

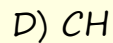
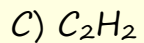
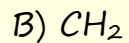
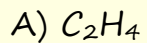
EMPIRICAL FORMULA



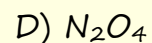
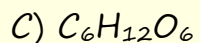
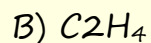
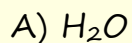
Answer all the questions below and then check your answers.

1. What is the empirical formula of a compound that contains 6 g of carbon and 1 g of hydrogen?
2. Define empirical formula.
3. True or False: The molecular formula is always a multiple of the empirical formula.
4. Given the molecular formula $C_6H_{12}O_6$, what is its empirical formula?
5. How is the molecular formula of a compound different from its empirical formula?
6. A compound contains 92.3% carbon and 7.7% hydrogen by mass. Calculate its empirical formula.
7. If a sample of a compound contains 3.2 g of sulfur and 4.8 g of oxygen, what is the empirical formula?
8. A compound contains 40.0% carbon, 6.7% hydrogen, and 53.3% oxygen by mass. Determine its empirical formula.
9. Determine the molecular formula of a compound with an empirical formula of CH_2O and a molar mass of 180g.

10. Which of the following is the empirical formula for C_2H_4 ?



11. Which of the following formulas is both an empirical and molecular formula?



12. Fill in the gaps to complete the sentences below:

The _____ formula represents the simplest whole-number ratio of the elements in a compound, while the _____ formula represents the actual number of atoms of each element in a molecule.

Answers

1. What is the empirical formula of a compound that contains 6 g of carbon and 1 g of hydrogen?

Answer: CH_2

2. Define empirical formula.

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

3. True or False: The molecular formula is always a multiple of the empirical formula.

Answer: True

4. Given the molecular formula $\text{C}_6\text{H}_{12}\text{O}_6$, what is its empirical formula?

Answer: CH_2O

5. How is the molecular formula of a compound different from its empirical formula?

Answer: The molecular formula gives the actual number of atoms of each element in a molecule of the compound, whereas the empirical formula gives the simplest whole-number ratio of these atoms.

6. A compound contains 92.3% carbon and 7.7% hydrogen by mass. Calculate its empirical formula.

Answer:

Symbol for each element present	C	H
% of each element present	92.3	7.7
Covert % to masses assuming 100g of the compound present.	92.3	7.7
Divide by Ar to get number of moles present	$92.3/12 = 7.7$	$7.7/1 = 7.7$
Divide by smallest number	$7.7/7.7 = 1$	$7.7/7.7 = 1$
Empirical formula	CH	

7. If a sample of a compound contains 3.2 g of sulfur and 4.8 g of oxygen, what is the empirical formula?

Answer:

Symbol for each element present	S	O
Mass of each element present	3.2	4.8
Divide by Ar to get number of moles present	$3.2/32 = 0.1$	$4.8/16 = 0.3$
Divide by smallest number	$0.1/0.1 = 1$	$0.3/0.1 = 3$
Empirical formula	SO ₃	

8. A compound contains 40.0% carbon, 6.7% hydrogen, and 53.3% oxygen by mass. Determine its empirical formula.

Answer:

Symbol for each element present	C	H	O
% of each element present	40.0%	6.7%	53.3%
Covert % to masses assuming 100g of the compound present.	40g	6.7g	53.3g
Divide by Ar to get number of moles present	$40/12=3.33$	$6.7/1=6.7$	$53.3/16=3.33$
Divide by smallest number	$3.33/3.33=1$	$6.7/3.33\approx 2$	$3.33/3.33=1$
Empirical formula	CH_2O		

9. Determine the molecular formula of a compound with an empirical formula of CH_2O and a molar mass of 180g.

Answer:

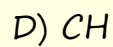
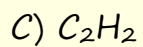
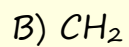
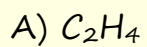
$$M_r \text{ of empirical formula} = 12 + (1 \times 2) + 16 = 30$$

$$\text{Divide molar mass by } M_r \text{ of empirical formula} = 180/30 = 6$$

Simply scale up empirical formula by x6 to get the molecular formula

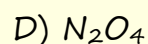
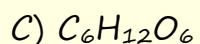
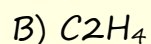
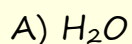
This gives $C_6H_{12}O_6$

10. Which of the following is the empirical formula for C_2H_4 ?



Answer: B) CH_2

11. Which of the following formulas is both an empirical and molecular formula?



Answer: A) H_2O

12. Fill in the gaps to complete the sentences below:

The _____ formula represents the simplest whole-number ratio of the elements in a compound, while the _____ formula represents the actual number of atoms of each element in a molecule.

Answer: empirical, molecular