

Topic 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 Cl ₂	a) 0.015 moles, 0.42 g
b) 2.5 g of O ₂	b) 0.125 moles of KBr	b) 0.0125 moles, 0.50 g
c) 240 kg of CO ₂	c) 0.075 moles of Ca(OH) ₂	c) 0.55 moles, 88 g
d) 12.5 g of Al(OH) ₃	d) 250 moles of Fe ₂ O ₃	d) 2.25 moles, 63 g
e) 5.2 g of PbO ₂	e) 0.02 moles of Al ₂ (SO ₄) ₃	e) 0.00125 moles, 0.312 g

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

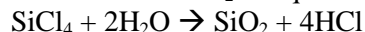
- a) 0.025 moles b) 2.5 g of CO₂ c) 5.0 g of Pb d) 100 g of N₂

5. Calculate the mass of the following substances:

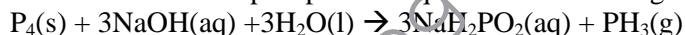
- a) 2.5×10^{23} molecules of N₂
 b) 1.5×10^{24} molecules of CO₂
 c) 2×10^{20} atoms of Mg

Reacting Masses

6. Calculate the mass of H₂O required to react completely with 5.0 g of SiCl₄:



7. Calculate the mass of phosphorus required to make 200 g of phosphine, PH₃, by the reaction:

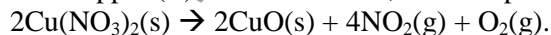


8. Lead (IV) oxide reacts with concentrated hydrochloric acid as follows:



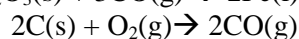
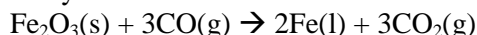
What mass of lead chloride would be obtained from 37.2g of PbO₂, and what mass of chlorine gas would be produced?

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 NO₂ 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?

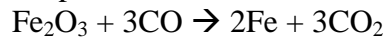




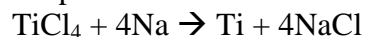
Atom Economy

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

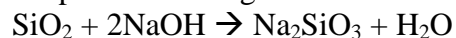
a) the production of iron in the blast furnace:



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:

