Chemistry 192
Quiz Number 2
Spring 2018
Solution

R =8.3144 J mol^{-1} K^{-1}

R=0.0821 L atm mol^{-1} K^{-1}

R=0.08314 L bar mol^{-1} K^{-1}

$N_A = 6.022 \times 10^{23}$ molecules mol^{-1}

$T = t + 273.15$

Name:

At 400.K and a total pressure of 2.00 bar, the degree of dissociation of gas-phase sulfur hexafluoride into solid sulfur and gas-phase fluorine

$$\mathrm{SF}_{6(g)} \rightleftharpoons \mathrm{S}_{(s)} + 3\mathrm{F}_{2(g)}$$

is $\alpha = 0.229$. If a mixture of gas-phase SF_6 and F_2 are placed in a container of fixed volume at 400.K such that the pressure of each gas is 0.400 bar, predict whether the reaction proceeds to the right or left under these conditions.

Answer:

	n_{SF_6}	n_{F_2}
initial	n	0
change	-αn	$3\alpha n$
equilibrium	$(1-\alpha)n$	$3\alpha n$

$$n_{tot} = n(1+2\alpha)$$

$$K_P = \frac{P_{F_2}^3}{P_{SF_6}} = \frac{\left(\frac{3\alpha}{1+2\alpha}P\right)^3}{\left(\frac{1-\alpha}{1+2\alpha}P\right)}$$

$$= \frac{27\alpha^3}{(1+2\alpha)^2(1-\alpha)}P^2 = 0.791$$

$$Q_P = \frac{(0.400)^3}{0.400} = 0.160$$

$$Q_P < K_P$$

so reaction goes to the right.

Name:

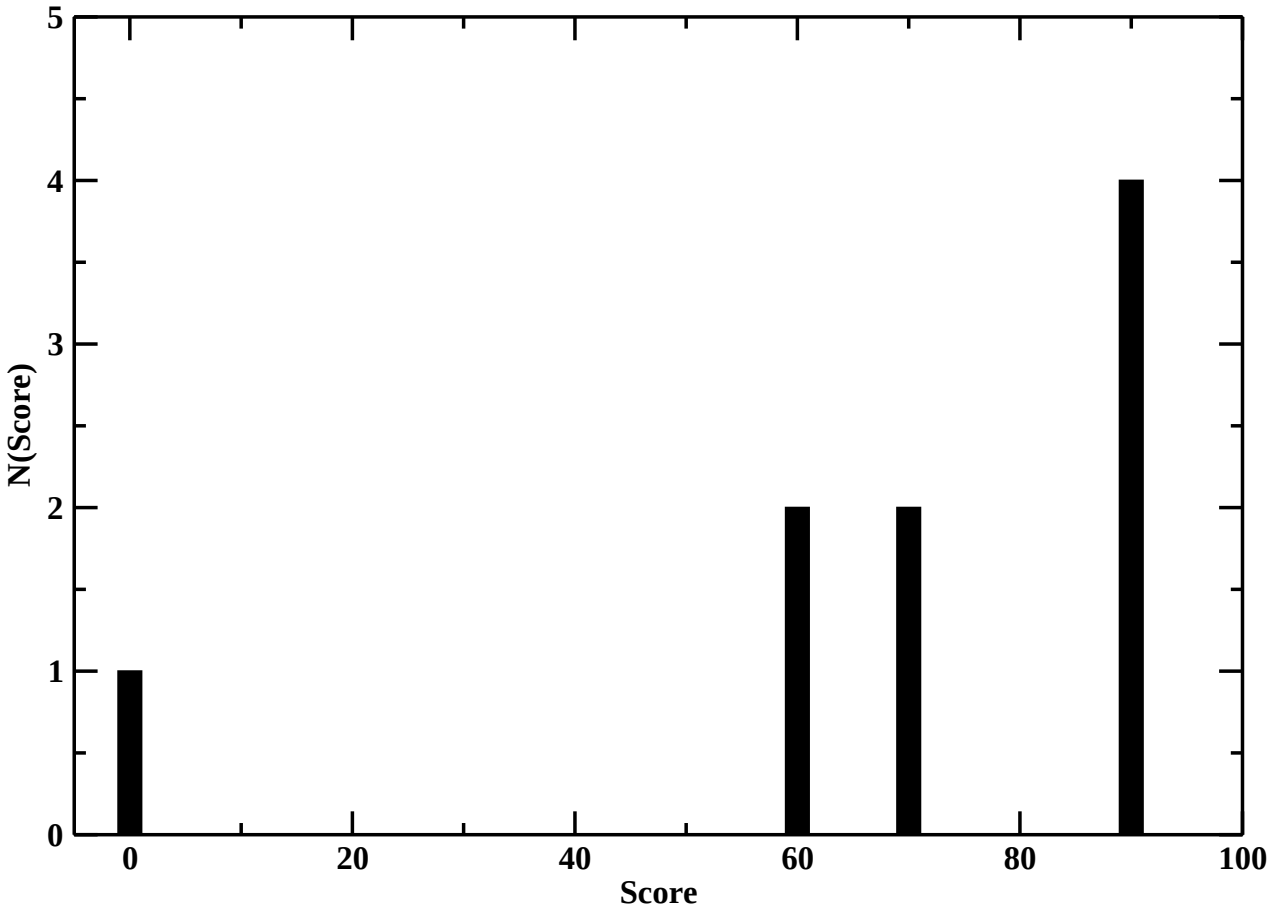

Figure 1: **High = 97, Median = 76, Mean = 73**