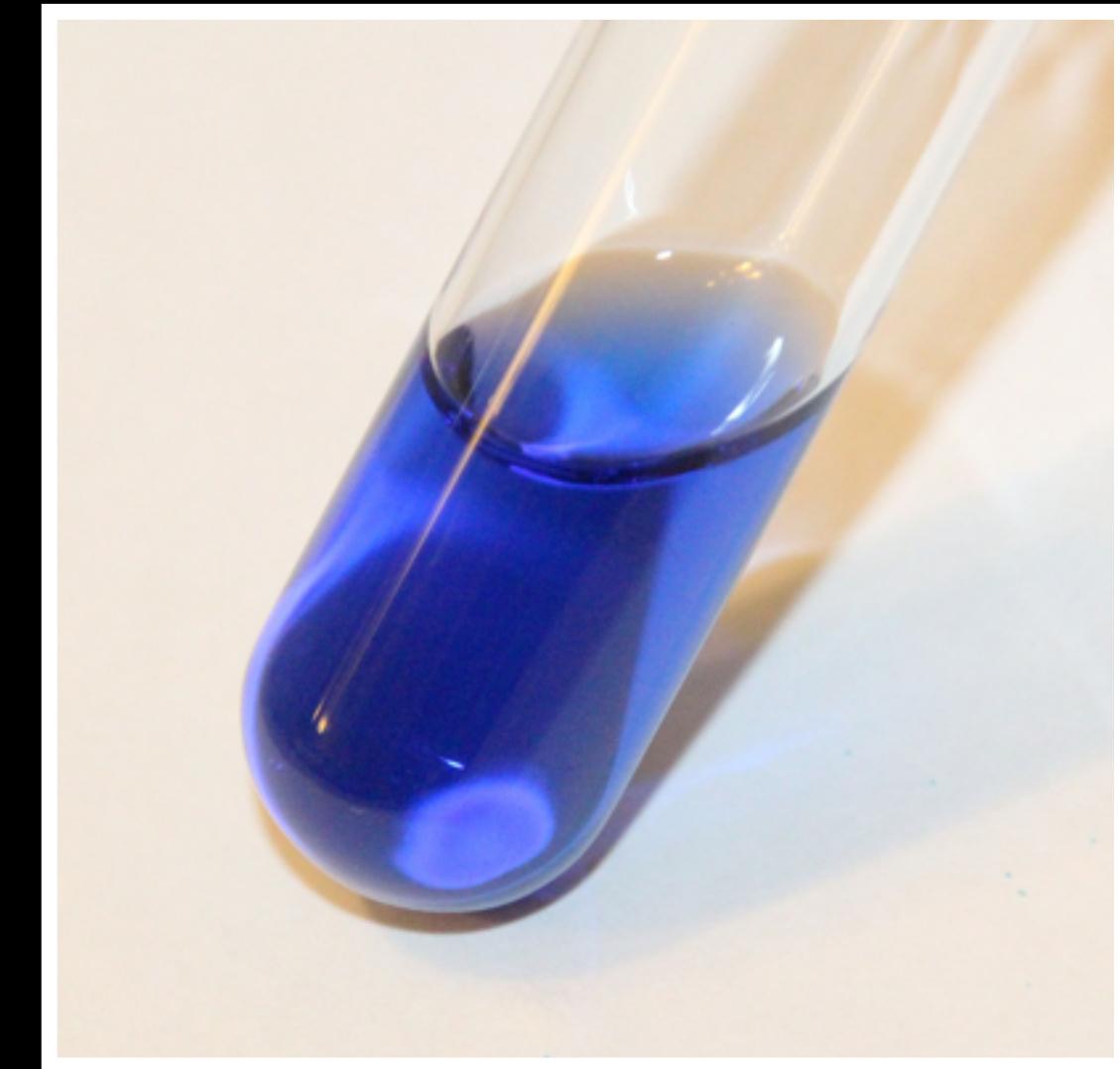
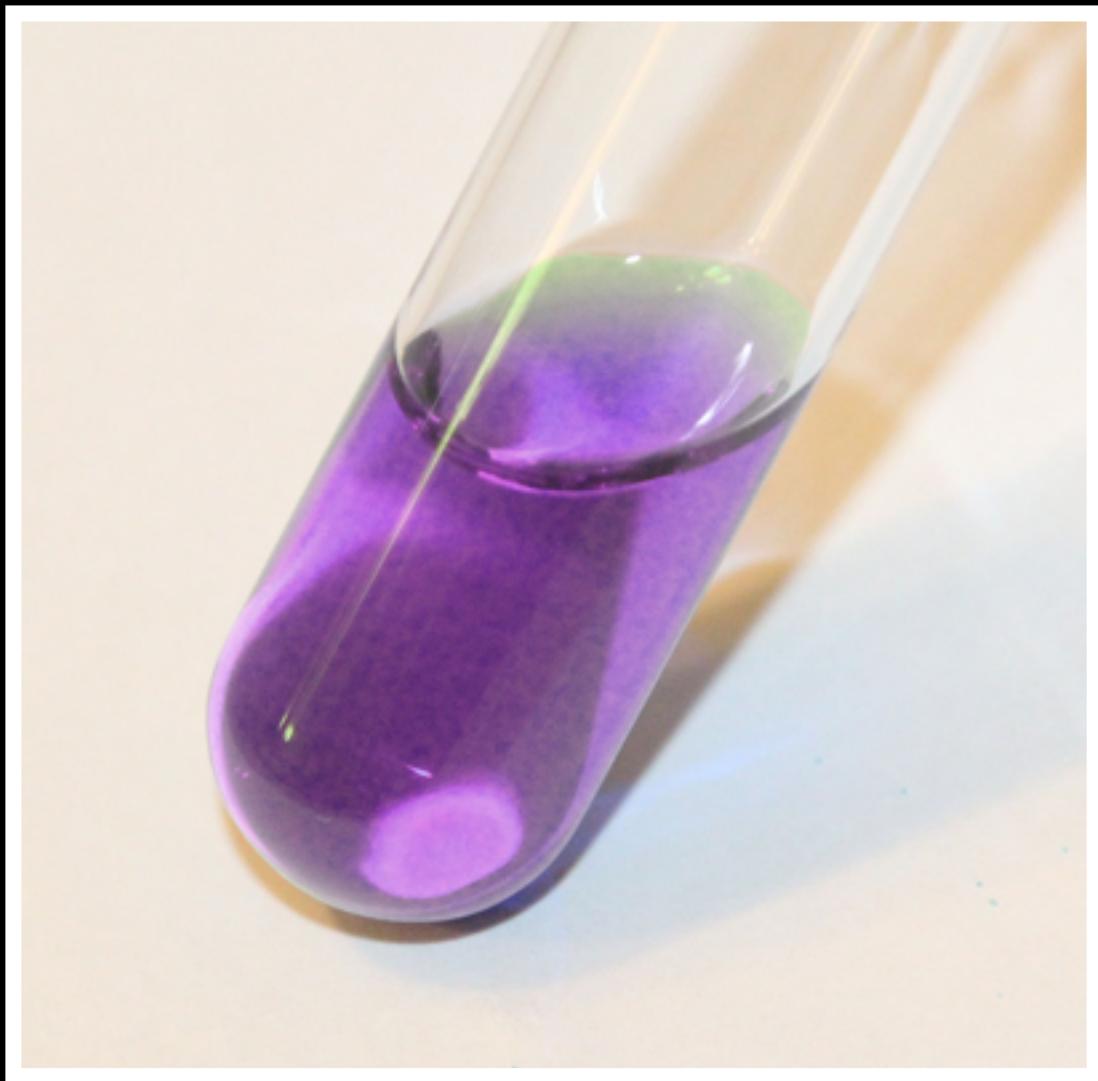


