Answer on the question #54713 – Chemistry – General chemistry

Question:

Sodium azide (NaN_3) yields N_2 gas when heated to 300 ∘C, a reaction used in automobile air bags.

If 1.00 mol of N_2 has a volume of 47.0 L under the reaction conditions, how many liters of gas can be formed by heating 39.0 g of NaN_3? The reaction is:
$2NaN_3 \rightarrow 3N_2(g)+2Na$

Answer:

According to the reaction equation, the number of the moles of the sodium azide and nitrogen relates as:

$$\frac{n(NaN_3)}{2} = \frac{n(N_2)}{3}$$

The number of the moles of the sodium azide is:

$$n(NaN_3) = \frac{m(NaN_3)}{M(NaN_3)} = \frac{39.0}{65} = 0.6\ mol$$

Then, the number of the moles of nitrogen gas is:

$$n(N_2) = n(NaN_3) * \frac{3}{2} = 0.6 * \frac{3}{2} = 0.9\ mol$$

The volume of nitrogen is:

$$V(N_2) = n(N_2) * 47 = 42.3\ L$$