Test Questions - Exam III (Part 2).

1. State the Conservation Laws of Energy (mechanical), Linear momentum and Angular momentum in your own words and illustrate your answers with examples.

2. Show that near Earth when you rise in height from y to $(y+\Delta y)$ the pressure in a fluid in equilibrium varies as

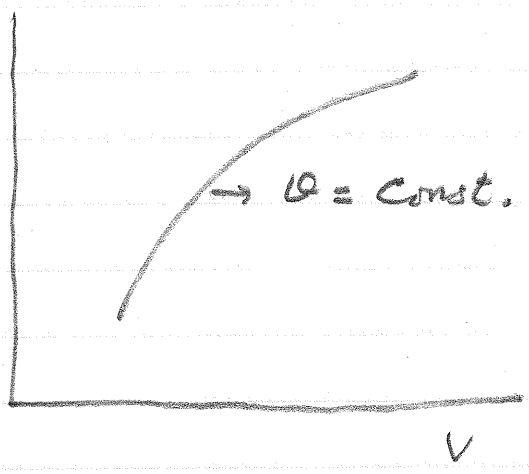
$$\Delta P = -\rho g \Delta y.$$

3. Ladies often wear high narrow heels. Calculate the pressure at the bottom of a [1cm x 1cm] heel of a lady whose mass is 50kg.

4. What is temperature? [Use two thermodynamic systems separated by a conducting wall to support your answer].

5. A 100 cm^3 beaker of Aluminum ($\alpha = 23 \times 10^{-6} C^{-1}$) is filled to the brim with water ($\beta = 210 \times 10^{-6} C^{-1}$) at 15C. Next, it is warmed to a temperature of 90C. How much water, if any, will overflow in this experiment.

6. What is wrong with the diagram showing Pressure vs Volume in an ideal gas →



7. When a gas particle of mass m and initial velocity $v\hat{x}$ bounces off a vertical wall in a totally elastic collision. What is the change in i) the momentum and ii) the kinetic Energy of the wall? Why?

8. Why does a gas exert pressure on the walls of its container? Explain.

9. A stationary container has 5 mols of He gas at 700 K. What is the average velocity of the He atoms? Why?

10. In a container at 500 K there is a mixture of He ($m_{He} = 4mp$) and Kr ($m_{Kr} = 84mp$) which atoms have the higher kinetic Energy? Why?

11. In Problem 10 which particles have the higher r.m.s. velocity and by what factor? Why?

12. At 27C a gas has a pressure of $10^5 N/m^2$. If you wish to double the pressure while keeping the volume constant what should be the new temperature? Why?

13. At constant temperature, if you double the pressure of a gas what happens to its density? why?

14 What is the difference between specific heat and latent heat?

15. Why does steam at 100C burn more severely than boiling water at 110C.

16 Why is there a minus sign on the right side of the Equation

$$\frac{\Delta Q}{\Delta t} = -kA\frac{\Delta T}{\Delta x}$$

17. What is the mechanical Equivalent of heat? Explain