Equilibrium Disturbances



Chemistry Essentials - 067

Reversible Reaction

Reactants

Products

Time

Equilibrium

Equilibrium Constant

$$K = \frac{[\text{Products}]}{[\text{Reactants}]}$$

Disturbance

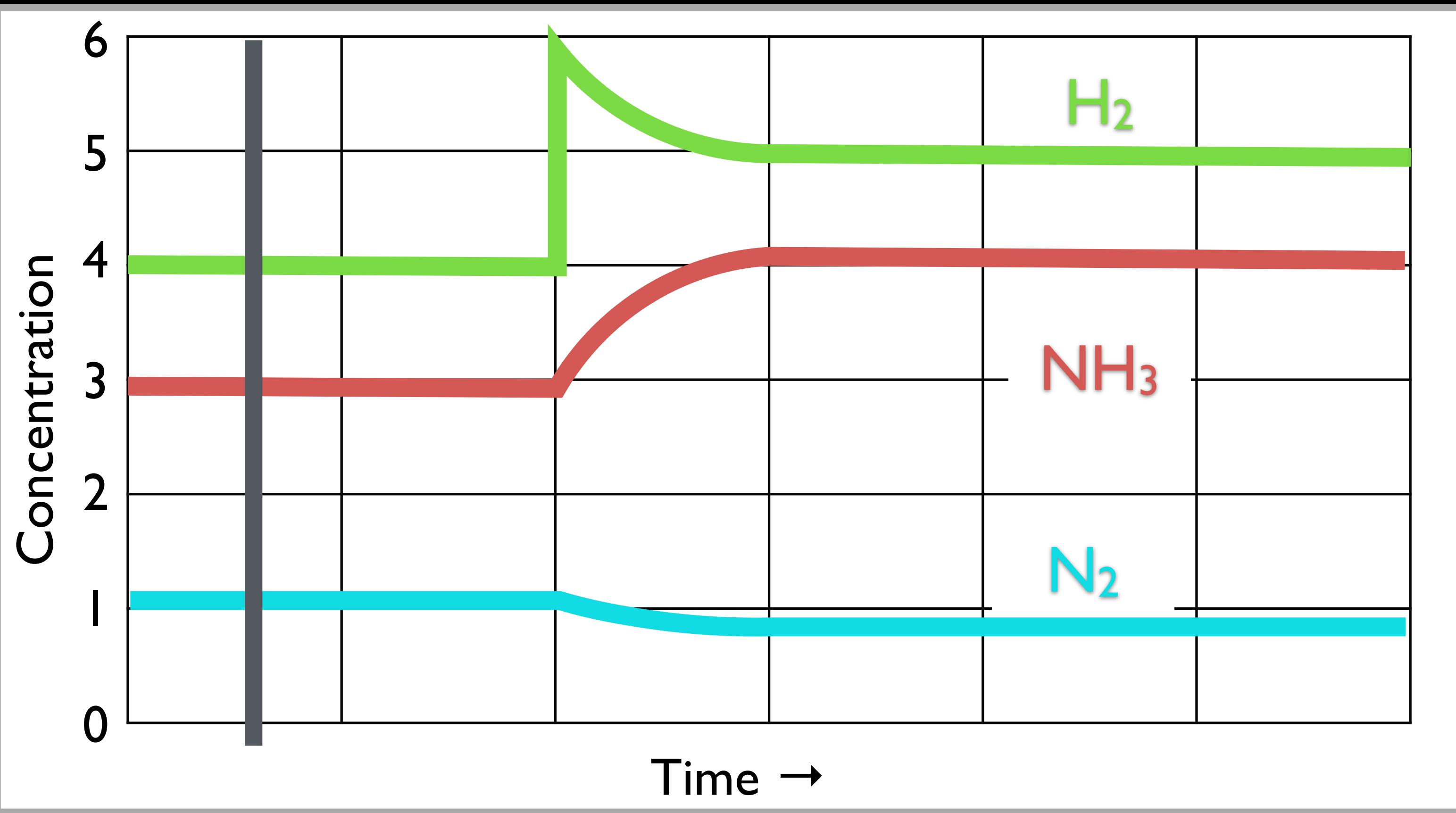
Concentration

$$K = \frac{[NH_3]^2}{[N_2][H_2]^3}$$

