Answer on Question 58120, Physics, Molecular Physics | Thermodynamics

Question:

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

a) $1250\,J$

b) $750\,J$

c) $2000\,J$

d) $350\,J$

Solution:

We can find the work done by the engine during the cycle from the law of conservation of energy:

$$Q_H = W + Q_C,$$

here, Q_H is the heat energy taken from the hot reservoir, W is the work done by the engine during the cycle, Q_C is the heat energy expelled to a cold reservoir.

Therefore, we can get:

$$W = Q_H - Q_C = 2000\,J - 750\,J = 1250\,J.$$

Answer:

a) $1250\,J$

19. An engine absorbs $2000\,J$ of heat from a hot reservoir and expels $750\,J$ to a cold reservoir during each operating cycle. What is the power output of the engine if each cycle lasts for $0.5\,s$?

a) $750\,W$

b) $1750\,W$

c) $3000\,W$

d) $2500\ W$

Solution:

By the definition of the power we have:

$$P = \frac{W}{t} = \frac{Q_H - Q_C}{t} = \frac{2000\ J - 750\ J}{0.5\ s} = \frac{1250\ J}{0.5\ s} = 2500\ W.$$

Answer:

d) $2500\ W$

20. The first law of thermodynamics is a restatement of which of these laws?

a) conservation of charge

b) conservation of momentum

c) conservation of entropy

d) conservation of energy

Solution:

The first law of thermodynamics is the application of the law of conservation of energy to heat and thermodynamic process. The first law of thermodynamics states that the change in internal energy of a system is equal 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.

Thus, the correct answer is d) conservation of energy.

Answer:

d) conservation of energy