∴ thus, work done by shaft is

$$W_{shaft} = F\Delta h = (1334\,N)(0.816\,m)\times 10^{-3}$$
$$\cong 1.088\ kJ$$

$$\boxed{W_{shaft} = 1.09\ kJ}$$

(b) work done by atmosphere being displaced is

$$W_{atm} = P_{atm} A_{net} \Delta h$$

the net area $\equiv A_{net} = \pi\left(\frac{D}{2}\right)^2 - A$

$$= (7.85\times 10^{-3} - 0.08\times 10^{-3})\,m^2$$
$$= 7.774\times 10^{-3}\,m^2$$

$$\therefore W_{atm} = (1\times 10^5\,Pa)(7.774\times 10^{-3}\,m^2)(0.8155\,m)$$
$$\cong 634.4\ J$$

$$\boxed{W_{atm} = 0.634\ kJ}$$

(c) $\dot{Q} = \Delta U + W + \Delta PE = \Delta U + (W_{shaft} + W_{atm}) + \Delta PE$

$$= 0.1\,kJ + (1.09\,kJ + 0.634\,kJ) + 0.2\,kJ$$
$$= 2.024\ kJ$$

$$\boxed{\dot{Q} = 2.02\ kJ}$$