$$K = \frac{(3)^2}{(1)(4)^3}$$

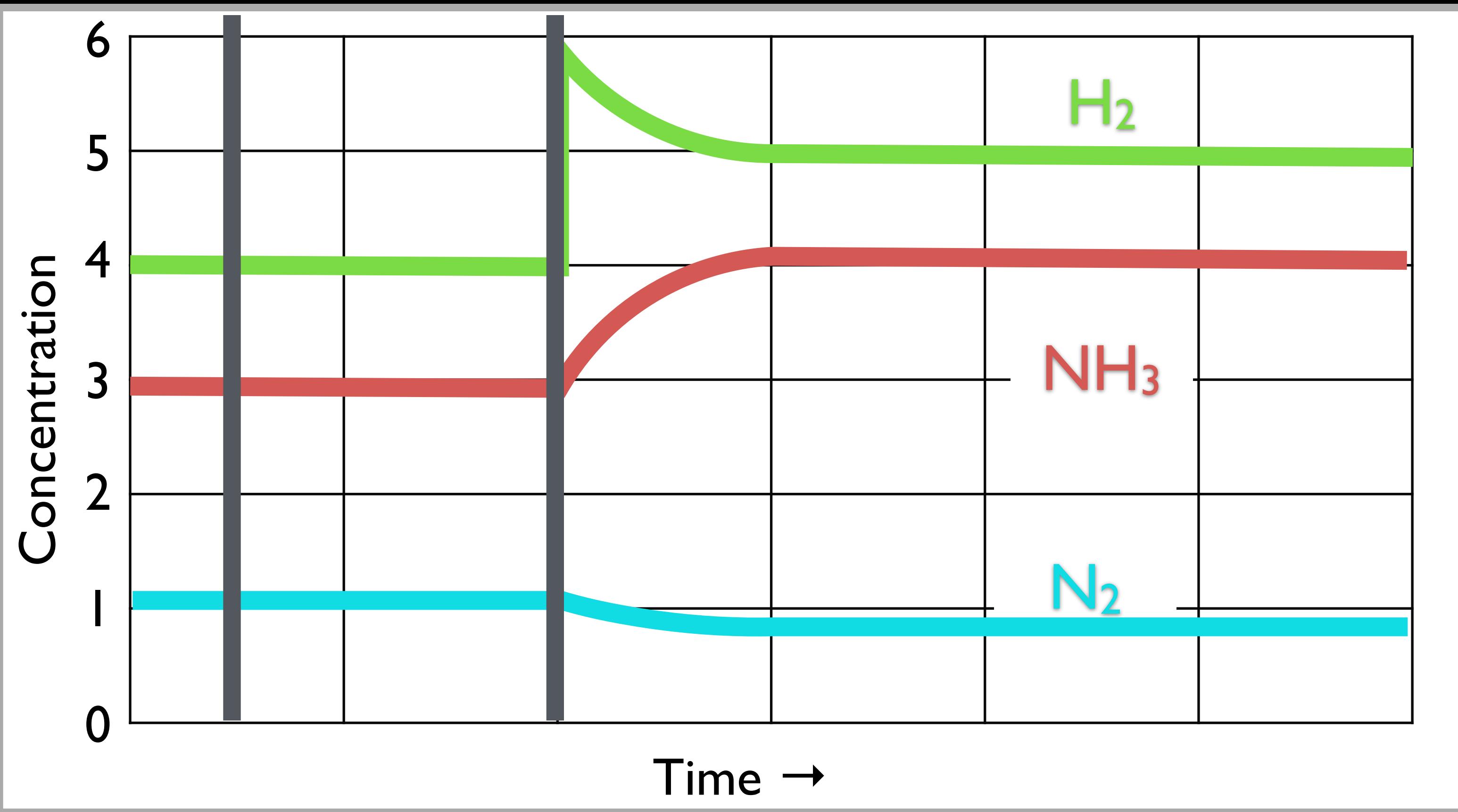
$$K = \frac{9}{64}$$

$$K = .14$$



Concentration

.14



$$Q = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3}$$

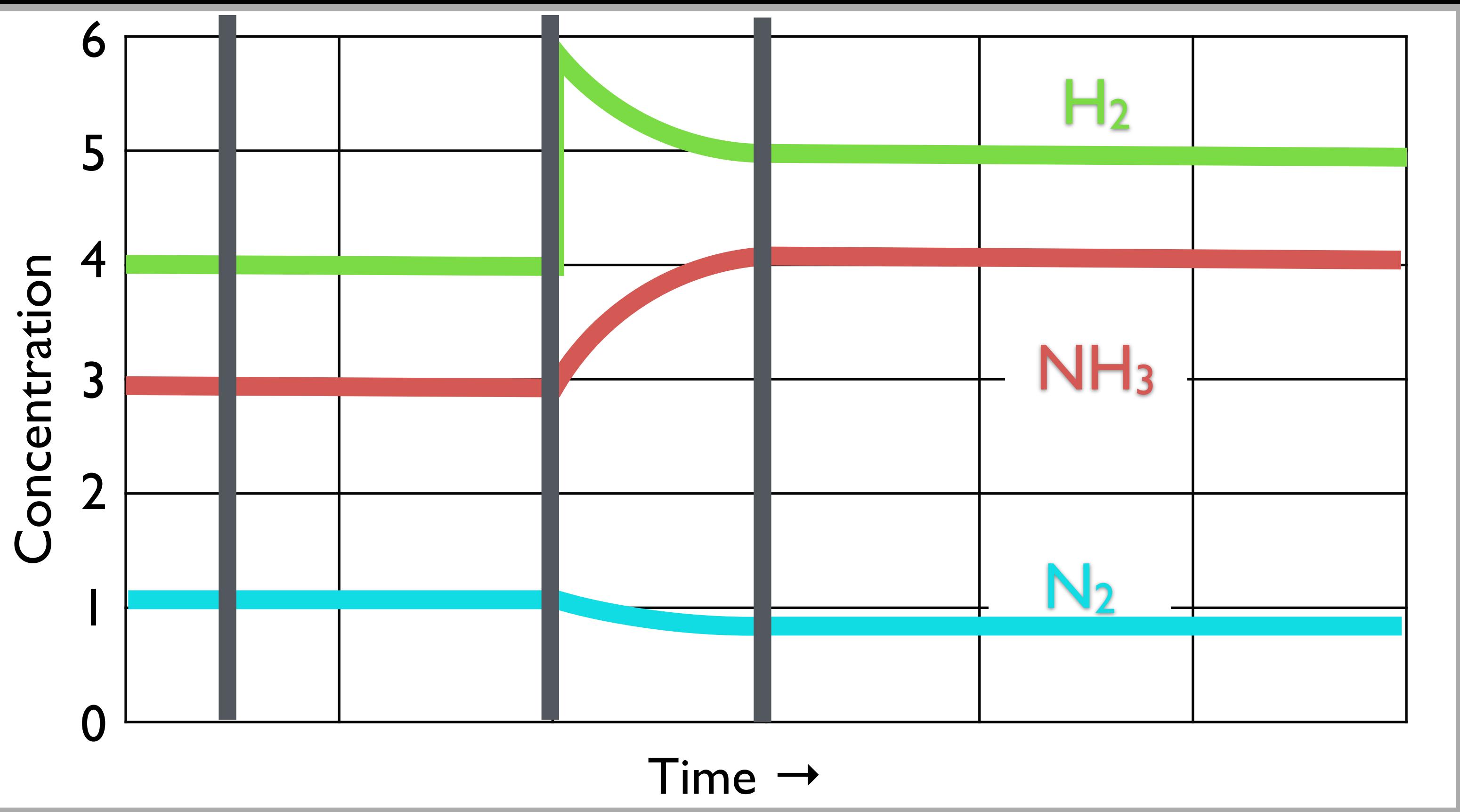
$$Q = \frac{3^2}{(1)(6)^3}$$

$$Q = \frac{9}{216}$$

$$Q = .042$$

Concentration

