

Chemistry 236 -- Quiz 5
October 8, 2003 — Thermal Expansivity

Pledge and signature:

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

1. (3) Suppose a substance obeys the equation of state, $PV = cnT^2$, where c is a constant, and the other quantities have their usual meaning. What is the thermal expansivity for this substance?
a. $2cnT$ b. $2cnT/P$ c. $1/T$ d. $2/T^2$ e. none of these

2. (3) The thermal expansivity for a particular fluid is $\alpha = 0.0013 \text{ K}^{-1}$ at 40°C . By what percent does the density of this fluid change when it is heated from 39°C to 41°C ?
a. 0.0013% b. -0.0013% c. 0.26% d. -0.26% e. none of these
f. This cannot be determined without additional information.

3. (3) A flask of known volume 100.000 mL is used to determine the density of an unknown liquid by weighing on an analytical balance. If the fluid has a true density of 0.75000 g/mL, what will be its apparent density if buoyancy of air is neglected. [Assume that air has a molar mass of 29 g/mol and that the measurements are carried out at 22°C and 750 torr. Also, neglect any buoyancy effects on the brass weights in the balance. $R = 0.082058 \text{ L atm mol}^{-1} \text{ K}^{-1}$.]
a. 0.63184 g/mL b. 0.74882 g/mL c. 0.75118 g/mL d. 0.86816 g/mL e. none of these

4. (3) A dilatometer has a volume of 30.0 mL and is equipped with a capillary extension having a diameter of 1.00 mm. An unknown liquid is heated from 29.50°C to 30.50° , whereupon the level of the liquid in the capillary rises from 0.0 to 34.6 mm. Calculate the thermal expansivity of the liquid at 30.0°C .
a. $9.1 \times 10^{-4} \text{ K}^{-1}$ b. 0.00362 K^{-1} c. 0.0272 K^{-1} d. 0.0362 K^{-1} e. none of these