Chemistry 236 -- Quiz 3

Lab Day ____

October 20, 2010 — Experiments 1 and 2

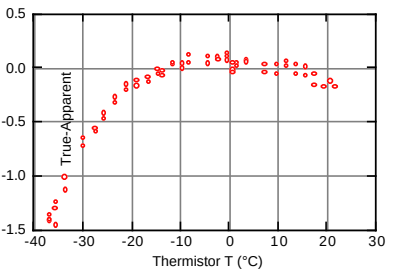
Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

A. (10) Calibration.

1. (2) It is generally satisfactory to correct Hg manometer and barometer readings by taking into account just the dependence on the Hg thermal expansivity α. If $\alpha = 6.0\times10^{-5}\ \mathrm{K}^{-1}$, what is the pressure difference in Torr when a manometer shows a difference of 306.2 mm Hg at t = 23°C?

2. (2) Calibration data for a thermistor are as shown in the accompanying graph. If the true temperature is –30.0°C, what does the thermistor read?



3. (6) A thermistor has a resistance of 13.27 kΩ at 10.0°C and 1.557 kΩ at 50.0°C. The resistance is measured to be 8.93 kΩ when the thermistor is immersed in a bath of unknown T. What is the apparent temperature of the bath?

B. (16) Smucrose^{-1}.

1. **(4) Getting Started.** Polarimetry is used to study the inversion process for a newly discovered sugar, smucrose. Initially a 20.0-cm polarimeter tube is charged with a solution of smucrose and HCl(*aq*) prepared by mixing 15.0 mL of a stock smucrose solution with 25.0 mL of 4.0 M HCl. At the start of the inversion reaction, the measured rotation of the polarimeter is 10.4°, and after a very long time, the rotation is measured to be –15.2°. The specific rotation $[\alpha]_{\lambda}^{T}$ for smucrose is 36.4 degree dm^{-1} mL g^{-1} at the temperature and wavelength used in the experiment. Calculate the initial concentrations in the polarimeter tube, of **(1)** smucrose, and **(2)** HCl. [Assume volumes are additive.]

2. **(6) Inverting.** The reaction is found to reach the inversion point after 33 min. Calculate **(1)** the effective rate constant k_{eff} and **(2)** the rate constant k_{H}.

3. **(6) Getting Warmer.** The rate constant is found to increase by a factor of 2.55(9) when the temperature is increased from 20.0°C to 40.0°C. Calculate the activation energy E_a and its uncertainty. [R = 8.3145 J mol^{-1} K^{-1}].