PHYS 2311 Ch. 19 HW

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MisConcQ 1.

7. D
10. D
11. D
12. B
13. B

Problem 1.

$$Q = mc\Delta T$$

$$6800 = (3.0)(1.000)(T_f - 10)$$

$$T_f = \frac{6800}{(3.0)(4186)} + 10 = \boxed{10.5\,^\circ\text{C}}$$

Problem 6.

$$Q = mc\Delta T$$

$$32\,000\,000 = m(4186)(42 - 12)$$

$$\frac{32\,000\,000}{(4186)(30)} = m = \boxed{254.8\,\text{kg/h}}$$

Problem 8.

Mass of 18 L of water is 18 kg.

$$m = 18\,\text{kg}, \quad \Delta T = 80\,^\circ\text{C}$$

$$Q = mc\Delta T$$

$$Q = (18)(4186)(80) = \boxed{6.03\,\text{MJ}}$$

Problem 9.

$$Q = mc\Delta T$$

$$165\,000 = (4.1)c(37.2 - 18.0)$$
$$c = \frac{165\,000}{(4.1)(19.2)} = \boxed{2096\,\text{J/kg°C}}$$

Problem 20.

$$L_V = 210\,\text{kJ/kg}, Q = 3.40 \times 10^5\,\text{J}$$
$$Q = mL_V$$
$$3.40 \times 10^5\,\text{J} = m(210\,\text{kJ/kg})$$
$$m = \frac{3.40 \times 10^5\,\text{J}}{210\,000\,\text{J/kg}} = \boxed{1.62\,\text{kg}}$$

Problem 21.

Silver is solid at 25 °C.

$$m = 26.50\,\text{kg}, L_F = 88\,\text{kJ/kg} = 88\,000\,\text{J/kg}, \quad \Delta T = (961 - 25) = 936\,\text{°C}, \quad c = 230\,\text{J/kg°C}$$
$$Q = mc\Delta T + mL_F = (26.50)(230)(936) + (26.50)(88000) = \boxed{8.0\,\text{MJ}}$$

Problem 32.

Isothermal means:

$$\Delta E_{\text{int}} = 0, \quad Q = W_{\text{by}}$$

(a)

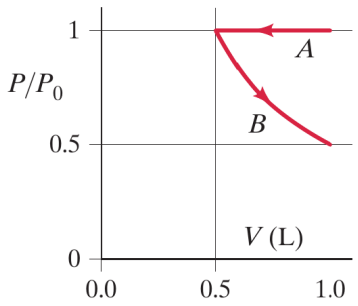
$$\boxed{\Delta E_{\text{int}} = 0}$$

(b)

$$Q = W_{\text{by}} = \boxed{4.3\,\text{kJ}}$$

Problem 33.

(Generated using TikZ)



Problem 35.

Isobaric means:

$$Q = \Delta E_{\text{int}} + W = \Delta E_{\text{int}} + P\Delta V$$

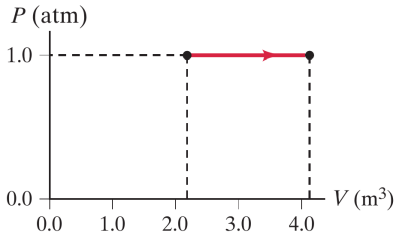
(a)

$$W = P\Delta V = (101325)(4.1 - 2.2) = \boxed{193\,\text{kJ}}$$

(b)

$$\Delta E_{\text{int}} = Q - P\Delta V = 680\,000 - (101325)(4.1 - 2.2) = \boxed{487\,\text{kJ}}$$

(c) (Generated using TikZ)



Problem 36.

Isovolumetric means:

$$W = 0, \quad Q = \Delta E_{\text{int}}$$

Given:

$$Q = 425\,\text{kJ}$$

(a)

$$\boxed{W = 0}$$

(b)

$$\Delta E_{\text{int}} = Q = \boxed{425\,\text{kJ}}$$

Problem 40.

Isothermal means:

$$\Delta E_{\text{int}} = 0, Q = W_{\text{by}}$$

Given:

$$n = 3.20\,\text{mol}, \quad T = 295\,\text{K}, \quad V_1 = 3.50\,\text{m}^3, \quad V_2 = 7.00\,\text{m}^3$$

(a)

$$W = nRT\ln(\frac{V_2}{V_1}) = (3.20)(8.314)(295)\ln(\frac{7.00}{3.50}) = \boxed{5440\,\text{J}}$$

(b)

$$Q = W = \boxed{5440\,\text{J}}$$

(c)

$$\boxed{\Delta E_{\text{int}} = 0}$$

Problem 49.

Given:

$$n = 5.40\,\text{mol}, \quad T = 2450\,\text{K}$$

For a fully excited diatomic gas:

$$C_V = \frac{7}{2}R$$

$$E_{\text{int}} = \frac{7}{2}nRT = \frac{7}{2}(5.40)(8.314)(2450) = \boxed{385\,\text{kcal}}$$