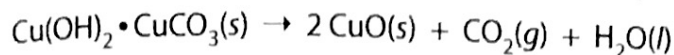


1. Malachite is a beautiful green mineral often sculpted into jewellery. It decomposes as follows:

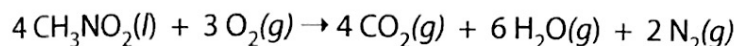


(a) How many moles of CuO are formed from the decomposition of 1.26 mol of malachite?

(b) If a 1.5 kg piece of malachite is completely decomposed, how many grams of copper(II) oxide are formed?

(c) If 706 g of copper(II) oxide are formed from the decomposition of a piece of malachite, how many litres of carbon dioxide gas would form at STP?

2. Nitromethane, a fuel occasionally used in drag racers, burns according to the reaction:



(a) What is the volume of nitrogen gas produced at STP if 3160 g of  $\text{CH}_3\text{NO}_2$  is burned?

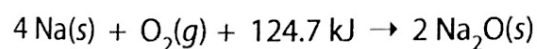
(b) What is the mass of nitromethane burned if 955 g of nitrogen gas are produced in the exhaust of the drag racer?

(c) What mass of water vapour is produced in the exhaust along with  $3.5 \times 10^{25}$  molecules of nitrogen gas?

3. What mass of zinc would completely react with 10.0 mL of 0.45 M hydrochloric acid solution?

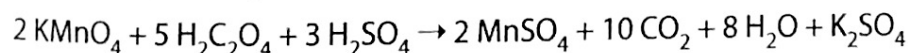


4. How much energy will be required to complete the reaction of 12.2 g of sodium to produce sodium oxide?



\* omit \*

5. Potassium permanganate reacts with oxalic acid in aqueous sulphuric acid according to the equation:



How many millilitres of a 0.250 M  $\text{KMnO}_4$  solution are needed to react with 3.225 g of oxalic acid?

Show all work for each of the following questions. Begin with a balanced chemical equation if one is not provided. Be sure to include the formulas as part of your units in each step. Give your final answer with the correct number of significant figures.

1. The exothermic reaction  $2 \text{K}(s) + 2 \text{H}_2\text{O}(l) \rightarrow 2 \text{KOH}(aq) + \text{H}_2(g)$  often releases enough heat to ignite the hydrogen gas it produces. What mass of potassium metal would be required to produce 250 mL of a 0.45 mol/L solution of potassium hydroxide?

2. What volume of 0.80 mol/L sodium iodide solution would completely react with  $2.4 \times 10^{24}$  molecules of chlorine gas?

Equation:

3. How many litres of carbon dioxide gas would be formed at STP if 1.5 L of 1.75 M phosphoric acid were reacted with excess potassium carbonate solution? Be cautious, as this question requires the use of both molar volume and molarity as conversion factors.

unbalanced

Equation:  $\text{H}_3\text{PO}_4(aq) + \text{K}_2\text{CO}_3(aq) \rightarrow \text{K}_3\text{PO}_4(aq) + \text{H}_2\text{O}(l) + \text{CO}_2(g)$