From page 7

Q6. A teacher found that the oxide of copper produced 2.54 g of copper and 0.72 g of water. Two possible equations for the reaction are:

Equation 1: $Cu_2O + H_2 \rightarrow 2Cu + H_2O$

Equation 2: $CuO + H_2 \rightarrow Cu + H_2O$

Determine which is the correct equation for the reaction in the teacher's experiment.
Relative atomic masses (Ar): H = 1 O = 16 Cu = 63.5

mol Cu = $\frac{2.54}{63.5}$ = 0.04 ✓

mol H_2O = $\frac{0.72}{18}$ = 0.04 ✓

ratio is 1 : 1

CuO

so equation 2 ✓

[3 marks]

AQA June 19 H Q8.4

From page 8

Q8. A mixture contains 1.00 kg of aluminium and 3.00 kg of iron oxide.
The equation for the reaction is: $2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$
Show that aluminium is the limiting reactant.
Relative atomic masses (Ar): O = 16 Al = 27 Fe = 56

HT

Mr Fe_2O_3 = ((56 × 2) + (16 × 3)) = 160 ✓

mol Fe_2O_3 = $\frac{3000}{160}$ = 18.75 ✓

mol Al = $\frac{1000}{27}$ = 37.0 ✓

ratio 2 : 1 so 18.75 mol Fe_2O_3 needs ✓

2 × 18.75 mol Al = 37.5 so not enough Al so is limiting reactant.

[4 marks]

AQA June 20 H Q6.2

From page 8

Q10. Calculate the minimum mass in grams of magnesium needed to completely reduce 1.2 kg of silicon dioxide.
The equation is $2\,Mg(s) + SiO_2(s) \rightarrow Si(s) + 2\,MgO(s)$
Relative atomic masses (Ar): O = 16 Mg = 24 Si = 28

HT

$2Mg + SiO_2 \rightarrow Si + 2MgO$

	Mg	SiO_2
mass	?	1200 ✓
Mr	24	60
moles		20 ✓
ratio	2	1

Mr SiO_2 = 28 + (16 × 2) = 60 ✓

moles Mg = 20 × 2 = 40 ✓

mass Mg = 40 × 24 = 960 g ✓

[5 marks]

AQA June 22 H Q7.4

From page 9

Q12. Calculate the percentage atom economy for the production of silver iodide in this reaction. The equation for the reaction is:
$AgNO_3(aq) + NaI(aq) \rightarrow AgI(s) + NaNO_3(aq)$
Give your answer to 3 significant figures.
Relative formula masses (Mr): $AgNO_3$ = 170 NaI = 150 AgI = 235 $NaNO_3$ = 85

Mr total reactants = 170 + 150 = 320 g ✓

$\frac{235}{320} \times 100 = 73.4375$ ✓

= 73.4 % ✓

[4 marks]

AQA June 20 H Q3.5

From page 11

Q15. Calculate the mass of sodium hydroxide in 30.0 cm^3 of a 0.105 mol/dm^3 solution. Relative formula mass (Mr): NaOH = 40

$$\text{mol} = \frac{30}{1000} \times 0.105 = 0.00315$$ ✓

$$\text{mass} = 0.00315 \times 40 = 0.126\text{g}$$ ✓

[2 marks]

AQA June 18 H Q9.5

Q16. A student made 250 cm^3 of a solution of citric acid of concentration 0.0500 mol/dm^3. Calculate the mass of citric acid ($C_6H_8O_7$) required. Relative atomic masses (Ar): H = 1 C = 12 O = 16

$$\text{mol} = \frac{250}{1000} \times 0.05 = 0.0125$$ ✓

$$\text{Mr citric acid} = (6 \times 12) + (8 \times 1) + (7 \times 16) = 192$$ ✓

$$\text{Mass} = 0.0125 \times 192 = 2.4\text{g}$$

[3 marks]

AQA June 20 H Q9.4

Q18. A student found that 15.5 cm^3 of 0.500 mol/dm^3 dilute sulfuric acid completely reacted with 25.0 cm^3 of potassium hydroxide solution. The equation for the reaction is:

$$2KOH + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O$$

Calculate the concentration of the potassium hydroxide solution in mol/dm^3 and in g/dm^3

Relative atomic masses (Ar): H = 1 O = 16 K = 39

	$2KOH$	+	H_2SO_4
vol	25/1000		15.5/1000
conc			0.500
mol	$0.00775 \times 2 = 0.0155$		$= 0.00775$
ratio	2		1

$$\text{conc} = \frac{0.0155}{25/1000} = 0.62 \text{ mol/dm}^3$$

Mr KOH
$= 39+16+1$
$= 56$

0.62×56
$= 34.7 \text{ g/dm}^3$

[6 marks]

AQA June 19 H Q9.5

Q19. A student found that 25.0 cm^3 of the sodium hydroxide solution was neutralised by 15.00 cm^3 of the 0.0480 mol/dm^3 ethanedioic acid solution. The equation for the reaction is:

$$H_2C_2O_4 + 2\,NaOH \rightarrow Na_2C_2O_4 + 2H_2O$$

Calculate the concentration of the sodium hydroxide solution in mol/dm^3

	$H_2C_2O_4$	:	$2\,NaOH$
vol	15/1000		25/1000
conc	0.0480		$= 0.00144 / 25/1000 = 0.0576 \text{ mol/dm}^3$
mol	0.00072 ✓		$= 0.00072 \times 2 = 0.00144$ ✓
ratio	1	:	2

[3 marks]

AQA June 21 H Q9.5