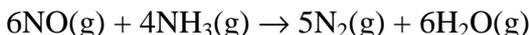


## Reacting masses problems 2

These questions are based on past GCSE questions. Remember to show all your working out clearly.

1. Research chemists discovered a simple way to reduce the amount of harmful nitrogen oxide in car exhaust fumes. If a stream of ammonia gas is injected into the hot exhaust, the following reaction happens:



- a) What are the products of this reaction?
- b) How much ammonia,  $\text{NH}_3$ , would be needed to react with 18g of nitrogen oxide,  $\text{NO}$ ?
- c) Assume that the average distance travelled by a car is about 19,800km per year, and that the average car emits 1g of nitrogen oxide per km.  
How much ammonia would be needed for one car in a year?
2. a) Balance the following equation:  
 $\text{Fe}_2\text{O}_3(\text{s}) + \dots\text{CO}(\text{g}) \rightarrow \dots\text{Fe}(\text{l}) + \dots\text{CO}_2(\text{g})$
- b) Iron(III) oxide is reduced to iron in the blast furnace according to the equation completed in part (a). How much iron(III) oxide is needed to produce 112g of iron?
- c) How much iron can be made from 320 tonnes of iron(III) oxide?
- d) A certain iron ore is impure iron(III) oxide. 320 tonnes of this ore will make 202 tonnes of iron. What is the percentage purity of the iron ore?  
[Hint: You will need to use your answer to part (c).]
3. In a titration experiment, it was found that  $25\text{cm}^3$  of  $0.1\text{mol}/\text{dm}^3$  sodium hydroxide solution was neutralised by exactly  $20\text{cm}^3$  of hydrochloric acid. The concentration of the acid was not known.
- a) How many moles of sodium hydroxide were there in the experiment?  
[Hints: No need to work out the  $M_r$  of  $\text{NaOH}$  because you know the volume and concentration. Remember that there are  $1000\text{cm}^3$  in  $1\text{dm}^3$  – convert volumes to  $\text{dm}^3$ .]
- b) The balanced symbol equation for the reaction is:  $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
How many moles of hydrochloric acid were needed to neutralise the sodium hydroxide?
- c) What was the concentration of the hydrochloric acid?  
[Hint: use your answer to part (b) and the volume of acid given in the question.]
4. In a titration experiment, it was found that  $25\text{cm}^3$  of  $0.5\text{mol}/\text{dm}^3$  sodium hydroxide solution was neutralised by exactly  $31.25\text{cm}^3$  of hydrochloric acid. What was the concentration of the acid?