

Problem 1

(a): Since $[SO_2] = [Cl_2] = 0$; $Q = 0$ and this reaction proceeds towards products.

(b): $2.75 = \frac{[SO_2][Cl_2]}{[SO_2Cl_2]}$

SO_2Cl_2	SO_2	Cl_2
2.15	0	0
-2x	+x	+x
2.15-2x	x	x

$$6.26 - 11.83x = x^2$$

$$2.15 \cdot (2.91 - 5.5x) = x^2$$

$$\frac{-5.5 \pm \sqrt{5.5^2 - 4 \cdot 1 \cdot -2.91}}{2} = 0.486$$

$$0 = x^2 + 11.83x - 6.26$$

$$\frac{-11.83 \pm \sqrt{11.83^2 - 4 \cdot 1 \cdot -6.26}}{2}$$

Let's try doing this the ~~write~~ right way

$$\frac{x^2}{2.15 - x} \left(\frac{1}{RT} \right) = 2.75$$

$$\frac{x^2}{2.15 - x} \left(\frac{1}{30.58} \right) = 2.75$$

$$x^2 = 2.75 \cdot 2.15 - 2.75x$$

$$x^2 + 2.75x - 5.91 = 0$$

$$x = \frac{-2.75 \pm \sqrt{2.75^2 - 4 \cdot 1 \cdot -5.91}}{2} = 1.42$$

2.15	0	0
2.15-x	x	x
0.73	1.42	1.42

Problem 2

(a) $[H_2]$ increases

(b) $[CO]$ increases

(c) $[H_2]$ decreases

(d) $[CO]$ ~~increases~~ does not change since $[C]$ is solid

Problem 3

(a) I increases

(b) D decreases

(c) does not change

(d) I increases

Problem 4

Start by writing

$$\log\left(\frac{54}{794}\right) = \frac{-4H^{\circ}}{R} \left(\frac{1}{200} - \frac{1}{298} \right) \Rightarrow \Delta H^{\circ} < 0$$

Thus, yes.