

Model Question Paper 1  
Heat and Thermodynamics 1

11th Standard

Physics

Reg.No. : 

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Answer all the Questions

Time : 00:45:00 Hrs

Total Marks : 40

5 x 1 = 5

Part A

- 1) Avogadro number is the number of molecules in\_\_\_\_\_  
(a) One liter of a gas at NTP (b) One mole of a gas (c) One gram of a gas (d) 1 Kg of a gas
- 2) First law of thermodynamics is a consequence of the conservation of \_\_\_\_\_  
(a) momentum (b) charge (c) mass (d) energy
- 3) At a given temperature, the ratio of the RMS velocity of hydrogen to the RMS velocity of oxygen is \_\_\_\_\_  
(a) 4 (b) 1/4 (c) 16 (d) 8
- 4) The property of the system that does not change during an adiabatic change is \_\_\_\_\_  
(a) temperature (b) volume (c) pressure (d) heat
- 5) For an ant moving on the horizontal surface, the number of degrees of freedom of the ant will be\_\_\_\_\_  
(a) 1 (b) 2 (c) 3 (d) 6

Part B

5 x 2 = 10

- 6) Derive an expression for the average kinetic energy of the molecule of gas.
- 7) Two different gases have exactly the same temperature. Do the molecules have the same RMS speed?
- 8) What are degrees of freedom?
- 9) State the law of equipartition of energy and prove that for a diatomic gas, the ratio of the two specific heats at room temperature is  $\frac{7}{5}$
- 10) A gas has two specific heats, whereas liquid and solid have only one. Why?

Part C

5 x 3 = 15

- 11) A gas is suddenly compressed to 1/2 of its original volume. If the original temperature is 300 K, find the increase in temperature (Assume  $\gamma = 1.5$ )
- 12) A system absorbs 8.4 kJ of heat and at the same time does 500 J of work. Calculate the change in internal energy of the system.
- 13) How many meters can a man weighing 60 kg, climb by using the energy from a slice of bread which produces a useful work of  $4.2 \times 10^5$  J. (Efficiency of human body is 28%)
- 14) The wavelength with maximum energy emitted from a certain star in our galaxy is  $1.449 \times 10^{-5}$  cm. Calculate the temperature of the star.
- 15) The opposite faces of the top of an electric oven are at a difference of temperature of  $100^\circ\text{C}$  and the area of the top surface and its thickness is  $300\text{ cm}^2$  and  $0.2\text{ cm}$  respectively. Find the quantity of heat that will flow through the top surface in one minute. ( $K = 0.2\text{ W m}^{-1}\text{ K}^{-1}$ )

Part D

2 x 5 = 10

- 16) Calculate the kinetic energy of translational motion of a molecule of a diatomic gas at 320K.
- 17) Calculate the RMS velocity of hydrogen molecules at NTP (One mole of hydrogen occupies 22.4 litres at NTP).

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