Big Chem Problem Set

CHEMICAL REACTIONS

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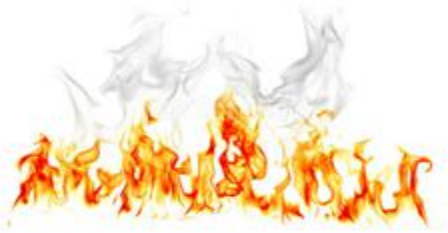

1. When bonds are broken energy is _____, and when bonds are formed energy is _____.
2. State whether each of the following represents a Physical Change, or a Chemical Change: Breaking glass, Dissolving sugar, Rusting iron, Boiling water, Digesting sugar, Burning gasoline, Respiration
3. Determine the empirical formula, for each of the following molecular formulas. C_8H_{18}, H_2O_2, Hg_2Cl_2, $C_3H_6O_3$, $Na_2C_2O_4$, H_2O
4. Determine the formula masses of each of the substances: CaC_{l2}, NH_4OH, $AgCH_3COO$, $Ba_3(PO_4)_2$, $Al_2(CO_3)_3$, $Zn(NO_3)_2$
5. Find the molecular formula for a compound with (EF = empirical formula)
   (a) a mass of 78 and the EF of CH.
   (b) a mass of 82 and the EF of C_3H_5.
   (c) a mass of 90 and the EF of HCO_2.
   (d) a mass of 112 and the EF of CH_2.
6. Determine the percent composition of each element in each compound: NaOH, $NaHCO_3$, $HC_2H_3O_2$, $C_{17}H_{35}COONa$
7. What is a diatomic molecule? What are the 7 diatomics whose identity you must memorize?
8. For each of the reactions shown below, identify the type of reaction as synthesis, decomposition, single replacement or double replacement:
   (a) $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$
   (b) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
   (c) $FeCl_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaCl$
   (d) $2Mg + O_2 \rightarrow 2MgO$
   (e) $H2CO_3 \rightarrow H_2O + CO_2$
   (f) $H_2O + N_2O_5 \rightarrow 2HNO_3$
   (g) $Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$
   (h) $2KClO_3 \rightarrow 2KCl + 3O_2$
   (i) $2K + 2H_2O \rightarrow 2KOH + H_2$
9. Why do equations have to be balanced?
10. Balance the equations below by writing the correct coefficient in the space before each formula. Do at least 4 - more if you are getting them wrong. Coefficient "1" need not be written:
    (a) $H_2 + Cl_2 \rightarrow HCl$
    (b) $Ca(NO_3)_2 + H_2SO_4 \rightarrow CaSO_4 + HNO_3$
    (c) $Fe + Cl_2 \rightarrow FeCl_3$
    (d) $Fe + O_2 \rightarrow Fe_2O_3$
    (e) $Zn + HCl \rightarrow ZnCl_2 + H_2$
    (f) $Cu + AgCH_3COO \rightarrow Cu(CH_3COO)_2 + Ag$
    (g) $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$
    (h) $N_2 + H_2 \rightarrow NH_3$
    (i) $CH_4 + O_2 \rightarrow CO_2 + H_2O$
    (j) $S + O_2 \rightarrow SO_3$
11. Balance the equations below by writing coefficients in front of the formulas where needed. Do at least 4 – more if you are getting them wrong. Identify the reaction type as Synthesis (S), Decomposition (D), Single Replacement (SR), or Double Replacement (DR):
    (a) $Fe2O_3 + C \rightarrow Fe + CO2$
    (b) $S + O_2 \rightarrow SO_3$
    (c) $N_2 + H_2 \rightarrow NH_3$
    (d) $H_2O + P_2O_5 \rightarrow H_3PO_4$
    (e) $NH_4NO_2 \rightarrow H_2O + N_2$
    (f) $Ba(NO_3)_2 + Fe_2(SO_4)_3 \rightarrow BaSO_4 + Fe(NO_3)_3$
    (g) $ZnCl_2 + AgNO_3 \rightarrow Zn(NO_3)_2 + AgCl$
    (h) $Na_2O + H_2O \rightarrow NaOH$
    (i) $NiCO_3 + Al(OH)_3 \rightarrow Ni(OH)_2 + Al_2(CO_3)_3$
    (j) $Ca(ClO_3)_2 \rightarrow CaCl_2 + O_2$
    (k) $Mg + H_2O \rightarrow Mg(OH)_2 + H_2$
12. Perform the following calculations:
    (a) What is the mass of 3 mol of KNO_3?
    (b) What is the mass of 0.75 mol of Al_2O_3?
    (c) What is the mass of 3.5 mol of $AgCH_3COO$?
    (d) What is the mass of 0.25 mol of $CaSO_4$?
    (e) How many mol are in 484.25 g of $(NH_4)_2PO_4$?
    (f) How many mol are in 75.46 g of H_2SO_4?

(g) How many mol are in 270. g of N_2O_2?
(h) How many mol are in 546 g of SnF_4?

13. How many moles of oxygen will be produced from the decomposition of 3 moles of KClO3 into potassium chloride and oxygen gas?

14. In a single replacement reaction of Zinc and hydrogen chloride where zinc replaces hydrogen, how many moles of Zn are needed to completely react with 0.4 moles of HCl?

15. Methane (CH_4) reacts with oxygen to form carbon dioxide and water. How many moles of oxygen will be needed to completely react with 4 moles of CH_4?

16. How many moles of hydrogen will be needed to react with 2 moles of nitrogen to form ammonia (NH_3)?

17. Using the above reaction how many moles of NH_3 will be formed if 18 moles of H_2 is used?

18. How many moles of sulfur are needed to react 3 moles of zinc metal (Zn) to form zinc sulfide?

19. How many moles of silver chloride will be produced if 2 moles of silver is allowed to react with an unlimited amount of chlorine?