1 B, 1

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 STEPS INVOLVED IN ARRIVING AT YOUR ANSWERS. It is to your advantage to do this, because you may earn 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 this booklet.

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

$$2\, H_2S(g) \rightleftarrows 2\, H_2(g) + S_2(g)$$

1. When heated, hydrogen sulfide gas decomposes according to the equation above. A 3.40 g sample of $H_2S(g)$ is introduced into an evacuated rigid 1.25 L container. The sealed container is heated to 483 K, and 3.72×10^{-2} mol of $S_2(g)$ is present at equilibrium.

   (a) Write the expression for the equilibrium constant, K_c, for the decomposition reaction represented above.

   (b) Calculate the equilibrium concentration, in mol L^{-1}, of the following gases in the container at 483 K.

   (i) $H_2(g)$

   (ii) $H_2S(g)$

   (c) Calculate the value of the equilibrium constant, K_c, for the decomposition reaction at 483 K.

   (d) Calculate the partial pressure of $S_2(g)$ in the container at equilibrium at 483 K.

   (e) For the reaction $H_2(g) + \frac{1}{2} S_2(g) \rightleftarrows H_2S(g)$ at 483 K, calculate the value of the equilibrium constant, K_c.

a. $K_c = \frac{[H_2]^2[S_2]}{[H_2S]^2}$

b. i $H_2(g)$

3.72×10^{-2} mol S_2 · $\frac{2H_2}{1S_2}$ = 7.44×10^{-2} mols

Concentration = 7.44×10^{-2} mols / 1.25 L

= .0595 mol L^{-1}

= 5.95×10^{-2} mol L^{-1}

ii H_2S 3.40 g

molar mass of H_2S = 34.0 g/mol

moles = 3.40 g / 34.0 g/mol

= .100 moles H_2S

Concentration = .100 moles / 1.25 L

= .080 mol L^{-1}

GO ON TO THE NEXT PAGE.