

2004 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS

CHEMISTRY

Section II

(Total time—90 minutes)

Part A

Time—40 minutes

YOU MAY USE YOUR CALCULATOR FOR PART A.

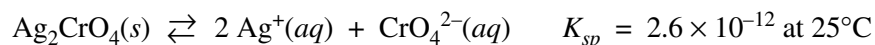
CLEARLY SHOW THE METHOD USED AND THE STEPS INVOLVED IN ARRIVING AT YOUR ANSWERS. It is to your advantage to do this, since you may obtain partial credit if you do and you will receive little or no credit if you do not. Attention should be paid to significant figures.

Be sure to write all your answers to the questions on the lined pages following each question in the booklet with the pink cover. Do NOT write your answers on the green insert.

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

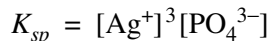
1. Answer the following questions relating to the solubilities of two silver compounds, Ag_2CrO_4 and Ag_3PO_4 .

Silver chromate dissociates in water according to the equation shown below.



- (a) Write the equilibrium-constant expression for the dissolving of $\text{Ag}_2\text{CrO}_4(s)$.
- (b) Calculate the concentration, in mol L^{-1} , of $\text{Ag}^+(aq)$ in a saturated solution of Ag_2CrO_4 at 25°C .
- (c) Calculate the maximum mass, in grams, of Ag_2CrO_4 that can dissolve in 100. mL of water at 25°C .
- (d) A 0.100 mol sample of solid AgNO_3 is added to a 1.00 L saturated solution of Ag_2CrO_4 . Assuming no volume change, does $[\text{CrO}_4^{2-}]$ increase, decrease, or remain the same? Justify your answer.

In a saturated solution of Ag_3PO_4 at 25°C , the concentration of $\text{Ag}^+(aq)$ is $5.3 \times 10^{-5} \text{ M}$. The equilibrium-constant expression for the dissolving of $\text{Ag}_3\text{PO}_4(s)$ in water is shown below.



- (e) Write the balanced equation for the dissolving of Ag_3PO_4 in water.
- (f) Calculate the value of K_{sp} for Ag_3PO_4 at 25°C .
- (g) A 1.00 L sample of saturated Ag_3PO_4 solution is allowed to evaporate at 25°C to a final volume of 500. mL. What is $[\text{Ag}^+]$ in the solution? Justify your answer.