Stoichiometry Practice Worksheet

1. Titanium(IV) oxide, TiO2, is used as a pigment in paints and as a whitening and coating agent for paper. It can be made by reacting O2 with TiCl4:

TiCl4 + O2 🡪 TiO2 + 2Cl2

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| **Reactants** | **Formula** | **Molar Mass** |
| titanium(IV) chloride | TiCl4 | 111.87 |
| oxygen gas | O2 | 32.00 |
| **Products** |  |  |
| titanium(IV) oxide | TiO2 | 79.87 |
| chlorine gas | Cl2 | 70.90 |

Given 42.34g of titanium(IV) chloride:

1. How many grams of oxygen can be reacted?
2. How many grams of titanium(IV) oxide can be produced?
3. How many grams of chlorine can be produced?
4. Tin(II) fluoride, also known as stannous fluoride, is added to some dental products to help prevent cavities. Tin(II) fluoride can be made from tin and hydrogen fluoride according to the following UNBALANCED equation:

Sn + HF 🡪 SnF2 + H2

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| **Reactants** | **Formula** | **Molar Mass** |
| tin | Sn | 118.71 |
| hydrogen fluoride | HF | 20.01 |
| **Products** |  |  |
| tin(II) fluoride | SnF2 | 156.71 |
| hydrogen gas | H2 | 2.02 |

Given 30.25g of tin:

1. How many grams of hydrogen fluoride can be reacted?
2. How many grams of tin(II) fluoride can be produced?
3. How many grams of hydrogen gas can be produced?
4. Air bags are activated when a severe deceleration (an impact) causes a steel ball to compress a spring and electrically ignite a detonator cap, which, in turn, causes sodium azide (NaN3) to decompose explosively, forming sodium and nitrogen gas in the following UNBALANCED equation:

NaN3 🡪 Na + N2

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| **Reactant** | **Formula** | **Molar Mass** |
| sodium azide | NaN3 | 65.02 |
| **Products** |  |  |
| sodium | Na |  |
| nitrogen gas | N2 |  |

Given 20.50g of sodium azide:

1. How many grams of sodium can be produced?
2. How many grams of nitrogen gas can be produced?
3. The phosphate industry uses such great quantities of sulfuric acid, H2SO4 that it is more cost efficient to synthesize it themselves. It is produced by a sequence of three reactions. The first of which is:

S + O2 🡪 SO2

Given 50.00g of sulfur dioxide produced:

1. How many grams of sulfur was reacted?
2. How many grams of oxygen gas was reacted?
3. The next reaction in sequence is the production of sulfur trioxide by reacting sulfur dioxide with oxygen gas in the following UNBALANCED equation:

SO2 + O2 🡪 SO3

Given 50.00g of sulfur dioxide reacted:

1. How many grams of oxygen gas was reacted?
2. How many grams of sulfur trioxide was produced?
3. The final reaction in sequence in the production of sulfuric acid is by reacting sulfur trioxide with water in the following equation:

SO3 + H2O 🡪 H2SO4

Given 76.55g of sulfuric acid produced:

1. How many grams of sulfur trioxide was reacted?
2. How many grams of water was reacted?