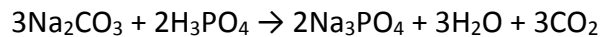# Answer on Question #67192, Chemistry, General Chemistry

If 2.12 grams of sodium carbonate reacts with an excess phosphoric acid, what volume of carbon dioxide would be produced at 755 torr and 27 degrees celcius?
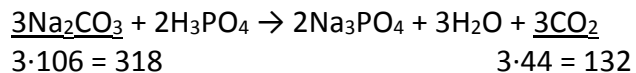
Solution:

The chemical equation for given reaction is

$3Na_2CO_3 + 2H_3PO_4 \rightarrow 2Na_3PO_4 + 3H_2O + 3CO_2$

Using chemical reaction, we can determine the mass of carbon dioxide:

  2.12 g   X g

$3\underline{Na_2CO_3} + 2H_3PO_4 \rightarrow 2Na_3PO_4 + 3H_2O + 3\underline{CO_2}$
$3\cdot106 = 318$ $3\cdot44 = 132$

Where 106 g/mol is molar mass of Na_2CO_3; 44 g/mol is molar mass of CO_2.

Make a proportion:

$$\frac{2.12}{318} = \frac{X}{132}$$

So:

$X = \frac{2.12\cdot132}{318} = 0.88$ (g) = m (CO_2)

According to Mendeleev – Klapeyron's equation, we can calculate the volume of CO_2 gas:

$pV = \frac{m(CO2)}{M(CO2)}\cdot RT$

where p is pressure (p = 755 torr = 0.993 atm); R is gas constant (R = 0,0821 L·atm/mole·K)

Thus, volume of carbon dioxide equals:

$V(CO_2) = \frac{m(CO2)}{M(CO2)\cdot p}\cdot RT = \frac{0.88}{44\cdot0.993}\cdot0.0821\cdot(273 + 27) = 0.496$ (L)

Answer: $V(CO_2) = 0.496$ (L).