Percent Composition by Mass

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Percent by mass is (mass of the element in one mole of compound ÷ molar mass of the compound) × 100 percent. Use 2025 atomic masses.

1 What belongs in the denominator of a percent-composition calculation for oxygen in water?

(1) The molar mass of oxygen alone

(2) The molar mass of water

(3) The number of atoms in a liter of water

(4) The mass of an empty container

2 Calculate the percent by mass of hydrogen in H_2O. Show how the subscript affects the calculation. [1]

Answer and work

3 Which expression gives the oxygen mass contribution in one mole of CO_2?

(1) 1 × 16.00 g

(2) 2 × 16.00 g

(3) 3 × 16.00 g

(4) 12.01 g

4 Explain why the percentages of all elements in a pure compound sum to about 100 percent. [1]

Answer and work

Comparing Carbonate Samples

Use the information below to answer the questions.

A mineral model compares three pure carbonates. Each formula unit has one carbon atom. The rounded molar masses are supplied.

Sample	Compound	Molar mass (g/mol)
P	$CaCO_3$	100.09
Q	$MgCO_3$	84.32
R	Na_2CO_3	105.99

5 Which compound has the greatest percentage of carbon by mass?

(1) P

(2) Q

(3) R

(4) All have the same percent carbon.

6 Calculate the carbon percentage in sample P. Use the atomic mass of carbon from the periodic table. [1]

Answer and work

7 Which formula has the lowest carbon percentage in the table?

(1) $CaCO_3$

(2) $MgCO_3$

(3) Na_2CO_3

(4) All have the same percent carbon.

8 Explain why one carbon atom per formula unit does not imply the same carbon percentage for all three compounds. [1]

Answer and work