Unit 7 Chemical Formulas and Reactions
Using Nomenclature to Balance Equations

Name _____
Block ____

Write balanced chemical equations for the following reactions.

1. Ammonia (NH_3) reacts with hydrogen chloride to form ammonium chloride.

$NH_3 + H^+ Cl^- \rightarrow NH_4^+ Cl^-$

$1\ NH_3 + 1\ HCl \rightarrow 1\ NH_4Cl$ (synthesis)

2. Calcium carbonate decomposes upon heating to form calcium oxide and carbon dioxide.

$Ca^{+2} CO_3^{-2} \rightarrow Ca^{+2} O^{-2} + CO_2$ ← no charges for covalent molecules

$1\ CaCO_3 \rightarrow 1\ CaO + 1\ CO_2$ (decomposition)

3. Barium oxide reacts with water to form barium hydroxide.

$Ba^{+2}\ O^{-2} + H_2O \rightarrow Ba^{+2} (OH)^{-1}_2$

$1\ BaO + 1\ H_2O \rightarrow 1\ Ba(OH)_2$

4. Acetaldehyde (CH_3CHO) decomposes to form methane (CH_4) and carbon monoxide.

$1\ CH_3CHO \rightarrow 1\ CH_4 + 1\ CO$ ← No charges b/c all covalent molecules so no ions

5. Zinc reacts with copper (II) nitrate to form zinc nitrate and copper.

Redox Reaction →

$1\ Zn^0 + 1\ Cu^{+2}(NO_3)^{-1}_2 \rightarrow 1\ Zn^{+2}(NO_3)^{-1}_2 + 1\ Cu^0$

Zinc is oxidized copper is reduced

6. Calcium sulfite decomposes when heated to form calcium oxide and sulfur dioxide.

$1\ CaSO_3 \rightarrow 1\ CaO + 1\ SO_2$

7. Iron reacts with sulfuric acid (H_2SO_4) to form iron (II) sulfate and hydrogen gas.

LEO GER →

$1\ Fe^0 + 1\ H_2^{+1}SO_4^{-2} \rightarrow 1\ Fe^{+2}SO_4^{-2} + 1\ H_2^0$

iron is oxidized hydrogen is reduced

8. A nitrogen-containing carbon compound, $C_2H_6N_2$, decomposes to form ethane, C_2H_6, and nitrogen gas.

$1\ C_2H_6N_2 \rightarrow 1\ C_2H_6 + 1\ N_2$ ← No charges b/c all covalent

★ 9. Phosgene, $COCl_2$, is formed when carbon monoxide reacts with chlorine gas.

worded backwards

$1\ CO + 1\ Cl_2 \rightarrow 1\ COCl_2$

10. Manganese (II) iodide decomposes when exposed to light to form manganese and iodine.

Mn^{+2} I^{-1} — diatomic element

$$1\,MnI_2 \rightarrow 1\,Mn + 1\,I_2$$

11. Dinitrogen pentoxide reacts with water to produce nitric acid (HNO_3).

$$1\,N_2O_5 + 1\,H_2O \rightarrow 2\,HNO_3$$

12. Magnesium reacts with titanium (IV) chloride to produce magnesium chloride and titanium.

Redox Reaction LEO GER

$$2\,Mg^{0} + 1\,Ti^{+4}Cl_4^{-1} \rightarrow 2\,Mg^{+2}Cl_2^{-1} + 1\,Ti^{0}$$

13. Carbon reacts with zinc oxide to produce zinc and carbon dioxide.

Zn^{+2} O^{-2}

$$1\,C + 2\,ZnO \rightarrow 2\,Zn + 1\,CO_2$$

14. Bromine reacts with sodium iodide to form sodium bromide and iodine.

Diatomic element — diatomic element

$$1\,Br_2 + 2\,NaI \rightarrow 2\,NaBr + 1\,I_2$$

15. Phosphorus (P_4) reacts with bromine to produce phosphorus tribromide.

diatomic — no prefix means only 1

even/odd swap 4 largest difference

$$1\,P_4 + 6\,Br_2 \rightarrow 4\,PBr_3$$

16. Ethanol, C_2H_5OH, reacts with oxygen gas to produce carbon dioxide and water.

★ Combustion ★ swap Hs balance C adjust O simplify

$$2\,C_2H_5OH + 6\,O_2 \rightarrow 4\,CO_2 + 6\,H_2O$$

14 − 2 = 12 ÷ 2 = 6 — 8 + 6 = 14

17. Calcium hydride reacts with water to produce calcium hydroxide and hydrogen gas.

Ca^{+2} H^{-1} — Ca^{+2} $(OH)^{-1}$

$$1\,CaH_2 + 2\,H_2O\ (H(OH)) \rightarrow 1\,Ca(OH)_2 + 1\,H_2$$

18. Sulfuric acid, H_2SO_4, reacts with potassium hydroxide to produce potassium sulfate and water.

H^{+1} SO_4^{-2} — K^{+1} OH^{-1} — K^{+1} SO_4^{-2} — $H(OH)$

$$1\,H_2SO_4 + 2\,KOH \rightarrow 1\,K_2SO_4 + 2\,H_2O$$

19. Propane, C_3H_8, burns in air to produce carbon dioxide and water.

Oxygen is in air

★ Combustion ★ swap Hs balance C adjust O simplify

$$1\,C_3H_8 + 5\,O_2 \rightarrow 3\,CO_2 + 4\,H_2O$$

20 ÷ 2 = 10 — 12 + 8 = 20