

Balance the equations

1. $\text{SO}_2 + \text{O}_2 \rightarrow \text{SO}_3$
2. $\text{Fe} + 3 \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$
3. $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
4. $\text{TiCl}_4 + \text{O}_2 \rightarrow \text{TiO}_2 + \text{Cl}_2$
5. $\text{Ba}(\text{OH})_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + \text{NaOH}$
6. $\text{Al} + \text{O}_2 \rightarrow 2 \text{Al}_2\text{O}_3$
7. $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
8. $\text{Pb}(\text{NO}_3)_2 + 2 \text{KI} \rightarrow \text{PbI}_2 + \text{KNO}_3$
9. $\text{Cl}_2 + 2 \text{Na} \rightarrow \text{NaCl}$
10. $\text{NaOH} \rightarrow \text{Na} + \text{O}_2 + \text{H}_2\text{O}$
11. $\text{NH}_3 + \text{Cl}_2 \rightarrow \text{HCl} + \text{N}_2$
12. $\text{N}_2 + \text{O}_2 \rightarrow \text{N}_2\text{O}_5$
13. $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$
14. $\text{P} + \text{O}_2 \rightarrow \text{P}_2\text{O}_5$
15. $\text{P} + \text{Cl}_2 \rightarrow \text{PCl}_3$
16. $\text{FeS} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2$
17. $\text{KNO}_3 \rightarrow \text{KNO}_2 + \text{O}_2$
18. $\text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$
19. $\text{CO}_2 + \text{KOH} \rightarrow \text{K}_2\text{CO}_3 + \text{H}_2\text{O}$
20. $\text{Al} + \text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + \text{H}_2$
21. $\text{NH}_4\text{NO}_2 \rightarrow \text{N}_2 + \text{H}_2\text{O}$
22. $\text{HCl} + \text{CaCO}_3 \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$

23. $\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$
24. $\text{Fe}_2\text{O}_3 + 3 \text{C} \rightarrow 3 \text{CO}_2 + 4 \text{Fe}$
25. $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
26. $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$
27. $2 \text{KClO}_3 \rightarrow \text{O}_2 + \text{KCl}$
28. $\text{Cu} + 2 \text{AgNO}_3 \rightarrow \text{Ag} + \text{Cu}(\text{NO}_3)_2$
29. $\text{Hf} + \text{N}_2 \rightarrow \text{Hf}_3\text{N}_4$
30. $5 \text{HNO}_3 + \text{P} \rightarrow \text{H}_3\text{PO}_4 + \text{NO}_2 + \text{H}_2\text{O}$
31. $\text{P}_4\text{O}_{10} + \text{H}_2\text{O} \rightarrow 4 \text{H}_3\text{PO}_4$
32. $\text{C}_2\text{H}_5\text{OH} + \text{O}_2 \rightarrow 2 \text{CO}_2 + \text{H}_2\text{O}$
33. $\text{N}_2 + \text{O}_2 \rightarrow 2 \text{N}_2\text{O}_5$
34. $\text{C}_2\text{H}_2 + \text{H}_2 \rightarrow \text{C}_2\text{H}_6$
35. $\text{C}_3\text{H}_8 + 5 \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
36. $\text{O}_2 + \text{C}_4\text{H}_9\text{OH} \rightarrow 4 \text{CO}_2 + \text{H}_2\text{O}$
37. $\text{Sr} + 2\text{N}_2 \rightarrow \text{Sr}_3\text{N}_2$
38. $\text{Cu}_2\text{S} + 2 \text{O}_3 \rightarrow \text{Cu}_2\text{O} + 2 \text{SO}_2$
39. $\text{Mg}_3\text{N}_2 + 3 \text{H}_2\text{O} \rightarrow \text{MgO} + \text{NH}_3$
40. $\text{Cr}(\text{OH})_3 + \text{NaOH} \rightarrow \text{NaCrO}_2 + \text{H}_2\text{O}$
41. $\text{FeCl}_2 + 2 \text{Na}_3\text{PO}_4 \rightarrow \text{Fe}_3(\text{PO}_4)_2 + \text{NaCl}$
42. $\text{HCl} + 2 \text{Al} \rightarrow \text{AlCl}_3 + 3 \text{H}_2$
43. $\text{H}_2\text{SO}_4 + \text{C} \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O} + \text{SO}_2$
44. $\text{CaCO}_3 + \text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$
45. $2 \text{NaI} + \text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbI}_2 + \text{NaNO}_3$

