

## Answer on the question #61927, Chemistry / Physical Chemistry

### Question:

Question No: 1. A system is undergoing expansion with  $P_{op} = p$  (pressure of the gas); then multistage compression with  $P_{op} = P$ . The initial and final volume for the expansion process are  $V_i$  and  $V_f$ , respectively. The initial and final volume for the compression are  $V_f$  and  $V_i$ , respectively. Calculate the net work done in the whole process

### Solution:

Isobaric expansion or compression work, done by the system, can be expressed as:

$$W = -p\Delta V.$$

Then, for the expansion part, we can write the following:

$$W_1 = -p\Delta V = -p(V_f - V_i).$$

For the compression stage, analogical expression:

$$W_2 = -p\Delta V = -P(V_i - V_f).$$

The net work done by the system in the whole process is

$$W = W_1 + W_2 = -p(V_f - V_i) - P(V_i - V_f) = (V_i - V_f)(p - P).$$

**Answer:**  $(V_i - V_f)(p - P)$