Chemistry 236 -- Quiz 2
September 10, 2003 — Kinetics: Inversion of Sucrose

Pledge and signature:

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1. (3)   The specific rotation for galactose ($M = 180.2$ g mol^{-1}) at the wavelength of the sodium D line is +83.9° mL g^{-1} dm^{-1}. A solution of galactose is prepared by dissolving 1.802 g of galactose in water and bringing the volume to 0.100 L in a volumetric flask. Calculate the optical rotation expected at $_D$ for this solution in a 1.00-foot polarimetry cell. (1 foot   30.48 cm).

   a. 1.512°   b. 4.61°   c. 8.39°   d. 46.1°   e. none of these

2. (3) An acid-calalyzed reaction has a rate constant of 0.0234 L mol^{-1} min^{-1}. A reaction is initiated by mixing 5.00 mL of 6.0 M HCl with 20.0 mL of a solution of the other reactant. Assuming that volumes are additive, calculate the effective rate constant for this mixture.

   a. 0.028 min^{-1} b. 0.035 min^{-1} c. 0.140 min^{-1}
   d. This cannot be determined without additional information.   e. none of these

3. (3)   A first-order reaction is monitored by its optical rotation, which is found to be 25.0° initially and 5.0° after the reaction has gone to completion. What is its rotation after two half-lives?

   a. 20.0°   b. 15.0°   c. 10.0°   d. 7.5°   e. none of these

4. (3) The reaction described in the previous problem is found to be acid catalyzed, with a rate constant of 0.051 L mol^{-1} min^{-1}. The reaction is started by mixing 25.0 mL of 6.0 M HCl with 50.0 mL of the reactant and gives an initial reading of 25.0°. Assuming, as usual, additive volumes, calculate the optical rotation after 15.0 min.

   a. 4.3°   b. 6.5°   c. 8.6°
   d. This cannot be determined without additional information.   e. none of these