

SOLUTION

NAME: _____

This is a closed book, no calculator quiz. An unsigned honors pledge will result in a zero.

1. The equation for the speed of sound c is:

$$c = \sqrt{-k v^2 \left(\frac{\partial p}{\partial v} \right)_T} \quad (1)$$

Develop an equation for the speed of sound of an ideal gas. Express your equation in simplest possible form.

GIVEN: Equation for c FIND: Equation for c for an ideal gasASSUMPTIONS:ANALYSIS:

$$c = \sqrt{-k v^2 \left(\frac{\partial p}{\partial v} \right)_T}$$

$$p v = RT \quad \left(v = \frac{RT}{p} \right)$$

$$p = \frac{RT}{v} \quad \left(\left(\frac{\partial p}{\partial v} \right)_T = -\frac{RT}{v^2} \right)$$

$$c = \sqrt{-k \frac{R^2 T^2}{p^2} \left(\frac{-RT}{v^2} \right)}$$

$$c = \sqrt{k \frac{R^3 T^3}{p^2 v^2}} = \sqrt{k \frac{R^3 T^3}{p^2} \left(\frac{p^2}{R^2 T^2} \right)}$$

$$c = \sqrt{k R T}$$

ANS.

I HAVE NEITHER PROVIDED OR RECEIVED HELP DURING THIS QUIZ.

SIGNATURE