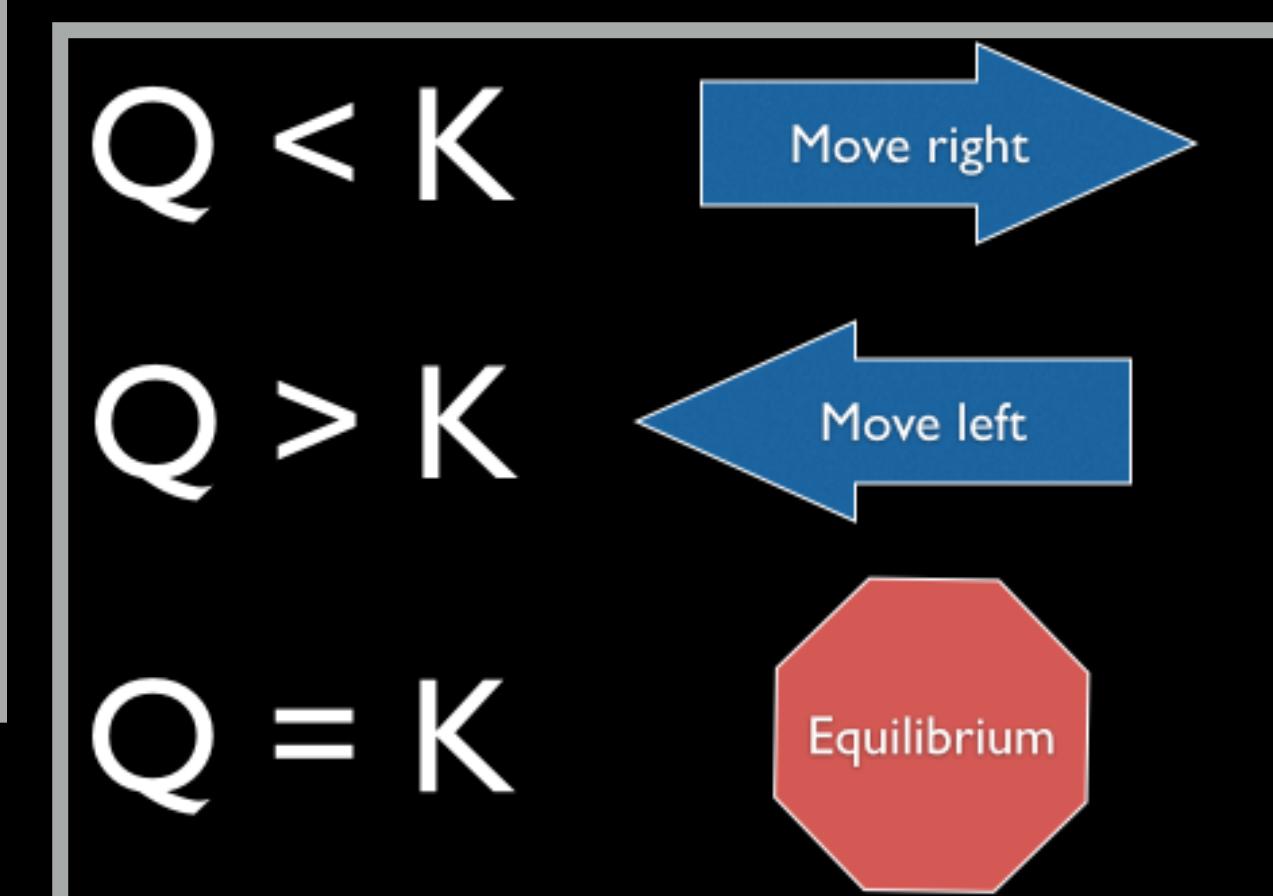
.14 .042 .14



$$K = \frac{[NH_3]^2}{[N_2][H_2]^3}$$

$$K = \frac{(4)^2}{(.9)(5)^3}$$

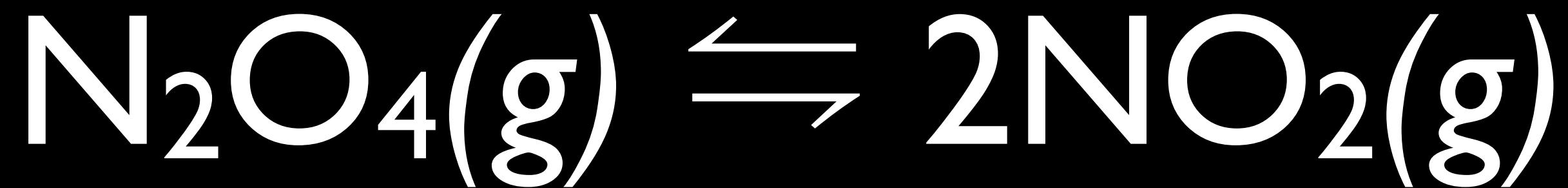
$$K = .14$$



Temperature

$$K = \frac{[\text{products}]}{[\text{reactants}]}$$

$$\Delta H = 57.2 \text{ kJ/mol}$$



(colorless)

