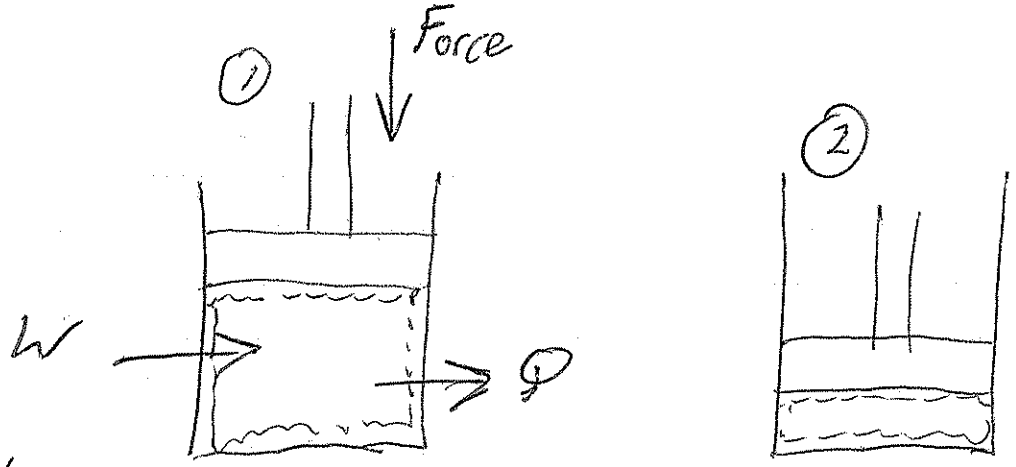

STATES

$V_1 = 2\ m^3$ $\quad V_2 = ?$

$P_1 = 101.3\ kPa$ $\quad P_2 = 500\ kPa$

$T_1 = 20\ C$ $\quad T_2 = 20\ C$

WHAT IS W? WHAT IS Q?

CLOSED SYSTEM - NO MASS TRANSFER

EQUATIONS

$$Q_{12} - W_{12} = m(u_2 - u_1) = mc_v(T_2 - T_1)$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \longleftarrow \text{IDEAL GAS}$$

BUT $T_1 = T_2$ SO $P_1 V_1 = P_2 V_2$

AND $V_2 = \frac{P_1}{P_2} V_1$

FOR ISOTHERMAL PROCESS W/ IDEAL GAS

$$W_{12} = P_1 V_1 \ln(V_2/V_1)$$

OR $W_{12} = P_1 V_1 \ln(P_1/P_2)$

SO $W_{12} = (101.3 \times 10^3 \frac{N}{m^2})(2 m^3) \ln(101.3/500)$

$W_{12} = -323 \times 10^3 Nm = -323 KJ$ (WORK INPUT)

SINCE $T_2 = T_1$, $U_2 - U_1 = 0$

$Q_{12} = W_{12}$!

$Q_{12} = -323 KJ$ (TRANSFERRED AWAY)