# Answer on Question#52087 - Physics - Field Theory

An engine absorbs 2000J of heat from a hot reservoir and expels 750J to a cold reservoir during each operating cycle. How much work is done during the cycle?

1250J

750J

2000J

350J

15 An engine absorbs 2000J of heat from a hot reservoir and expels 750J to a cold reservoir during each operating cycle. What is the efficiency of the engine?

50%

62.5%

74.2%

85.6%

16 Calculate the work done on the system when 1.00 mol of gas held behind a piston expands irreversibly from a volume of 1.00dm3 to a volume of 10.0dm3 against an external pressure of 1.00 bar.

-900 J

-1800 J

-1900 J

-60 J

17 A perfect gas expands reversibly at a constant temperature of 298 K so that its volume doubles. What is the change in the molar internal energy of the gas?
$-0.125 J mol^{-1}$
$0 J mol^{-1}$
$983 J mol^{-1}$
$1 J mol^{-1}$

Solution:

1. The work done during the cycle is given by the difference between absorbed heat from the heater and expelled heat to the cooler. So, the answer to the first question is 1250J.
2. The efficiency of the engine is given by the ratio of work done during the cycle to the heat absorbed from the heater. So, the answer to the second question is

$$\frac{1250\text{J}}{2000\text{J}} = 62.5\%$$

3. The work done against external pressure is given by
$$W = p \cdot \Delta V,$$
where $p$ – is external pressure, and $\Delta V$ – is increase in volume. Since $p = 1\text{bar} = 10^5\text{Pa}$ and $\Delta V = 10\text{dm}^3 - 1\text{dm}^3 = 9\text{dm}^3 = 9 \times 10^{-3}\text{m}^3$, we obtain
$$W = p \cdot \Delta V = 10^5\text{Pa} \cdot 9 \times 10^{-3}\text{m}^3 = 900\text{J}$$
So, the answer to the 3rd question is 900J.
4. Since the temperature of the gas remain constant, its internal energy doesn't change. So, the answer to the 4th question is 0 $\text{Jmol}^{-1}$.

Answer:

1. 1250J
2. 62.5%
3. 900J
4. 0$\text{Jmol}^{-1}$