(reddish brown)

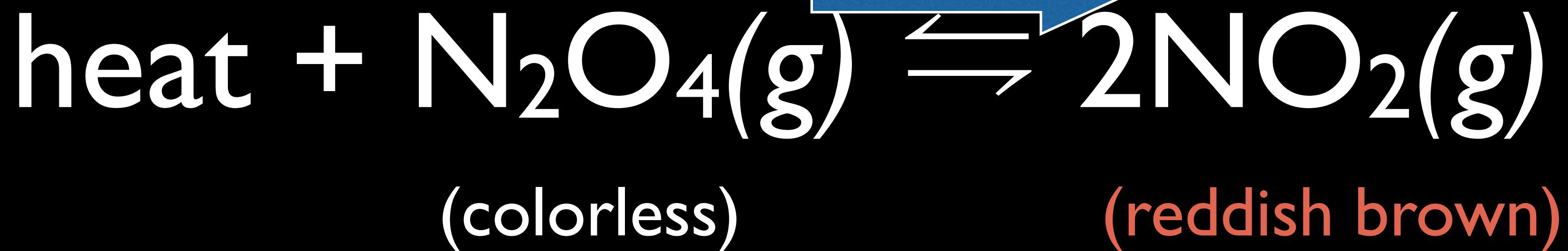
Temperature

$$K = \frac{[\text{products}]}{[\text{reactants}]}$$



Temp

Move right



Temperature


$$K = \frac{[\text{products}]}{[\text{reactants}]}$$



$$\text{heat} + \text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$$

(colorless) (reddish brown)

