Answer on Question 58706, Physics, Molecular Physics | Thermodynamics

Question:

Calculate how much heat is needed to be supplied to a gas at a pressure of

$1.25 \cdot 10^5\ Pa$, such that the pressure increases by 25 percent at constant volume, and the internal energy by $120\ J$.

a) $240\ J$

b) $120\ J$

c) $320\ J$

d) $480\ J$

Solution:

Let's start with the definition of the First Law of Thermodynamics. The First Law of Thermodynamics states that the change in internal energy of a system equals to the heat added to the system minus the work done by the system:

$$\Delta U = Q - W,$$

here, ΔU is the change in internal energy, Q is the heat added to the system, W is the work done by the system.

From the condition of the question, we know that the change in internal energy, ΔU, is equal to $120\ J$. Also, from the analysis of the formula we can see, that the work done by the system is equal to zero (no work is done because there is no change in volume).

Therefore, we get:

$$\Delta U = Q,$$

$$Q = 120\ J.$$

Answer:

b) $120\ J$.