

Chemical Equations and Conservation

Student Worksheet | g09_u08_w29

I can: represent a reaction with an equation and balance it by conserving atoms.

Rule: Change *coefficients* only; never change formula subscripts. Check each element before and after. Equation conventions are cited in **sources.md**; use the provided data cards only—no chemical handling.

1. In $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$, identify one subscript and one coefficient. Explain why only a coefficient may change while balancing.

2. Make an atom inventory for $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$. Is it balanced?

3. Balance $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$. Show an atom check.

4. Balance $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$.

5. Balance $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$.

6. Balance $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$.

7. Balance $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$.

8. Balance $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$.

9. Balance $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$.

10. Balance $\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$.

11. Balance $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$.

12. Balance $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$.

13. A student writes $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}_2$. Use an atom inventory to critique the equation; then give a balanced equation for forming water.
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14. For $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, how many H and O atoms appear on each side? Does the number of particles stay the same?
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15. **Data card A:** A sealed reaction vessel has 10.000 g total mass before and 10.000 g after a modeled reaction. What conservation claim does the data support?
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16. **Data card B:** An open vessel has 10.000 g before a gas-forming reaction and 9.500 g afterward. Give two explanations consistent with conservation of matter.
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17. A reaction card lists $2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2$. Make a C/O atom table and decide whether the card conserves each element.
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18. A particle card begins with four H_2 molecules and two O_2 molecules. Using $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, predict the number of H_2O molecules and leftovers.
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19. Explain why $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ conserves atoms even though three reactant molecules become two product molecules.
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20. **Data card C:** Reactants total 18.0 g; measured products total 17.4 g in an open cup. Does this disprove conservation? Calculate the mass difference and name one better measurement design.
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