ESCI 341 – Atmospheric Thermodynamics
Answers to Selected Exercises for Lesson 9

3. a. 6240 J of heat are supplied to 2 moles of helium (He, molecular weight 4 g/mol) at constant volume. The initial temperature and pressure are 15°C and 1000 mb. What are the final temperature and pressure?

Answer: T = 539K, p = 1870 mb

b. The helium is now allowed to expand isothermally to twice its initial volume. What is the new pressure?

Answer: p = 935 mb

c. What is the total change in entropy and specific entropy for the helium?

Answer: $\Delta S = 27.1\ \text{J K}^{-1}$; $\Delta s = 3390\ \text{J kg}^{-1}\ \text{K}^{-1}$

4. a. 100 grams of helium (He) is mixed with 100 grams of nitrogen (N_2, molecular weight 28 g/mol) at a pressure of 1000 mb and temperature of 20°C. What is the entropy of mixing?

Answer: $\Delta S = 89.5\ \text{J K}^{-1}$