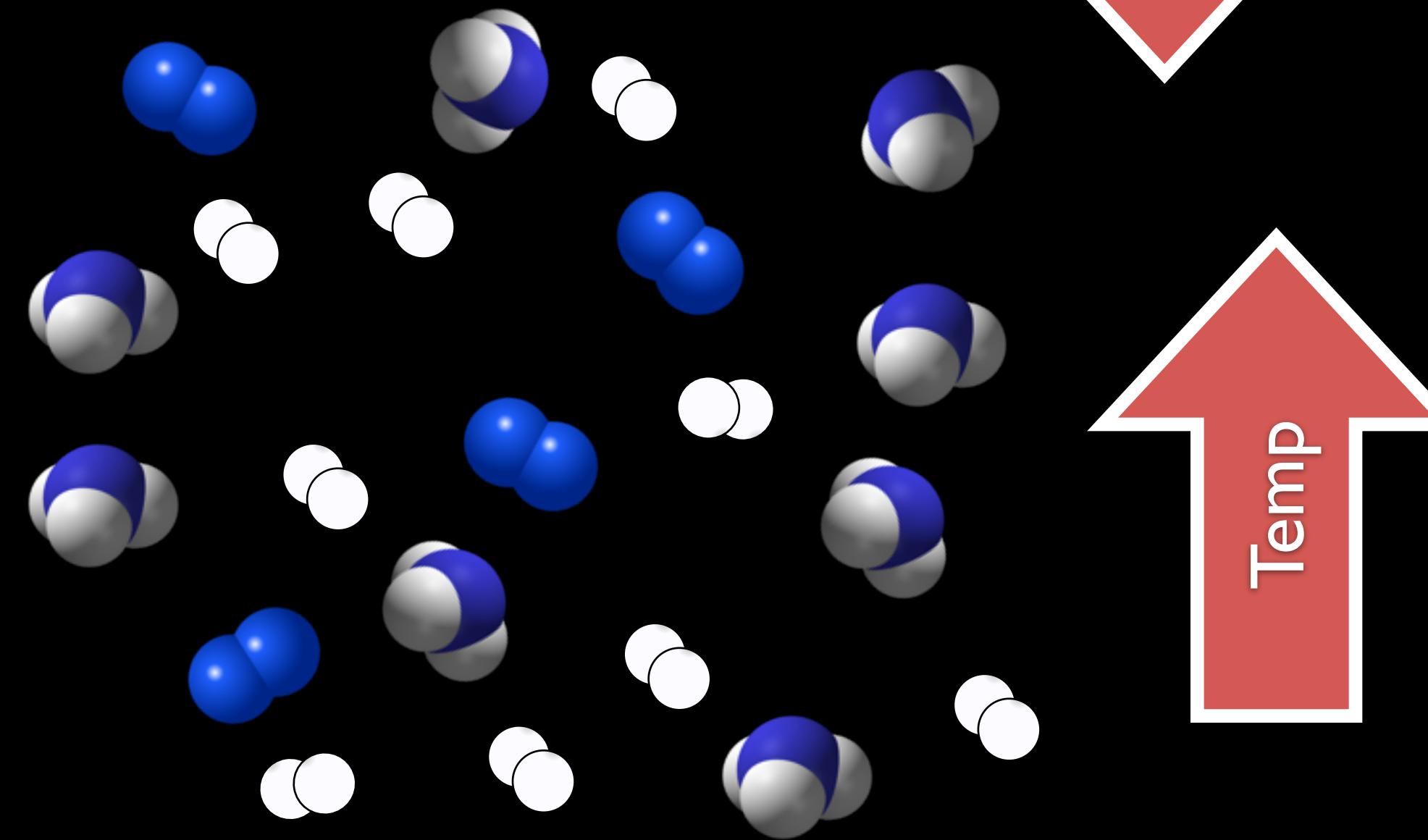
Temp

Move left

Temperature

$$K = \frac{[\text{products}]}{[\text{reactants}]}$$

Temperature (°C)	Equilibrium constant
300	4.34×10
400	1.64×10
450	4.51×10
500	1.45×10
550	5.38×10
600	2.25×10



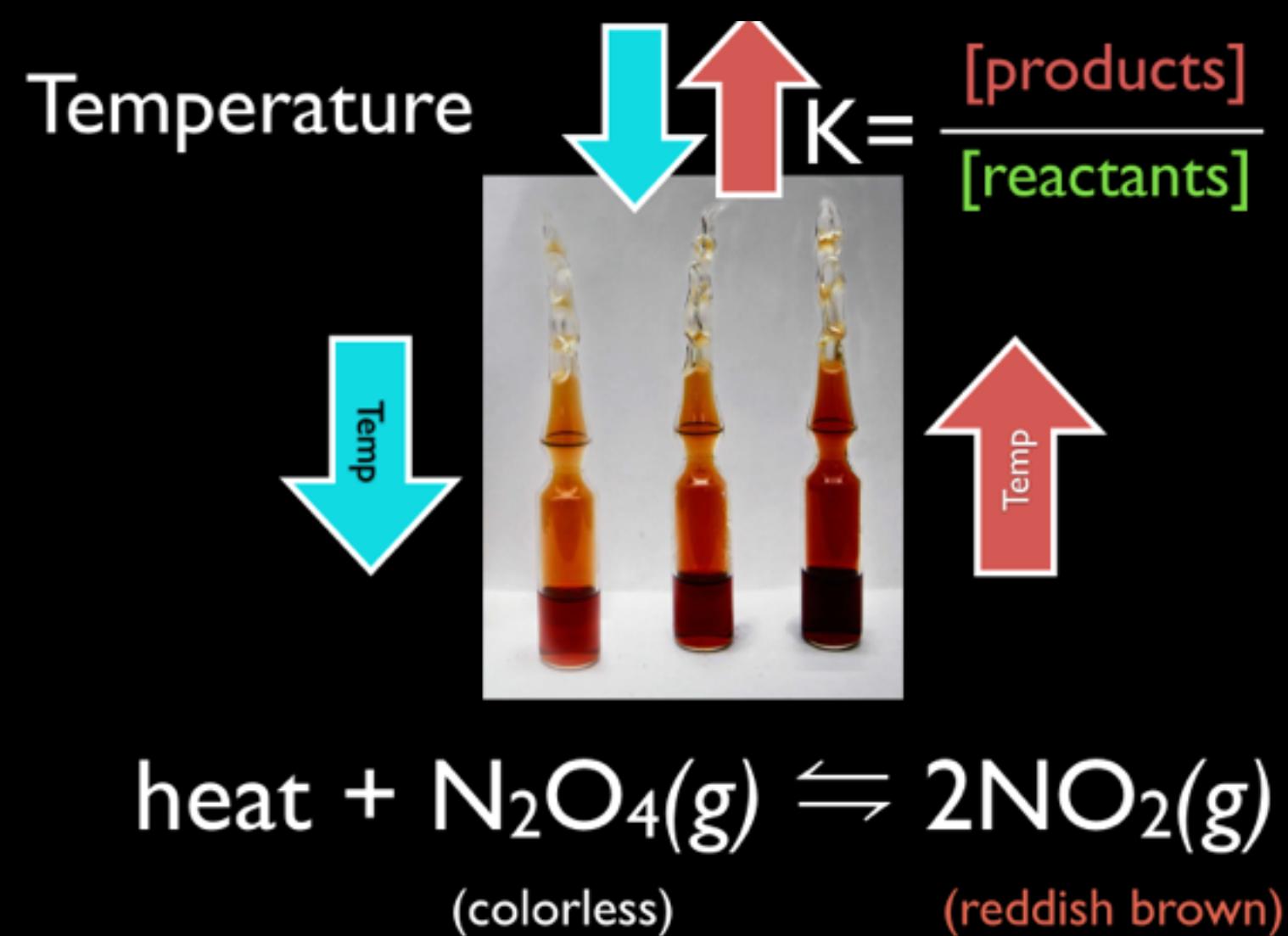
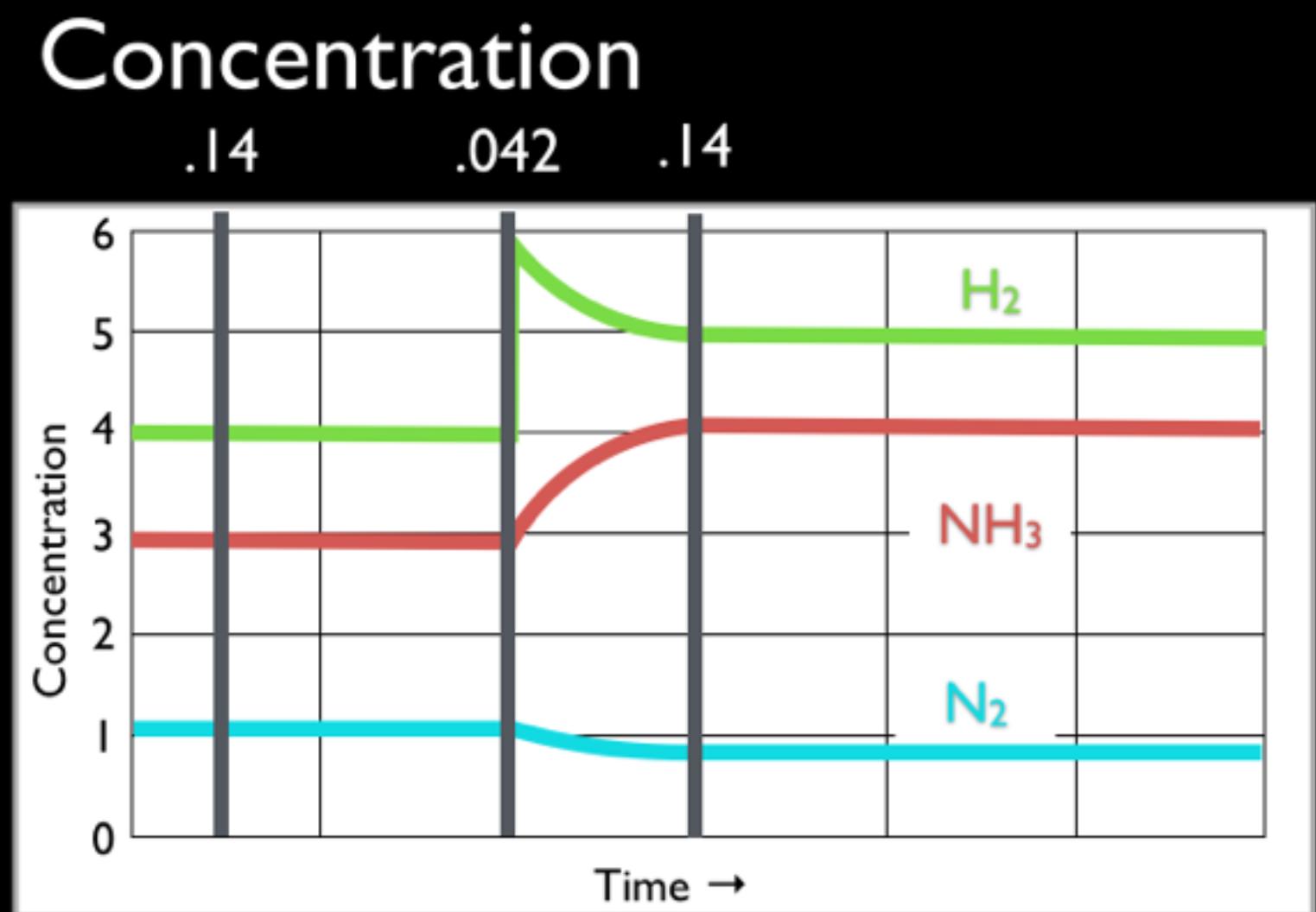
Temp

$$\Delta H = -92 \text{ kJ/mol}$$

Move left



Did you learn?



To connect LeChatelier's principle to the comparison of Q to K by explaining the effects of the stress on Q and K .

Acknowledgements

Eframgoldberg. English: An Overlay of the Same 99.9% Pure NO₂/N₂O₄ Sealed in an Ampoule. From Left to Right -196C, 0C, 23C, 35C, 50C, July 16, 2013. Own work. http://commons.wikimedia.org/wiki/File:Nitrogen_dioxide_at_different_temperatures.jpg. “File:Ammonia-3D-vdW.png,” January 3, 2014. <http://en.wikipedia.org/wiki/File:Ammonia-3D-vdW.png>. “File:Tetrachlorocobaltate Aqueous Ion.jpg,” January 3, 2014. http://en.wikipedia.org/wiki/File:Tetrachlorocobaltate_aqueous_ion.jpg. yinch. English: SVG Version of Nitrogen Molecule., November 25, 2010. Produced in Inkscape. <http://commons.wikimedia.org/wiki/File:Nitrogen2.svg>.



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