

## Answers to Selected Problems: Chapter 4

### 4.1

2.

$$W = -80.47 \text{ kJ}$$

3.

(a)

$$\Delta U = 20 \text{ J}$$

(b)

$$Q = +100 \text{ J}$$

(c)

$$Q = -10 \text{ J}$$

(d)

$$\text{A-D: } Q = -10 \text{ J, D-B: } Q = 80 \text{ J}$$

4.

$$\Delta u = -281.14 \text{ kJ/kg}$$

5.

(b)

$$W = 20.8 \text{ kJ}$$

(c)

$$Q_{23} = -89.7 \text{ kJ}$$

### 4.2

2.

$$\text{(a) } 307, \text{ (b) } 140, \text{ (c) } 67, \text{ (d) } 0$$

3.

(a)

$$w = 2100 \text{ kJ / kg}$$

(b)

$$\Delta s = 6.062 \text{ kJ / (kg K)}$$

(c)

$$w = -162.14 \text{ kJ / kg}$$

(d)

$$q = 2262.14 \text{ kJ / kg}$$

(e)

$$\Delta s^{(r)} = 6.062 \text{ kJ / (kg K)}, \quad \Delta s^{(i)} = 0$$

4.

$$\text{Path (1): } \Delta S = 2R \ln 2, \quad Q = 172.7R$$

$$\text{Path (2): } \Delta S = 2R \ln 2, \quad Q = -81.8R$$