

Problem 2.56

Each line of the following table gives data for a process of a closed system. Each entry has the same energy units. Determine the missing entries.

Process	Q	W	E_1	E_2	ΔE
a	+50		-20		+70
b		+20		+50	+30
c		-60	+40	+60	
d	-40		+50		0
e	+50	+150		-80	

Process	Q	W	E_1	E_2	ΔE
a	+50	-20	-20	+50	+70
b	+50	+20	+20	+50	+30
c	-40	-60	+40	+60	+20
d	-90	-90	+50	+50	0
e	+50	+150	+20	-80	-100

} $\Delta E = Q - W$

Process a:

$$W = Q - \Delta E = +50 - (+70) = -20 \quad \leftarrow$$

$$\Delta E = E_2 - E_1$$

$$E_2 = \Delta E + E_1 = +70 + (-20) = +50 \quad \leftarrow$$

Process b:

$$Q = \Delta E + W = +30 + (+20) = +50 \quad \leftarrow$$

$$\Delta E = E_2 - E_1$$

$$E_1 = E_2 - \Delta E = +50 - (+30) = +20 \quad \leftarrow$$

Process c:

$$\Delta E = E_2 - E_1 = +60 - (+40) = +20 \quad \leftarrow$$

$$Q = \Delta E + W = +20 + (-60) = -40 \quad \leftarrow$$

Process d:

$$W = Q - \Delta E = (-90) - 0 = -90 \quad \leftarrow$$

$$\Delta E = E_2 - E_1$$

$$E_2 = \Delta E + E_1 = 0 + 50 = +50 \quad \leftarrow$$

Process e:

$$\Delta E = Q - W = +50 - (+150) = -100 \quad \leftarrow$$

$$E_1 = E_2 - \Delta E = (-80) - (-100) = +20 \quad \leftarrow$$