**Chemistry 20 – Lesson 4**

**Balancing chemical equations**

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# Practice problems

Reaction Type

1. 4 Al(s) + 3 O2 (g) → 2 Al2O3 (s) **formation**

2. 2 HCl (aq) + Ca(OH)2 (aq) → 2 HOH (l) + CaC12 (aq) **double replacement**

3. CH4 (g) + 2 O2 (g) → CO2 (g) + 2 H2O (g) **complete combustion**

4. Zn(s)  + Pb(CH3COO)2 (aq) → Pb(s) + Zn(CH3COO)2 (aq) **single replacement**

5. SO3 (g) + H2O (l) → H2SO4 (aq)  **formation**

6. 2 HgO (s) → 2 Hg (l) + O2 (g) **decomposition**

7. CaCO3 (s) → CaO (s) + CO2 (g) **decomposition**

8. 2 NaI (aq) + Pb(NO3)2 (aq) → PbI2 (s) + 2 NaNO3 (aq) **double replacement**

9. C12 (aq) + 2 NaI (aq) → I2 (aq) + 2 NaCl (aq) **single replacement**

10. Al2(SO4)3 (aq) + 3 Ca(OH)2 (aq) → 2 Al(OH)3 (s) + 3 CaSO4 (s) **double replacement**

# checkmarkcheckmarkAssignment

checkmarkcheckmark1. N2 (g) + 3 H2(g) → 2 NH3(g) **(formation)**

checkmarkcheckmark2. HIO4(s) + 2 H2O(l) → H5IO6(s) **(formation)**

checkmarkcheckmark3. 2 H2S(g) + 3 O2(g) → 2 SO2(g) + 2 H2O(g) **(complete combustion)**

checkmarkcheckmark4. CH4(g) + 2 O2(g) → CO2(g) + 2 H2O(g) **(complete combustion)**

5. C3H8(g) + 5 O2(g) → 3 CO2(g) + 4 H2O(g) **(complete combustion)**

checkmarkcheckmark6. 2 Al(OH)3(s) + 3 H2SO4(aq) → Al2(SO4)3aq) + 6 HOH(l) **(double replacement)**

checkmarkcheckmark7. iron + sulfur → iron (II) sulfide

checkmarkcheckmark 8 Fe(s) + S8 (s) → 8 FeS (s) **formation**

8. aluminum + fluorine → aluminum fluoride

2 Al(s) + 3 F2 (g) → 2 AlF3 (s) **formation**

9. copper + silver nitrate → silver + copper (II) nitrate

Cu(s) + 2 AgNO3 (aq) → 2 Ag (s) + Cu(NO3)2 (s) **single replacement**



10. iron (III) chloride + sodium hydroxide → **sodium chloride** + **iron (III) hydroxide**

FeCl3 (aq) + 3 NaOH (aq) → 3 NaCl (s) + Fe(OH)3 (s) **double replacement**



11. iron (III) oxide → iron + oxygen



Fe2O3 (s) → 4 Fe(s) + 3 O2 (g) **decomposition**

12. potassium chlorate → potassium chloride + oxygen



2 KClO3 (s) → 2 KCl (s) + 3 O2 (g) **decomposition**

13. barium chloride + sodium phosphate → **barium** **phosphate** + **sodium chloride**



3 BaCl2 (aq) + 2 Na3PO4 (aq) → Ba3(PO4)2 (s) + 6 NaCl (aq) **double replacement**

14. **phosphorous** + **oxygen** → diphosphorous pentaoxide

P4 (s) + 5 O2 (g) → 2 P2O5 (s) **formation**



15. hydroiodic acid + magnesium → **magnesium iodide** + **hydrogen**



2 HI(aq) + Mg (s) → MgI2 (aq) + H2 (g) **single replacement**

16. Iron pipes are strongly attacked and corroded by hydrosulfuric acid. (iron (II) sulfide is one product)

Balanced reaction: Fe(s) + H2S (aq) → FeS(s) + H2 (g)



Reaction type: **single replacement**

17. Coal (C9H6) undergoes complete combustion.

Balanced reaction: 2 C9H6 (s) + 2 O2 (g) → 18 CO2 (g) + 6 H2O(g)



Reaction type: **complete combustion**

18. The first recorded observation of hydrogen gas was made by Paracelsus (1493-1541) when he added iron to sulfuric acid.

