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Purity of a sample: exercises

1. The purity of a sample of aluminum is 85 %. Calculate the amount of aluminum sulfate –$Al_2(SO_4)_3$- that can be formed from 250 g of that sample.

   Atomic weights: Al=27; S=32; O=16

   SOL: 1345.8 g

2. The purity of a sample of magnesium is of 80 %. Calculate the amount of that sample needed to get 405 g of magnesium chloride.

   Atomic weights: Mg=24; Cl=35.5

   SOL: 127.9 g sample

3. From 540 g of a sample of calcium, we get 250 g of $Ca(OH)_2$. Calculate the purity of that sample.

   Atomic weights: Ca=40; O=16; H=1

   SOL: 25 %

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1. The purity of a sample of aluminum is 85 %. Calculate the amount of aluminum sulfate –$Al_2(SO_4)_3$- that can be formed from 250 g of that sample.

Atomic weights: Al=27; S=32; O=16

SOL: 1345.8 g

The (partial) chemical equation is:

$$2\ Al + \ldots \rightarrow Al_2(SO_4)_3 + \ldots$$

$$2\ mol \qquad 1\ mol$$

$$54\ g \qquad 342\ g$$

Now, we are going to calculate

1) the amount of aluminum in that sample
2) The amount of the product formed, based on the amount of calcium in the sample

$$m(Al) = 250\ g\ sample\ x\ \frac{85\ g\ Al}{100\ g\ sample} = 212.5\ g\ Al$$

$$m(product) = 212.5\ g\ Al\ x\ \frac{342\ g\ product}{54\ g\ Al} = 1345.8\ g\ product$$

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Purity of a sample: exercises

2. The purity of a sample of magnesium is of 80 %. Calculate the amount of that sample needed to get 405 g of magnesium chloride.

Atomic weights: Mg=24; Cl=35.5

SOL: 127.9 g sample

The (partial) chemical equation is:

$$Mg + \ldots \rightarrow MgCl_2 + \ldots$$

1 mol 1mol

24 g 95 g

Now, we are going to calculate

1) the amount of magnesium in the product
2) The amount of the sample, based on the amount of magnesium needed

$$m(Mg) = 405 \text{ g } MgCl_2 \times \frac{24 \text{ g Mg}}{95 \text{ g } MgCl_2} = 102.3 \text{ g Mg}$$

$$m(\text{sample}) = 102.3 \text{ g Mg} \times \frac{100 \text{ g sample}}{80 \text{ g Mg}} = 127.9 \text{ g sample}$$

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Purity of a sample: exercises

3. From 540 g of a sample of calcium, we get 250 g of $Ca(OH)_2$. Calculate the purity of that sample.

Atomic weights: Ca=40; O=16; H=1

SOL: 25 %

The (partial) chemical equation is:

$$Ca + \ldots \rightarrow Ca(OH)_2 + \ldots$$

$$1\,mol \qquad 1\,mol$$

$$40\,g \qquad 74\,g$$

Now, we are going to calculate

1) the amount of calcium element in the product
2) the purity of that sample, based on the amount of calcium in the product

$$m(Ca) = 250\ g\ Ca(OH)_2\ x\ \frac{40\ g\ Ca}{74\ g\ Ca(OH)_2} = 135.1\ g\ Ca$$

$$purity\ (sample) = 100\ x\ \frac{135.1\ g\ Ca}{540\ g\ sample} = 25\ \%$$