

### Question #83493

What is the mass of water (in g) at 100 °C that can be completely boiled into liquid water at 100°C by a 111 g aluminum block at temperature 340 °C? Assume the aluminum is capable of boiling the water until its temperature drops below 100 °C.

The heat capacity of aluminum is 0.903 J g<sup>-1</sup> °C<sup>-1</sup> and the heat of vaporization of water at 100°C is 40.7 kJ mol<sup>-1</sup>.

Express your answer to 3 significant figures.

Solution:

First of all, it is necessary to calculate the amount of heat produced by the 111 g of aluminum block:

$$Q = mC\Delta T = 111 * 0.903 * (340 - 100) = 111 * 0.903 * 240 = 24055,92 J = 24.056 kJ$$

Next, it is possible to calculate the mass of water that can be completely boiled by that aluminum block is:

$$m(H_2O) = \frac{24.056}{40.7} * 18 = 10.639 \approx 10.6 g$$

Answer:

The mass of water that can be completely boiled by that aluminum block is 10.6 g.

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