Balanced reaction: 2 Fe(s) + 3 H2SO4 (aq) → Fe2(SO4)3 (aq) + 3 H2 (g)



Reaction type: **single replacement**

19. When hydrogen gas and oxygen gas are mixed they form an explosive combination.

Balanced reaction: 2 H2 (g) + O2 (g) → 2 H2O (g)



Reaction type: **formation/complete combustion**

20. A precipitate forms when potassium iodide is mixed with lead (II) nitrate.

Balanced reaction: 2 KI (aq) + Pb(NO3)2 (aq) → 2 KNO3 (aq) + PbI2 (s)



Reaction type: **double replacement**

21. Joseph Priestly (1733-1804) decomposed cinnabar (mercury (II) sulfide).

Balanced reaction: 8 HgS(s) → 8 Hg (l) + S8 (s)



Reaction type: **decomposition**

22. A sulfurous acid solution used in the lab neutralises an ammonium hydroxide solution.

Balanced reaction: H2SO3 (aq) + 2 NH4OH(aq) → (NH4)2SO3 (aq) + 2 HOH (l)



Reaction type: **double replacement**

23. Potassium metal may be obtained by decomposing molten potassium chloride.

Balanced reaction: 2 KCl(l) → 2 K (l) + Cl2 (g)



Reaction type: **decomposition**

# Remedial assignment – for extra practice

F\_\_\_ 1. 2 Cu(s) + O2(g) → 2 CuO(s)

D\_\_\_ 2. 2 H2O(l) → 2 H2(g) + O2(g)

SR\_\_ 3. 3 Fe(s) + 4 H2O(g) → 4 H2(g) + Fe3O4(s)

DR\_\_ 4. 2 AsCl3 + 3 H2S(aq) → As2S3(s) + 6 HCl(aq)

D\_\_\_ 5. CuSO4 • 5H2O(s) →CuSO4(s) + 5 H2O(g)

SR\_\_ 6. Fe2O3(s) + 3 H2(g) → 2 Fe(s) + 3 H2O(l)

D\_\_\_ 7. CaCO3(s) → CaO(s) + CO2(g)

F\_\_\_ 8. 8 Fe(s) + S8 (s) → 8 FeS(s)

DR\_\_ 9. H2S (aq) + 2 KOH (aq) → 2 HOH (l) + K2S (aq)

D\_\_\_ 10. 2 NaCl(l) → 2 Na(l) + Cl2(g)

SR\_\_ 11. 2 Al(s) + 3 H2SO4(aq) → Al2(SO4 )3 (aq)+ 3 H2(g)

DR\_\_ 12. H3PO4(aq) + 3 NH4OH(aq) → 3 HOH(l) + (NH4)3PO4(aq)

CC\_\_ 13. C3H8(g) + 5 O2(g) → 3 CO2(g) + 4 H2O(g)

F\_\_\_ 14. 4 Al(s) + 3 O2 (g) → 2 Al2O3 (s)

CC\_\_ 15. CH4(g) + 2 O2(g) → CO2(g) + 2 H2O(g)

F\_\_\_ 16. 2 K (l) + Cl2 (g) → 2 KCl(l)

DR\_\_ 17. 2 CuBr (aq) + K2S (aq) → Cu2S (s) + 2 KBr (aq)

DR\_\_ 18. AlCl3 (aq) + 3 NaOH (aq) → 3 NaCl (aq) + Al(OH)3 (s)

DR\_\_ 19. HNO3 (aq) + KOH(aq) → KNO3 (aq) + HOH(l)

SR\_\_ 20. 2 Fe(s) + 3 CuSO4 (aq) → 3 Cu(s) + Fe2(SO4)3 (aq)

DR\_\_ 21. H2SO4(aq) + Ba(OH)2 (aq) → BaSO4 (s) + 2 HOH(l)

F\_\_\_ 22. 2 Zn(s) + O2 (g) → 2 ZnO(s)

CC\_\_ 23. C25H52 (s) + 38 O2 (g) → 25 CO2 (g) + 26 H2O(g)

DR\_\_ 24. 3 H2SO4 (aq) + 2 Fe(OH)3 (s) → Fe2(SO4)3 (aq) + 6 HOH(l)

DR\_\_ 25. Na2CO3 (aq) + CaSO4 (s) → CaCO3 (s) + Na2SO4 (aq)

F\_\_\_ 26. 2 Na(s) + Cl2 (g) → 2 NaCl(s)

SR\_\_ 27. Zn(s) + Pb(CH3COO)2 (aq) → Pb(s) + Zn(CH3COO)2 (aq)