Handout 1

Identifying and Balancing Chemical Equations

Law of Conservation of Mass: in **any** process, mass cannot be created nor destroyed

In order to obey the Law of Conservation of Mass, we must "balance" equations, or make the numbers of all atoms the same on both sides of the arrow. We cannot ever change subscripts to do this, so we balance by using **coefficients** in front of the chemical formulas.

Example:

D 1. ___ HgO → ___ Hg + ___ O_2

Inventory
___ Hg ___
___ O ___

Identify each of the equations below as **synthesis (S), decomposition (D), single replacement (SR), or double replacement (DR)**. Balance each of them using the inventory method. An example inventory has been set up for you in number 2.

___ 2. ___ $NaCl$ + ___ $Ag(NO_3)$ → ___ $Na(NO_3)$ + ___ $AgCl$

___ Na ___
___ Cl ___
___ Ag ___
___ NO_3 ___

___ 3. ___ Mg + ___ HCl → ___ $MgCl_2$ + ___ H_2

___ 4. ___ Zn + ___ $H_2(SO_4)$ → ___ $Zn(SO_4)$ + ___ H_2

___ 5. ___ $Na(OH)$ + ___ HCl → ___ $NaCl$ + ___ $H(OH)$

___ 6. ___ $NaCl$ + ___ $Ag(NO_3)$ → ___ $Na(NO_3)$ + ___ $AgCl$

___ 7. ___ H_2 + ___ O_2 → ___ H_2O

___ 8. ___ Cl_2 + ___ $NaBr$ → ___ $NaCl$ + ___ Br_2

___ 9. ___ Zn + ___ $Cu(SO_4)$ → ___ $Zn(SO_4)$ + ___ Cu

____ 10. ___ $K(ClO_3)$ → ___ KCl + ___ O_2

____ 11. ___ H_2O + ___ Fe → ___ Fe_2O_3 + ___ H_2

____ 12. ___ $Ca(OH)_2$ + ___ $H(NO_3)$ → ___ $Ca(NO_3)_2$ + ___ H(OH)

____ 13. ___ Na_2O + ___ CO_2 → ___ Na_2CO_3

____ 14. ___ H_2 + ___ N_2 → ___ NH_3

____ 15. ___ HgO + ___ Cl_2 → ___ HgCl + ___ O_2

____ 16. ___ Na + ___ Br_2 → ___ NaBr

____ 17. ___ Al_2O_3 → ___ Al + ___ O_2

____ 18. ___ $CuCl_2$ + ___ H_2S → ___ CuS + ___ HCl

____ 19. ___ $Ba(NO_3)_2$ + ___ $Na_2(CO_3)$ → ___ $Ba(CO_3)$ + ___ $Na(NO_3)$

____ 20. ___ $(NH_4)(NO_3)$ → ___ N_2O + ___ H_2O

____ 21. ___ SO_2 + ___ O_2 → ___ SO_3

Handout 1

Balancing Equations

1. _____ H_2 + _____ O_2 → _____ H_2O
2. _____ H_3PO_4 + _____ KOH → _____ K_3PO + _____ H_2O
3. _____ K + _____ B_2O_3 → _____ K_2O + _____ B
4. _____ HCl + _____ NaOH → _____ NaCl + _____ H_2O
5. _____ Na + _____ $NaNO_3$ → _____ Na_2O + _____ N_2
6. _____ C + _____ S_8 → _____ CS_2
7. _____ Na + _____ O_2 → _____ Na_2O_2
8. _____ N_2 + _____ O_2 → _____ N_2O_5
9. _____ H_3PO_4 + _____ $Mg(OH)_2$ → _____ $Mg_3(PO_4)_2$ + _____ H_2O
10. _____ NaOH + _____ H_2CO_3 → _____ Na_2CO_3 + _____ H_2O
11. _____ KOH + _____ HBr → _____ KBr + _____ H_2O
12. _____ H_2 + _____ O_2 → _____ H_2O_2
13. _____ Na + _____ O_2 → _____ Na_2O
14. _____ $Al(OH)_3$ + _____ H_2CO_3 → _____ $Al_2(CO_3)_3$ + _____ H_2O
15. _____ Al + _____ S_8 → _____ Al_2S_3
16. _____ Cs + _____ N_2 → _____ Cs_3N
17. _____ Mg + _____ Cl_2 → _____ $MgCl_2$
18. _____ Rb + _____ $RbNO_3$ → _____ Rb_2O + _____ N_2

BALANCING EQUATIONS

Balance the following chemical equations.

