JEE previous year questions:

Chemical Thermodynamics-IV

1. For water Δ_{vap} H = 41 kJ mol^{--1} at 373 K and 1 bar pressure. Assuming that water vapour is an ideal gas that occupies a much larger volume than liquid water, the internal energy change during evaporation of water is _____ kJ mol^{-1} [Use: R = 8.3 J mol^{-1} K^{-1}] (JEE Mains, 2021)

Ans: 38

Explanation:
$H_2O(l) \rightarrow H_2O(g)$
$\Delta H = 41$ kJ/mol (given)
We know, $\Delta H = \Delta U + \Delta n_g RT = 41$kJ/mol $= \Delta U + 1 \times (8.3/1000) \times 373$
(As, R = (8.3/1000) kJ mol^{-1} K^{-1})
$\Delta U = 41 - 3.0959 = 38$ kJ/mol