46. Choose the balanced equation

- A) $2 \text{KOH} + \text{H}_2\text{SO}_4 \rightarrow \text{H}_3\text{O} + \text{K}_2\text{SO}_4$
- B) $\text{KOH} + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{O} + \text{K}_2\text{SO}_4$
- C) $\text{KOH} + \text{H}_2\text{SO}_4 \rightarrow \text{OHSO}_5 + \text{KH}_2$
- D) $2 \text{KOH} + \text{H}_2\text{SO}_4 \rightarrow 2 \text{H}_2\text{O} + \text{K}_2\text{SO}_4$

47. Choose the balanced equation

- A) $2 \text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- B) $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + 2 \text{H}_2\text{O}$
- C) $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- D) $\text{HCl} + 2 \text{NaOH} \rightarrow 2 \text{NaCl} + 2 \text{H}_2\text{O}$

48. Which equation **is not** balanced?

- A) $2 \text{NO} + \text{O}_2 \rightarrow 2 \text{NO}_2$
- B) $2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + \text{H}_2$
- C) $\text{H}_3\text{PO}_4 + 3 \text{KOH} \rightarrow \text{K}_3\text{PO}_4 + 3 \text{H}_2\text{O}$
- D) $3 \text{HBr} + \text{Fe}(\text{OH})_3 \rightarrow \text{FeBr}_3 + 6 \text{H}_2\text{O}$

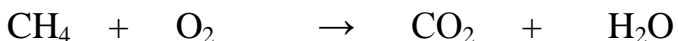
49. Which **equations** are balanced?

- A) $\text{CH}_4 + 3 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$
- B) $4 \text{C}_2\text{H}_5 + 13 \text{O}_2 \rightarrow 8 \text{CO}_2 + 10 \text{H}_2\text{O}$
- C) $\text{C}_3\text{H}_8 + 2 \text{O}_2 \rightarrow 3 \text{CO}_2 + 4 \text{H}_2\text{O}$
- D) $\text{C}_4\text{H}_8 + 6 \text{O}_2 \rightarrow 4 \text{CO}_2 + 4 \text{H}_2\text{O}$

50. The neutralization of hydrochloric acid (HCl) by calcium carbonate (CaCO_3) produces calcium chloride (CaCl_2), carbon dioxide (CO_2) and water (H_2O).

Write the balanced equation for this neutralization reaction.

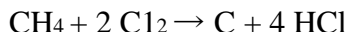
51. The combustion of methane, CH_4 mixed with O_2 produces carbon dioxide, CO_2 , and water, H_2O . The unbalanced chemical equation for this reaction is as follows:



Balance the chemical equation for this combustion reaction.

52. The complete reaction of 8 g of methane (CH₄) with 71 g of chlorine gas (Cl₂) produces 73 g of hydrochloric acid (HCl) and a certain amount of carbon (C).

The balanced equation for this reaction is as follows:



What mass of carbon is produced by this reaction?

53. When 191 g of copper, Cu, is combined with 756 g of nitric acid, HNO₃, the chemical reaction produces 563 g of copper nitrate, Cu(NO₃)₂, 108 g of water, H₂O, and a certain amount of nitrogen dioxide, NO₂. This reaction is represented by the following balanced chemical equation:



What mass of nitrogen dioxide does this reaction produce?

54. The combustion of 16 g of methane (CH₄) in 64 g of oxygen gas (O₂) produces 36 g of water (H₂O) and a certain mass of carbon dioxide (CO₂). The following balanced equation represents this combustion reaction:

Combustion Reaction Involving Methane



The combustion of 11 g of propane (C₃H₈) in 40 g of oxygen gas (O₂) produces 18 g of water (H₂O) and a certain mass of carbon dioxide (CO₂). The following balanced equation represents this combustion reaction:

Combustion Reaction Involving Propane



Which of these two reactions produces the smaller mass of carbon dioxide (CO₂)? For each reaction, show the calculations required to determine the mass of carbon dioxide (CO₂) produced.