

Reactions Worksheet - Putting it Together

This worksheet covers nomenclature and types of reactions. It is hard. If you get this, you are well prepared for exams.

HINTS:

- There are three types of names for chemicals:
 - Ionic (fixed charge metal + nonmetal) ends in "ide"
 - Ionic with variable charge metal, ends in "ide" AND uses a Roman Numeral in parenthesis which is the charge on the metal, NOT how many metal atoms there are in the formula
 - Covalent (nonmetal + nonmetal) ends in "ide" AND use prefixes to tell how many atoms there are in the formula
- If there is a polyatomic ion in a chemical, do not change its name – it will not necessarily end in "ide" and remember to keep the polyatomic ion as a group and use () if there are more than one of them
- When you must write the products yourself for a reaction (combustion, single displacement, and neutralization reactions) you MUST write the correct formulas for the product chemicals first making sure the charges adds up to zero. (like Mg plus Cl is $MgCl_2$ not $MgCl_3$) Only then do you balance the reaction.
- For all the chemicals you must have the state (s, l, g, aq). For ionic compounds they are either (s) or (aq). Use solubility rules. Soluble means dissolved in water (aq). Insoluble means will not dissolve so it stays solid (s). For elements, you should KNOW the states. Like chlorine is diatomic gas $Cl_2(g)$, iodine is solid diatomic $I_2(s)$, carbon is solid $C(s)$, hydrogen is diatomic gas $H_2(g)$ and sodium is solid $Na(s)$. Etc.
- For single displacement reaction, the more active metal wants to buddy up in a compound while the less active metal wants to be alone as an element. Only the top 6 active metals react with water producing hydrogen gas and an ionic compound.
- Elements in their naturally occurring state are all NEUTRAL with zero charge. You have to be in an ionic compound to be an ion and have a charge. Like solid gold is charged zero, hydrogen gas, helium gas, solid silver, oxygen gas, liquid mercury are all charged zero.
- My last hint – if you study you will learn this stuff and pass. You are smart, you owe it to yourself to study and invest in the time and get the grade you deserve. Your future depends on it. You can do it.

I. Write the correct formula for these chemicals and for only the ionic compounds also determine if they are soluble in water.

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|-------------------------|---------------------------|
| 1. Barium nitrate | 11. ammonium sulfate |
| 2. Cobalt(III) fluoride | 12. phosphorus tribromide |
| 3. Lead(IV) sulfide | 13. sulfur hexafluoride |
| 4. Lithium iodide | 14. magnesium acetate |
| 5. Dinitrogen pentoxide | 15. gold(II) sulfide |
| 6. Carbon tetrachloride | 16. iodine heptafluoride |
| 7. Sulfur dioxide | 17. potassium chloride |
| 8. Copper(II) phosphate | 18. dihydrogen dioxide |
| 9. calcium hydroxide | 19. carbon monoxide |
| 10. potassium bromide | 20. sodium hydroxide |

II. Write the correct names for these chemicals.

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|-----------------|---------------|
| 1. $HgCl_2$ | 9. PbI_4 |
| 2. $Sr(NO_3)_2$ | 10. Fe_2S_3 |
| 3. $Al(CN)_3$ | 11. $ZnCrO_4$ |
| 4. P_2O_5 | 12. $AgNO_3$ |
| 5. SiO_2 | 13. SnO_2 |
| 6. CdS | 14. $NiCl_3$ |
| 7. $Na_2(SO_4)$ | 15. K_2CO_3 |
| 8. $LiCl$ | 16. $NaCl$ |

III. Write the products if not given, write the states if needed, balance the reaction, and classify as combination (C), decomposition (D), combustion (CB), single replacement (SR), double replacement (DR) or acid base neutralization (N).

