Balancing Equations

All chemical equations must be balanced so that they are consistent with the Law of Conservation of Mass.

Here are some suggestions for balancing equations:

1. When balancing equations, always start with the "ugliest" molecule first (polyatomics).
2. To balance, place the desired number (coefficient) in front of the element or compound. Never split-up a compound and never change the subscripts in the chemical formula.
3. It is often useful to balance the diatomic molecules, if they are present, last.
4. Creating a chart to keep track of the type and number of each atoms on the reactant and product side of the equation can make balancing easier.
5. Make sure to always recheck the final balanced equation.

Examples:

2 Mg (s) + ___ O_2 (g) → 2 MgO (s)

Atoms	Reactants	Products
Mg	2	2
O	2	2

2 H_2 (g) + ___ O_2 (g) → 2 H_2O (g)

Atoms	Reactants	Products
H	4	4
O	2	2

4 Fe (s) + 3 O_2 (g) → 2 Fe_2O_3 (s)

Atoms	Reactants	Products
Fe	4	4
O	6	6

___ Al_2O_3 (s) + 3 H_2 (g) → 3 H_2O (l) + 2 Al (s)

Atoms	Reactants	Products
Al	2	2
O	3	3
H	6	6

3 $Pb(NO_3)_2$ (aq) + 2 BF_3 (s) → 2 $B(NO_3)_3$ (aq) + 3 PbF_2 (s)

Atoms	Reactants	Products
Pb	3	3
NO_3	6	6
B	2	2
F	6	6

Sometimes to balance an equation, fractions must be used. Fractions are not to be left in the final balanced equation, as it impossible to have part of an atom. To get rid of the fraction, multiply every element or compound in the equation by the denominator of the fraction (i.e. If you use ½ as a coefficient, then multiply by 2).

4 ~~2~~ NH_3 (l) + 7 ~~2~~ O_2 (g) → 4 ~~2~~ NO_2 (g) + 6 ~~3~~ H_2O(s)

Atoms	Reactants	Products
N	4	4
H	12	12
O	14	14

4 ~~2~~ FeS_2 (s) + 11 ~~2~~ O_2 (g) → 2 Fe_2O_3 (s) + 8 ~~4~~ SO_2 (g)

Atoms	Reactants	Products
Fe	4	4
S	8	8
O	22	22

Balancing chemical equations becomes increasing more difficult when you are given the reaction as a word equation. To balance the equation, you must first convert the elements and/or compounds into their correct chemical formula. Even the slightest mistake will make you equation incorrect and could possibly create an equation that is impossible to balance. Be careful, and make sure to always check your work.

Write out a balanced chemical equation for the following:

Oxygen gas reacts with solid aluminum sulfide to produce solid aluminum oxide and sulfur dioxide gas.

9 ~~2~~ O_2(g) + 2 Al_2S_3(s) → 2 Al_2O_3(s) + 6 SO_2(g)

Name: ANSWERS Date: _____

BCI SCIENCE
SCH4CI

Balancing Equations Practice

___1. 2 F_2 + 2 H_2O → 4 HF + ___ O_2

___2. 2 SO_2 + ___ O_2 → 2 SO_3

___3. ___ S_8 + 8 O_2 → 8 SO_2

___4. 3 C + ___ Fe_2O_3 → 3 CO + 2 Fe

___5. ___ CO_2 + ___ C → 2 CO

___6. ___ Fe_2O_3 + 3 CO → 3 CO_2 + 2 Fe

___7. ~~2~~ 4 FeS + ~~11~~ 7 O_2 → 2 Fe_2O_3 + ~~2~~ 4 SO_2

___8. 2 $KClO_3$ → 2 KCl + 3 O_2

___9. 6 HCl + ___ Fe_2O_3 → 2 $FeCl_3$ + 3 H_2O

___10. ___ MnO_2 + 4 HCl → ___ $MnCl_2$ + 2 H_2O + ___ Cl_2

___11. 2 C_5H_{10} + ~~15~~ 15 O_2 → ~~5~~ 10 CO_2 + ~~5~~ 10 H_2O

___12. 2 C_6H_6 + ~~15~~ 15 O_2 → ~~6~~ 12 CO_2 + ~~3~~ 6 H_2O

___13. 2 KOH + ___ Cl_2 → ___ KClO + ___ KCl + ___ H_2O

___14. 2 Al + 6 NaOH → 2 Na_3AlO_3 + 3 H_2

___15. 2 $AsCl_3$ + 3 H_2S → ___ As_2S_3 + 6 HCl

___16. 2 $Cu_{(s)}$ + ___ $O_{2(g)}$ → 2 $CuO_{(s)}$

___17. 2 $H_2O_{(l)}$ → 2 $H_{2(g)}$ + ___ $O_{2(g)}$

___18. 3 $Fe_{(s)}$ + 4 $H_2O_{(l)}$ → 4 $H_{2(g)}$ + ___ $Fe_3O_{4(aq)}$

___19. 2 $AsCl_{3(s)}$ + 3 $H_2S_{(aq)}$ → + ___ $As_2S_{3(aq)}$ + 6 $HCl_{(aq)}$

___20. ___ $CuSO_4 \cdot 5H_2O_{(l)}$ → ___ $CuSO_{4(s)}$ + 5 $H_2O_{(g)}$

___21. ___ $Fe_2O_{3(s)}$ + 3 $H_{2(g)}$ → 2 $Fe_{(s)}$ + 3 $H_2O_{(l)}$

___22. ___ $CaCO_{3(s)}$ → ___ $CaO_{(s)}$ + ___ $CO_{2(g)}$

___23. 8 $Fe_{(s)}$ + ___ $S_{8(s)}$ → 8 $FeS_{(s)}$

___24. ___ $H_2S_{(aq)}$ + 2 $KOH_{(aq)}$ → 2 $H_2O_{(l)}$ + ___ $K_2S_{(s)}$

___25. 2 $NaCl_{(l)}$ → 2 $Na_{(l)}$ + ___ $Cl_{2(g)}$

___26. 2 $Al_{(s)}$ + 3 $H_2SO_{4(aq)}$ → 3 $H_{2(g)}$ + ___ $Al_2(SO_4)_{3(aq)}$

___27. ___ $H_3PO_{4(aq)}$ + 3 $NH_4OH_{(aq)}$ → 3 $H_2O_{(l)}$ + ___ $(NH_4)_3PO_{4(aq)}$

___28. ___ $C_3H_{8(l)}$ + 5 $O_{2(g)}$ → 4 $H_2O_{(l)}$ + 3 $CO_{2(g)}$

___29. 4 $Al_{(s)}$ + 3 $O_{2(g)}$ → 2 $Al_2O_{3(s)}$

___30. ~~2~~ 4 $CH_{3(l)}$ + ~~7~~ 7 $O_{2(g)}$ → ~~3~~ 6 $H_2O_{(l)}$ + ~~2~~ 4 $CO_{2(g)}$