

18. For an ideal gas, the work of reversible expansion under isothermal condition

can be calculated by using the expression $w = -nRT \ln \frac{V_f}{V_i}$

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A sample containing 1.0 mol of an ideal gas is expanded isothermally and reversibly to ten times of its original volume, in two separate experiments. The expansion is carried out at 300 K and at 600 K respectively. Choose the correct option.

- (i) Work done at 600 K is 20 times the work done at 300 K.
- (ii) Work done at 300 K is twice the work done at 600 K.
- (iii) Work done at 600 K is twice the work done at 300 K. ✓
- (iv) $\Delta U = 0$ in both cases. ✓

Solution:

(iii) and (iv)

Explanation:

For isothermal process, in case of ideal gas, $\Delta U = nC_v \Delta T$. Hence, $\Delta U = 0$

$V_2/V_1 = 10$ for both cases. Hence work done will be doubled if temperature is doubled