1 a How many moles of magnesium bromide are formed when 3.0 moles of magnesium reacts with 2.0 moles of bromine?

$Mg + Br_2 \rightarrow MgBr_2$

2.0 moles of $MgBr_2$

b How many moles of ammonia are formed when 4.0 moles of nitrogen reacts with 9.0 moles of hydrogen?

$N_2 + 3H_2 \rightarrow 2NH_3$

6.0 moles of NH_3

c How many moles of iron oxide are formed when 12.0 moles of iron reacts with 6.0 moles of oxygen?

$4Fe + 3O_2 \rightarrow 2Fe_2O_3$

4.0 moles of Fe_2O_3

2 4.8 g of magnesium is reacted with 4.5 g of steam. Work out which is the limiting reagent and then calculate the mass of magnesium oxide formed.

$$Mg + H_2O \rightarrow MgO + H_2$$

moles Mg = $\frac{mass}{M_r}$ = $\frac{4.8}{24}$ = 0.2 mol

moles H_2O = $\frac{mass}{M_r}$ = $\frac{4.5}{18}$ = 0.25 mol

0.2 moles of Mg needs 0.2 moles of H_2O for all the Mg to react,

there is more than enough H_2O and so the H_2O is in excess, therefore Mg is the limiting reagent

therefore 0.2 moles of Mg reacts with the 0.2 moles of H_2O, and forms 0.2 moles of MgO

mass MgO = M_r x moles = 40 x 0.2 = 8 g

3 2.0 g of calcium is reacted with 0.32 g of oxygen. Work out which is the limiting reagent and then calculate the mass of calcium oxide formed.

$$2Ca + O_2 \rightarrow 2CaO$$

moles Ca = $\frac{mass}{M_r}$ = $\frac{2.0}{40}$ = 0.05 mol

moles O_2 = $\frac{mass}{M_r}$ = $\frac{0.32}{32}$ = 0.01 mol

0.05 moles of Ca needs 0.025 moles of O_2 for all the Ca to react, but we don't have this much O_2

therefore O_2 is the limiting reagent (so the Ca is in excess and does not all react)

therefore only 0.02 moles of Ca reacts with the 0.01 moles of O_2, and forms 0.02 moles of CaO

mass CaO = M_r x moles = 56 x 0.02 = 1.12 g