Answer on Question #40482 - Chemistry – Other

Question

Combining 0.400 mol of Fe_2O_3 with excess carbon produced 14.3 g of Fe.

$$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$$

1) What is the actual yield of Iron in moles?

2) What was the theoretical yield of iron in moles?

3) What was the percent yield?

Answer:

1) Number of moles equals:

$$n = \frac{m}{M}$$

m – Mass of the Iron, g.

M – Molar mass of Iron, M(Fe) = 55.85 g/mol.

Then number of moles of Iron produced by reaction is:

$$n(Fe) = \frac{m(Fe)}{M(Fe)} = \frac{14.3}{55.85} = 0.256 \ mol$$

So, the actual yield of Iron in moles equals 0.256 mol.

2) Make a proportion:

1 mole of Fe₂O₃ produces 2 mol of Fe (Iron)

0.400 moles of
$$Fe_2O_3 - x$$
 mol of Fe

$$x = \frac{0.400 \cdot 2}{1} = 0.800 \text{ mol of Fe}$$

So, the theoretical yield of Iron in moles equals 0.800 mol.

3) The percent yield is the actual yield divided by the theoretical yield:

$$\% yield = \frac{0.256}{0.800} \times 100\% = 32.0\%$$

Answer: 1) 0.256 mol

2) 0.800 mol 3) 32.0 %