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PHYS 212X, Ataur R. Chowdhury
HW 1: Ch. 18; CQ: 8,12; Problems: 29,37,38,48,50,56,58,66

Chapter 18

Con. Questions

8. a.

Given the ideal gas law of $PV = nRT$, as the volume decreases, the pressure will increase but the temperature will remain the same. Given that the vapor is at -0.01°C and the pressure is so miniscule, the gas will eventually turn into ice and as the pressure increases, it will turn into water as it passes the melting point.

b.

If the temperature starts at 0.02°C, then the vapor will never turn to ice; it will condense into water directly as the pressure passes the condensation line.

12.

Their C line is linear, yet isothermal processes occur as a multiplicative function of pressure and volume. The C line should be curved outwards from the inside of the triangle.

Problems

29. a.

When placed in a mixture of water and ice, the pressure will change from 1 atm to $\frac{273.15}{373.15}$ atm, or 0.73 atm.

b.

Dry ice is 194.7K, thus the pressure would decrease to $\frac{194.7}{373.15}$ atm or 0.52 atm.

37. a.

This process is isothermic.

b.

$$T = 101{,}350(0.0004)(0.020)(8.3145) = 5.056^\circ K$$
$$5.056 - 273.15 = \boxed{-268.09^\circ K}$$

c.

$$V = \frac{0.020(8.3145)(5.056)}{304{,}050} = \frac{0.1106}{3} = \boxed{0.0000028 m^3}$$

38. a.

$$PV = nRT$$
$$P = 101{,}350Pa \quad V = 0.0001m^3 \quad n = 0.0050 \quad R = 8.3145$$
$$T = \frac{10.135}{0.0050 \cdot 8.3145} = \boxed{243.79^\circ K}$$

b.

$$T = 2926^\circ K \quad V = 0.0003m^3 \quad n = 0.0050 \quad R = 8.3145$$
$$P = \frac{0.0050(8.3145)(2926)}{0.0003} = \boxed{405{,}470.45\ Pa}$$

c.

$$P = 202{,}700 \quad T = 2438^\circ K \quad n = 0.0050 \quad R = 8.3145$$
$$\frac{0.0050(8.3145)(2438)}{202{,}700} = \boxed{0.000025\ m^3}$$

48.

$$PV = nRT$$
$$101{,}350V = \frac{10{,}000}{23}(8.3145)(273.15)$$
$$V = \frac{434.78(2{,}271.11)}{101{,}350} = 9.74m^3$$
$$\sqrt[3]{9.74} = \boxed{2.135m}$$

50. I stared at this for 30 minutes. I have no idea where I'm even supposed to start. 1 atmosphere? 3 meters? A rubber room? They make me crazy.

56.

58.

66.