C) C<sub>6</sub>H<sub>12</sub> ✓**

undefined. D) C<sub>7</sub>H<sub>14</sub>

The molecular formula can be determined by multiplying the empirical formula by a whole number based on the molar mass.

**Evaluate the following statements and identify which are true regarding the process of determining molecular formulas:**

**undefined. A) It requires knowledge of the empirical formula. ✓**

**undefined. B) It involves calculating the molar mass. ✓**

undefined. C) It can be determined without experimental data.

**undefined. D) It often requires additional structural information. ✓**

True statements include that determining molecular formulas requires knowledge of the empirical formula and involves calculating the molar mass.

**Evaluate the following statements and identify which are true regarding the process of determining molecular formulas:**

**undefined. A) It requires knowledge of the empirical formula. ✓**

**undefined. B) It involves calculating the molar mass. ✓**

undefined. C) It can be determined without experimental data.

**undefined. D) It often requires additional structural information. ✓**

The process of determining molecular formulas requires knowledge of the empirical formula and involves calculating the molar mass.

**Evaluate the following statements and identify which are true regarding the process of determining molecular formulas:**

**undefined. A) It requires knowledge of the empirical formula. ✓**

**undefined. B) It involves calculating the molar mass. ✓**

undefined. C) It can be determined without experimental data.

**undefined. D) It often requires additional structural information. ✓**

Determining molecular formulas requires knowledge of the empirical formula and often involves calculating the molar mass.

**Design an experiment to determine the empirical formula of a compound given its percent composition and suggest how you would verify the results.**

**An experiment could involve measuring the mass of each element, converting to moles, and determining the simplest ratio, with verification through repeated trials or comparison with known compounds.**

**Design an experiment to determine the empirical formula of a compound given its percent composition and suggest how you would verify the results.**

**An experiment can be designed by converting percent composition to moles, determining the empirical formula, and verifying results through additional experiments.**

**Design an experiment to determine the empirical formula of a compound given its percent composition and suggest how you would verify the results.**

**An experiment can be designed by converting percent composition to grams, then to moles, and finally determining the empirical formula.**