Answer on Question #58114, Physics / Molecular Physics | Thermodynamics |

3 Calculate the work done against external atmospheric pressure when 1 g of water changes to 1672cm^3 of steam. Take the atmospheric pressure as 1.013×10^{5}Nm^{-2}

169.3 J

342.4 J

226.2 J

143.5 J

Solution:

$$W = P(V_{steam} - V_{water})$$

$$W = Pm\left(\frac{1}{\rho_{steam}} - \frac{1}{\rho_{water}}\right)$$

$$W = 1.013 \cdot 10^5 \cdot 10^{-3}\left(\frac{1672 \cdot 10^{-6}}{10^{-3}} - \frac{1}{10^3}\right) = 169.3\ \text{J}$$

Answer: $\mathbf{169.3\ J}$

4 An electric kettle contains 1.5 kg of water at 100°C and powered by a 2.0 kW electric element. If the thermostat of the kettle fails to operate, approximately how long will it take for the kettle boil dry? (Take the specific latent heat of vaporization of water as 2000 $kJkg^{-1}$)

500s

1000s

1500s

3000s

Solution:

Needed amount of heat

$$Q = m\lambda$$

where m is mass of water and λ is specific heat of vaporization.

Then the time will be heat devided by power:

$$t = \frac{Q}{P} = \frac{1.5 \cdot 2000 \cdot 10^3}{2 \cdot 10^3} = 1500 \text{ s}$$

Answer: **1500s**