

## Tutorial 12

### PHY-101

Q1. An ideal diatomic gas, with rotation but no oscillation, undergoes an adiabatic compression.

Its initial pressure and volume are 1.20 atm and  $0.200 \text{ m}^3$ . Its final pressure is 2.40 atm. How much work is done by the gas?

Hint:  $\gamma = C_P/C_V$  For diatomic gas  $C_P = 7R/2$ ;  $C_V = 5R/2$

Q2. A 2.5 mol sample of helium gas (a monoatomic ideal gas) is contained in a 10.0 L vessel at 300K.

- Calculate the pressure of the gas using the Ideal Gas Law.
- Calculate the average kinetic energy of each helium atom.

Find the root mean square (RMS) speed of the helium atoms. (Helium has a molar mass of  $4.00 \text{ g/mol} = 0.004 \text{ kg/mol}$ ).

Q3 . Find the total internal energy of 96 gm of oxygen gas at  $27^\circ\text{C}$ .

Q4. (a) 60 Joule(J) of work is done on a gas and the gas loses 150J of heat to the surrounding. What is the change in internal energy?

(b) A gas starts with 200J of internal energy, while 180J of heat is added to the gas while the gas does 70J of work. What is the final internal energy of the gas?

(c) If 40J of work is done on a gas, the internal energy goes down by 150J. What was the value of heat added to the gas?

Q5. When 1.3KJ of heat is added to a balloon ,its volume increases from  $4 \times 10^6$  to  $4.5 \times 10^6$  under constant pressure of 105 kPa. Calculate change in internal energy.