

## 1.2 Exercise 1 – Avogadro's Number and reacting masses

1. Calculate the number of moles present in each of the following cases:	2. Calculate the mass of substance present in the following cases:	3. Calculate the relative molecular mass of the following substances and suggest a possible identity of each substance:
a) 2.3 g of Na	a) 0.05 moles of $\text{Cl}_2$	a) 0.015 moles, 0.42 g
b) 2.5 g of $\text{O}_2$	b) 0.125 moles of KBr	b) 0.0125 moles, 0.50 g
c) 240 kg of $\text{CO}_2$	c) 0.075 moles of $\text{Ca(OH)}_2$	c) 0.55 moles, 88 g
d) 12.5 g of $\text{Al(OH)}_3$	d) 250 moles of $\text{Fe}_2\text{O}_3$	d) 2.25 moles, 63 g
e) 5.2 g of $\text{PbO}_2$	e) 0.02 moles of $\text{Al}_2(\text{SO}_4)_3$	e) 0.00125 moles, 0.312 g

4. Calculate the number of particles in the following substances:

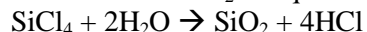
- a) 0.025 moles                      b) 2.5 g of  $\text{CO}_2$    c) 5.0 g of Pb                      d) 100 g of  $\text{N}_2$

5. Calculate the mass of the following substances:

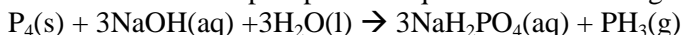
- a)  $2.5 \times 10^{23}$  molecules of  $\text{N}_2$   
 b)  $1.5 \times 10^{24}$  molecules of  $\text{CO}_2$   
 c)  $2 \times 10^{20}$  atoms of Mg

### Reacting Masses

6. Calculate the mass of  $\text{H}_2\text{O}$  required to react completely with 5.0 g of  $\text{SiCl}_4$ :



7. Calculate the mass of phosphorus required to make 200 g of phosphine,  $\text{PH}_3$ , by the reaction:

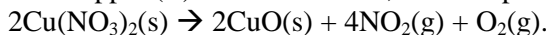


8. Lead (IV) oxide reacts with concentrated hydrochloric acid as follows:



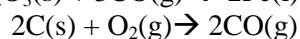
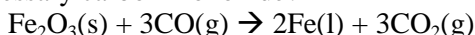
What mass of lead chloride would be obtained from 37.2g of  $\text{PbO}_2$ , and what mass of chlorine gas would be produced?

9. When copper (II) nitrate is heated, it decomposes according to the following equation:



When 20.0g of copper (II) nitrate is heated, what mass of copper (II) oxide would be produced? What mass of  $\text{NO}_2$  would be produced?

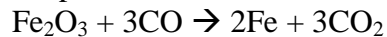
10. A blast furnace can produce about 700 tonnes of iron a day. How much iron (III) oxide will be consumed? Assuming coke is pure carbon, how much coke would be needed to produce the necessary carbon monoxide?



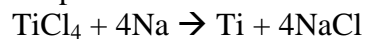
## Atom Economy

11. Calculate the percentage atom economy of the following processes:

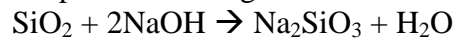
- a) the production of iron in the blast furnace:



- b) the production of titanium:



- c) the production of glass from sand:



12. Calculate the atom economy of each of the following methods of producing iron and decide which is the most efficient process:

