

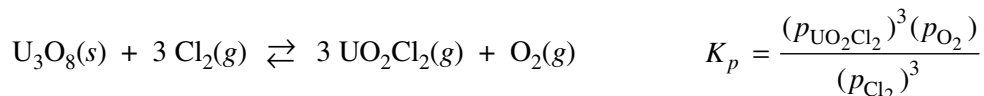
2007 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS (Form B)**CHEMISTRY****Section II****(Total time—95 minutes)****Part A****Time—55 minutes****YOU MAY USE YOUR CALCULATOR FOR PART A.**

CLEARLY SHOW THE METHOD USED AND THE STEPS INVOLVED IN ARRIVING AT YOUR ANSWERS. It is to your advantage to do this, since you may obtain partial credit if you do and you will receive little or no credit if you do not. Attention should be paid to significant figures.

Be sure to write all your answers to the questions on the lined pages following each question in the goldenrod booklet. Do NOT write your answers on the lavender insert.

Answer Questions 1, 2, and 3. The Section II score weighting for each question is 20 percent.

1. A sample of solid U_3O_8 is placed in a rigid 1.500 L flask. Chlorine gas, $\text{Cl}_2(\text{g})$, is added, and the flask is heated to 862°C . The equation for the reaction that takes place and the equilibrium-constant expression for the reaction are given below.



When the system is at equilibrium, the partial pressure of $\text{Cl}_2(\text{g})$ is 1.007 atm and the partial pressure of $\text{UO}_2\text{Cl}_2(\text{g})$ is 9.734×10^{-4} atm.

- (a) Calculate the partial pressure of $\text{O}_2(\text{g})$ at equilibrium at 862°C .
- (b) Calculate the value of the equilibrium constant, K_p , for the system at 862°C .
- (c) Calculate the Gibbs free-energy change, ΔG° , for the reaction at 862°C .
- (d) State whether the entropy change, ΔS° , for the reaction at 862°C is positive, negative, or zero. Justify your answer.
- (e) State whether the enthalpy change, ΔH° , for the reaction at 862°C is positive, negative, or zero. Justify your answer.
- (f) After a certain period of time, 1.000 mol of $\text{O}_2(\text{g})$ is added to the mixture in the flask. Does the mass of $\text{U}_3\text{O}_8(\text{s})$ in the flask increase, decrease, or remain the same? Justify your answer.