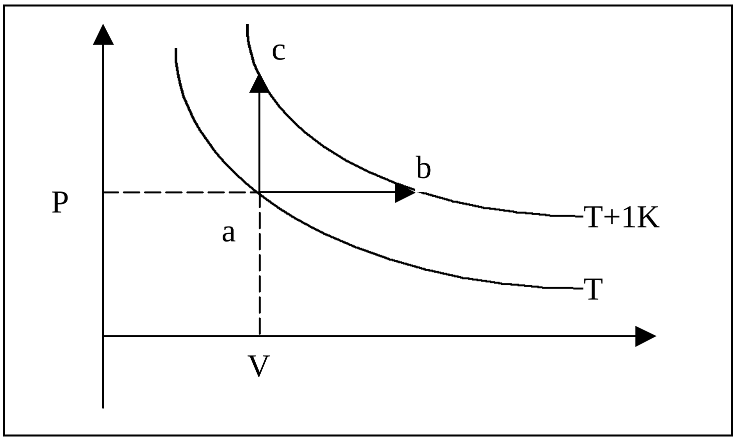
AL Physics MC Answers

Year:1988

Question Number:16,30,41

1988 MC (16)

Referring to the PV diagram, the energy (here, the term “energy” refers to heat) supplied during the process a to b is Q_1, while that from a to c is Q_2.



The changes in internal energy in these two processes are the same because of the same temperature rise.

Process a to b, there is a work done by the gas (the gas expands).

PV = nRT, so work $\Delta W = P\Delta V = nR\Delta T = R$ (n = 1 mole and ΔT = 1K)

Since $\Delta U = \Delta Q - \Delta W$ and same ΔU, i.e.

$$(\Delta Q - \Delta W)_{a\ to\ c} = (\Delta Q - \Delta W)_{a\ to\ b}, \quad \text{so } Q_1 = Q_2 - R \quad = \quad Q_2 - \frac{PV}{T}$$

1988MC (30)

Total potential = scalar sum of potentials due to each charge.

Let x be the separation between center and corner, i.e x = $\frac{a}{\sqrt{2}}$

At the center,

potential due to the charge placed at the top-left corner $V_1 = \frac{-2q}{4pe_o x}$

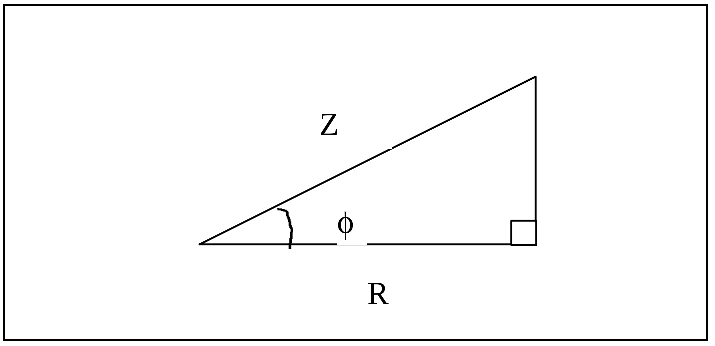
potential due to the charge placed at the top-right corner $V_2 = \frac{q}{4pe_o x}$

potential due to the charge placed at the bottom-left corner $V_3 = \frac{q}{4pe_o x}$

potential due to the charge placed at the bottom-right corner $V_4 = \frac{-2q}{4pe_o x}$

The answer is the sum of V_1, V_2, V_3 and V_4.

1988MC (41)



Power factor $\cos\phi = R/Z = 1/2$

Power = $V_{rms,supply} I_{rms,supply} \cos\phi$

So Power = IV/2