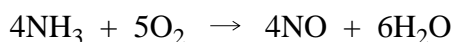


1. Chlorine can be produced by the reaction



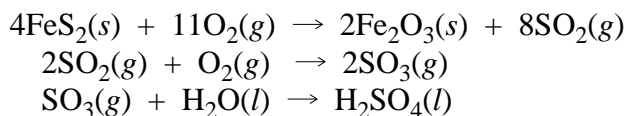
- (a) The reaction of 50.0 g of impure MnO_2 with an excess of HCl gave 32.1 g of Cl_2 . Assuming the reaction went in 100% yield, calculate the percentage purity of the MnO_2 .
- (b) Calculate the theoretical yield of chlorine from the reaction of 25.0 g of 88.5% MnO_2 with 1.50 litres of 0.635 M HCl .

2. Ammonia reacts with oxygen as follows:



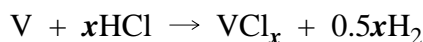
If the percentage yield in this reaction is 86.5%, how many grams of NH_3 are needed to form 13.7 g of H_2O ?

3. Sulphuric acid, H_2SO_4 , may be prepared from FeS_2 by the following sequence of reactions:



What mass of FeS_2 is required to prepare 1.00 litre of $\text{H}_2\text{SO}_4(l)$? The density of $\text{H}_2\text{SO}_4(l)$ is 1.85 g/mL.

4. When 1.11 g of vanadium is dissolved in HCl , 0.066 g of H_2 is produced. Calculate the value of x for the compound VCl_x produced according to the equation



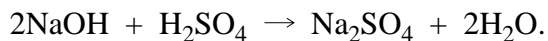
5. Calculate the number of grams of SF_4 that can be made from 4.00 g of SCl_2 and 2.00 g of NaF by the following reaction:



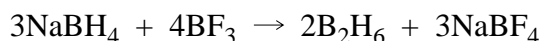
How many grams of the reactant in excess are left over?

6. A certain compound was found to be 29.95% C, 3.137% H and 66.91% Cl by mass. Calculate the empirical formula of the compound. The molecular weight was found to be 320 ± 5 . Calculate the molecular formula and the accurate molecular weight.

7. When 24.0 mL of 0.100 *M* NaOH was reacted with 20.0 mL of H₂SO₄ of unknown molarity, the final solution was 0.0375 *M* in H₂SO₄. Calculate the molarity of the original H₂SO₄ solution. The equation for the reaction is given below.



8. A 40.0% HNO₃ solution (by mass) has a density of 1.25 g/mL. Calculate the molarity of the solution.
9. A 32.0% (by mass) solution of KBr is 3.44 *M*. Calculate the density of the solution (in g/mL).
10. Calculate the theoretical yield of B₂H₆ from the reaction of 25.0 g of 85.0% NaBH₄ with 54.0 g of BF₃. The reaction is:



11. Calculate the percent purity of a sample of KO₂ if 3.30 g of the sample gave 655 mL of O₂ at STP by the reaction below. The volume of 1 mole of O₂ at STP is 22.4 L.

