Questions 2-5 concern the equilibrium \( A + B \leftrightarrow C \), which is studied spectrophotometrically at 550 nm, where only \( A \) absorbs light. A 1.000-cm path length cuvette is used. The stock solution of \( A \) at a concentration of 0.0227 M gives an absorbance of 1.229. 3.00 mL of this solution is mixed with 1.00 mL of 0.0319 M \( B \), and this mixture gives an absorbance of 0.714 at 550 nm.

2. (3) Calculate (a) the transmittance associated with the first absorbance measurement, and (b) the molar absorptivity of \( A \) at 550 nm.

(a) \( 10^{-A} = 0.0590 \)  
(b) \( \varepsilon = A/c \ell = 54.1 \text{ L mol}^{-1} \text{ cm}^{-1} \)

3. (2) Calculate \([A]\) in the equilibrium mixture.

\[ c = A/\varepsilon \ell = 0.0132 \text{ mol/L} \]

4. (2) Calculate \([B]\) in the equilibrium mixture.

\[ [B]_0 - [B] = [A]_0 - [A] \Rightarrow [B] = 0.0041\text{ mol/L} \]

5. (3) Calculate the equilibrium constant \( K_c \) for this system.

\[ [C] = [A]_0 - [A] = 0.00384 \text{ mol/L} \]
\[ K_c = [C]/([A][B]) = 70.3 \text{ L/mol} \]

6. (3) For a particular reaction, \( K = 8.6 \times 10^{19} \) at 25°C and \( K = 1.09 \times 10^{15} \) at 125°C. If the first of these \( K \) values is uncertain by 3.5% and the second by 5.3%, what is the uncertainty in the natural logarithm of their ratio?

If \( r = \text{ratio} \), then its percent uncertainty is \( (3.5^2 + 5.3^2)^{1/2} \% = 6.35 \% \).

If \( z = \ln r \), then \( s_z = s_r/r = 0.0635 \) (0.06).