

2004 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS (Form B)

CHEMISTRY

Section II

(Total time—90 minutes)

Part A

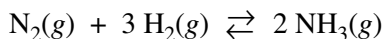
Time—40 minutes

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 booklet with the goldenrod cover. Do NOT write your answers on the lavender insert.

Answer Question 1 below. The Section II score weighting for this question is 20 percent.



1. For the reaction represented above, the value of the equilibrium constant, K_p , is 3.1×10^{-4} at 700. K.

(a) Write the expression for the equilibrium constant, K_p , for the reaction.

(b) Assume that the initial partial pressures of the gases are as follows:

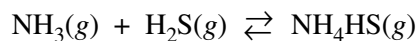
$$p_{\text{N}_2} = 0.411 \text{ atm}, p_{\text{H}_2} = 0.903 \text{ atm}, \text{ and } p_{\text{NH}_3} = 0.224 \text{ atm}.$$

(i) Calculate the value of the reaction quotient, Q , at these initial conditions.

(ii) Predict the direction in which the reaction will proceed at 700. K if the initial partial pressures are those given above. Justify your answer.

(c) Calculate the value of the equilibrium constant, K_c , given that the value of K_p for the reaction at 700. K is 3.1×10^{-4} .

(d) The value of K_p for the reaction represented below is 8.3×10^{-3} at 700. K.



Calculate the value of K_p at 700. K for each of the reactions represented below.

