Answer on the question #47633, Chemistry, Physical Chemistry

Question

If 21.3 grams of lithium react with excess water, how many liters of hydrogen gas can be produced at 297 Kelvin and 1.40 atmospheres? Show all of the work used to solve this problem.

2 Li (s) + 2 H2O (l) yields 2 LiOH (aq) + H2 (g)

Solution

According to the reaction equation:

$$n(Li) = 2n(H_2)$$

$$n(Li) = \frac{m}{M} = \frac{21.3}{6.94} = 3.07 \ mol$$

$$n(H_2) = 1.53 \ mol$$

$$V(H_2) = n(H_2) * V_m$$

At STP: $V_m = 22.4 \ mol/L$:

$$V(H_2, STP) = 1.53 * 22.4 = 34.4 \ L$$

At 297 K and 1.4 atm:

$$\frac{pV}{T} = const \Rightarrow \frac{1 * 34.4}{273.15} = \frac{1.40 * V}{297}$$

$$V = 26.7 \ L$$

Answer: 26.7 L