1. $CH_4 + O_2 \rightarrow CO_2 + H_2O$
2. $Na + I_2 \rightarrow NaI$
3. $N_2 + O_2 \rightarrow N_2O$
4. $N_2 + H_2 \rightarrow NH_3$
5. $KI + Cl_2 \rightarrow KCl + I_2$
6. $HCl + Ca(OH)_2 \rightarrow CaCl_2 + H_2O$
7. $KClO_3 \rightarrow KCl + O_2$
8. $K_3PO_4 + HCl \rightarrow KCl + H_3PO_4$
9. $S + O_2 \rightarrow SO_3$
10. $KI + Pb(NO_3)_2 \rightarrow KNO_3 + PbI_2$
11. $CaSO_4 + AlBr_3 \rightarrow CaBr_2 + Al_2(SO_4)_3$
12. $H_2O_2 \rightarrow H_2O + O_2$
13. $Na + H_2O \rightarrow NaOH + H_2$
14. $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$
15. $Mg(NO_3)_2 + K_3PO_4 \rightarrow Mg_3(PO_4)_2 + KNO_3$

BALANCING EQUATIONS

Handout 2

For the following reactions, balance the equations and identify the type of reaction as synthesis **(S)**, decomposition **(D)**, single replacement **(SR)**, double replacement **(DR)**, or combustion **(C)**. Put in your final answer the boxes.

1. ___HgO → ___Hg + ___O_2 Type of Reaction _____

2. ___$KClO_3$ → ___KCl + ___O_2 Type of Reaction _____

3. ___Zn + ___HCl → ___$ZnCl_2$ + ___H_2 Type of Reaction _____

4. ___HCl + ___$CaCO_3$ → ___$CaCl_2$ + ___H_2O + ___CO_2

5. ___N_2 + ___H_2 → ___NH_3 Type of Reaction _____

6. ___NCl_3 → ___N_2 + ___Cl_2 Type of Reaction _____

7. ___Na + ___Cl_2 → ___$NaCl$ Type of Reaction _____

8. ___Ag + ___Cl_2 → ___$AgCl$ Type of Reaction _____

9. ___$NaHCO_3$ → ___Na_2CO_3 + ___CO_2 + ___H_2O TR _____

10. ___CO + ___Fe_2O_3 → ___FeO + ___CO_2 TR _____

11. ___ SiH_4 + ___ O_2 → ___ SiO_2 + ___ H_2O TR _____

12. ___ HNO_2 → ___ NO + ___ NO_2 + ___ H_2O TR _____

13. ___ PCl_5 + ___ H_2O → ___ H_3PO_4 TR _____

14. ___ CuO + ___ NH_3 → ___ Cu + ___ H_2O + ___ N_2 TR _____

15. ___ B_2O_3 + ___ Mg → ___ B + ___ MgO TR _____

16. ___ NiS + ___ O_2 → ___ NiO + ___ SO_2 TR _____

17. ___ Co_3O_4 + ___ H_2 → ___ Co + ___ H_2O TR _____

18. ___ N_2H_4 + ___ O_2 → ___ N_2 + ___ H_2O TR _____

19. ___ FeS_2 + ___ O_2 → ___ FeO_3 + ___ SO_2 TR _____

20. ___ Cu_2S + ___ O_2 → ___ Cu_2O + ___ SO_2 TR _____

21. ___ Ag + ___ HNO_3 → ___ NO_2 + ___ $AgNO_3$ + ___ H_2O

22. ___ $CaCO_3$ + ___ $NaCl$ → ___ Na_2CO_3 + ___ $CaCl_2$ TR _____