7. In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.

(i) $q = 0, \Delta T \neq 0, w = 0$

(ii) $q \neq 0, \Delta T = 0, w = 0$

(iii) $q = 0, \Delta T = 0, w = 0$

(iv) $q = 0, \Delta T < 0, w \neq 0$

Solution:

(iii) $q=0, \Delta T=0, w=0$

Explanation:

Adiabatic process means no heat transfer, hence $q=0$.

As it's a free expansion, there will be no work done. Hence, $w=0$

From first law of Thermodynamics, $\Delta U=0$ and for ideal gas, $\Delta U=nC_v\Delta T$. So, $\Delta T=0$