Answer on the question #62753, Chemistry / General chemistry

How many grams of carbon disulfide will be produced if 5.90 g of C and 12.9 g of S_8 are allowed to react completely?

Solution:

Reaction that take place:

$$4\mathrm{C} + \mathrm{S_8} = 4\mathrm{CS_2}$$

To identify who is from the reagents reacts completely we need the mole number value:

$$\mathrm{n(C)} = \frac{\mathrm{m(C)}}{\mathrm{M(C)}} = \frac{5.9\ \mathrm{g}}{12\ \mathrm{g/mol}} = 0.5\ \mathrm{mole}$$

$$\mathrm{n(S_8)} = \frac{\mathrm{m(S_8)}}{\mathrm{M(S_8)}} = \frac{12.9\ \mathrm{g}}{256\ \mathrm{g/mol}} = 0.05\ \mathrm{mole}$$

As we can see from the previous calculations, the mole number of S_8 is less than of C, it means that S_8 reacts completely and C is in excess. That is why the mass of CS_2 calculates from mole number of S_8 (from the law of equivalent):

$$\mathrm{n(CS_2)} = 4 \cdot \mathrm{n(S_8)} = 4 \cdot 0.05\ \mathrm{mol} = 0.2\ \mathrm{mol}$$

$$\mathrm{m(CS_2)} = \mathrm{n(CS_2)} \cdot \mathrm{M(CS_2)} = 0.2\ \mathrm{mol} \cdot 76 \frac{\mathrm{g}}{\mathrm{mol}} = 15.2\ \mathrm{g}$$

Answer: the mass of CS_2 is 15.2 g.