

Question #83073, Chemistry / General Chemistry | for completion

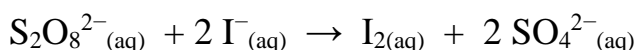
Expt. [S₂O₈²⁻ raised to 2-] [I⁻ raised to negative] Initial Rate

1. 0.036 0.060 1.5 × 10 raised to negative 5
2. 0.072 0.060 2.9 × 10 raised to negative 5
3. 0.036 0.0120 2.9 × 10 raised to negative 5

S₂O₈²⁻ (aq) + 3I⁻ (aq) yields 2SO₄²⁻ (aq) + I₃⁻ (aq)

- A. Determine the order of the reactions and write each reactant. Write the rate law for the above reaction.
- B. Calculate the rate constant, k, and give its appropriate units.
- C. Calculate reaction rate when each reactant concentration is 0.20 M.

Answer:



- A. Determine the order of the reactions and write each reactant. Write the rate law for the above reaction.

The order of the reactions 3, because for S₂O₈²⁻ = 1 and for I⁻ = 2, therefore 1+2=3.

Rate law for the reaction:

$$\text{rate} = k[\text{S}_2\text{O}_8^{2-}] \times [\text{I}^-]^2$$

- B. Calculate the rate constant, k, and give its appropriate units.

$$\text{rate} = k[\text{S}_2\text{O}_8^{2-}] \times [\text{I}^-]^2$$

$$k = \text{rate} / [\text{S}_2\text{O}_8^{2-}] \times [\text{I}^-]^2 = 1,5 \times 10^{-5} / 0,036 \times 0,060^2 = 1,5 \times 10^{-5} / 0,0001296 = 0,1157$$

For order three, the rate constant has units of L²·mol⁻²·s⁻¹ (or M⁻²·s⁻¹)

- C. Calculate reaction rate when each reactant concentration is 0.20 M.

$$\text{rate} = k[\text{S}_2\text{O}_8^{2-}] \times [\text{I}^-]^2 = 0,1157 \times 0,2 \times 0,2^2 = 0,0009256$$