Empirical and molecular formulae: the ratio test

Teacher / technician

YEAR 11 / LESSON 71 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Written and model-based lesson; no laboratory procedure is implied.

Coverage and delivery

Shared formula representation: 4.2 and quantitative recall from 1.29–1.31. Structure cannot be inferred uniquely from an empirical formula.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklet / writing tools	1 per learner	30 sets
Model kit / periodic table	1 set per pair	15 sets

Immediate safety

Desk activity only; keep small model pieces away from mouths.

Preparation and delivery

Read alongside the student method

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1. Provide 30 booklets and 15 model kits or reusable atom counters; no chemicals are needed.

2. Use 10 minutes retrieval, 25 independent/pair tasks, 15 explanation and 10 corrections. Keep first attempts visible.

3. Prepare calculators as well as model kits; the percentages are rounded invented examples.

4. Do not label relative masses g mol^{-1}. Molar mass has those units; M_r does not.

5. Check all carbon valencies, formula subscripts and equation coefficients. Label any supplied numbers as practice data, not class observations.

Close of lesson

- Return shared equipment and retain corrected reasoning.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- CH_3 and CH_2O.
- The subscripts 3 and 8 share no integer factor greater than one.
- In 100 g: C=85.7/12≈7.14 mol; H=14.3 mol; ratio approximately 1:2, giving CH_2.
- Empirical formula mass=14; 56/14=4; C_4H_8.
- No; it gives only an atom ratio, not the molecular size or connectivity.
- Divide both subscripts by four: CH_2. Subtraction changes the ratio.

References and provenance

Pearson Chemistry specification

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.