Worksheet: Kinetic Theory

Maharashtra State Board · Class 11 · Physics · 10 questions · 31 marks

Name: _____	Date: _____	Score: _____ / 31

Q1. 2 moles of an ideal gas are enclosed in a container of volume 0.05 m^3 at 300 K. Find the pressure (R = 8.314 J/mol/K). *[2 marks]*

Q2. Find the rms speed of oxygen molecules at 300 K (molar mass 0.032 kg/mol, R = 8.314 J/mol/K). *[2 marks]*

Q3. Using the law of equipartition of energy, estimate the molar specific heat of a solid element at room temperature. *[2 marks]*

Q4. A gas has number density 3 x 10^25 per m^3, molecular mass 4.65 x 10^-26 kg, and mean square speed 2.66 x 10^5 m^2/s^2. Find its pressure. *[3 marks]*

Q5. Using the law of equipartition of energy, find Cv, Cp, and gamma for a rigid diatomic gas. *[3 marks]*

Q6. Estimate the mean free path of a gas with number density 2.7 x 10^25 per m^3 and molecular diameter 2 x 10^-10 m. *[3 marks]*

Q7. A vessel contains a mixture of 2 mol of oxygen and 3 mol of nitrogen at a total pressure of 5 x 10^5 Pa. Find the partial pressure of each gas. *[3 marks]*

Q8. A gas at pressure 2 x 10^5 Pa, volume 4 L, and temperature 300 K is compressed to 2 L at 350 K. Find the new pressure. *[3 marks]*

Q9. A polyatomic gas molecule has 3 translational, 3 rotational, and 2 active vibrational modes. Find Cv, Cp, and gamma. *[5 marks]*

Q10. Hydrogen (M = 2 u) and oxygen (M = 32 u) are at the same temperature. Find (a) the ratio of their rms speeds, and (b) the temperature at which oxygen's rms speed at that temperature equals hydrogen's rms speed at 300 K. *[5 marks]*