- $\text{C}_2\text{H}_4(\text{g}) + \text{O}_2(\text{g}) \rightarrow$
- $\text{P}_4(\text{s}) + \text{Cl}_2(\text{g}) \rightarrow \text{PCl}_3(\text{s})$
- $\text{H}_3\text{PO}_4(\text{aq}) + \text{LiOH}(\text{aq}) \rightarrow$
- $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2(\text{g}) + \text{O}_2(\text{g})$
- $\text{Al}(\text{s}) + \text{CoSO}_4(\text{aq}) \rightarrow$
- $\text{Ag}(\text{s}) + \text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq}) \rightarrow$
- $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{K}_2\text{CO}_3(\text{aq}) \rightarrow \text{KNO}_3(\text{aq}) + \text{PbCO}_3(\text{s})$
- $\text{H}_2\text{O}_2(\text{l}) \rightarrow \text{O}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow$
- $\text{K}(\text{s}) + \text{HCl}(\text{aq}) \rightarrow$

Answers

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|--|--|------------------------------|
| 1. $\text{Ba}(\text{NO}_3)_2(\text{aq})$ | 8. $\text{Cu}_3(\text{PO}_4)_2(\text{s})$ | 15. $\text{AuS}(\text{s})$ |
| 2. $\text{CoF}_3(\text{aq})$ | 9. $\text{Ca}(\text{OH})_2(\text{aq})$ | 16. IF_7 |
| 3. $\text{PbS}_2(\text{s})$ | 10. $\text{KBr}(\text{aq})$ | 17. $\text{KCl}(\text{aq})$ |
| 4. $\text{LiI}(\text{aq})$ | 11. $(\text{NH}_4)_2\text{SO}_4(\text{aq})$ | 18. H_2O_2 |
| 5. N_2O_5 | 12. PBr_3 | 19. CO |
| 6. CCl_4 | 13. SF_6 | 20. $\text{NaOH}(\text{aq})$ |
| 7. SO_2 | 14. $\text{Mg}(\text{C}_2\text{H}_3\text{O}_2)_2(\text{aq})$ | |

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|---------------------------|---------------------------|
| 1. Mercury(II) chloride | 9. lead(IV) iodide |
| 2. Strontium nitrate | 10. Iron(III) sulfide |
| 3. Aluminum cyanide | 11. Zinc chromate |
| 4. Diphosphorus pentoxide | 12. Silver nitrate |
| 5. Silicon dioxide | 13. Tin(IV) oxide |
| 6. Cadmium sulfide | 14. Nickel (III) chloride |
| 7. Sodium sulfate | 15. Potassium carbonate |
| 8. Lithium chloride | 16. Sodium chloride |

- Type (CB) $\text{C}_2\text{H}_4(\text{g}) + 3 \text{O}_2(\text{g}) \rightarrow 2 \text{CO}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{g})$
- Type (C) $\text{P}_4(\text{s}) + 6 \text{Cl}_2(\text{g}) \rightarrow 4 \text{PCl}_3(\text{s})$
- Type (N) $\text{H}_3\text{PO}_4(\text{aq}) + 3 \text{LiOH}(\text{aq}) \rightarrow 3 \text{H}_2\text{O}(\text{l}) + \text{Li}_3\text{PO}_4(\text{aq})$
- Type (D) $2 \text{H}_2\text{O}(\text{l}) \rightarrow 2 \text{H}_2(\text{g}) + \text{O}_2(\text{g})$
- Type (SR) $2 \text{Al}(\text{s}) + 3 \text{CoSO}_4(\text{aq}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + 3 \text{Co}(\text{s})$
- Type (NR) No reaction
- Type (DR) $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{K}_2\text{CO}_3(\text{aq}) \rightarrow 2 \text{KNO}_3(\text{aq}) + \text{PbCO}_3(\text{s})$
- Type (D) $2 \text{H}_2\text{O}_2(\text{l}) \rightarrow \text{O}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{l})$
- Type (N) $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{NaCl}(\text{aq})$
- Type (SR) $2 \text{K}(\text{s}) + 2 \text{HCl}(\text{aq}) \rightarrow \text{H}_2(\text{g}) + 2 \text{KCl}(\text{aq})$