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 CH2O and a molar mass of 180g.

10. Which of the following is the empirical formula for C2H4?

A) C_2H_4 B) CH_2 C) C_2H_2 D) CH

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

A) H_2O B) $C2H_4$ C) $C_6H_{12}O_6$ D) N_2O_4

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 $C_6H_{12}O_6$, 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	3.3/32= 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≈2	3.33/3.33=1
Empirical formula	CH_2O		

9. Determine the molecular formula of a compound with an empirical formula of CH2O and a molar mass of 180g.

Answer:

M_r of empirical formula = 12 + (1 x 2) + 16 = 30

Divide molar mass by Mr 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 C2H4?

A) C_2H_4 B) CH_2 C) C_2H_2 D) CH

Answer: B) CH_2

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

A) H_2O B) $C2H_4$ C) $C_6H_{12}O_6$ D) N_2O_4

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