



Video Solution on Website:-

<https://physicsaholics.com/home/courseDetails/57>

Video Solution on YouTube:-

<https://youtu.be/R21yaok6WpQ>

- Q 1. Calculate the total number of degree of freedom for a mole of diatomic gas at STP  
(a)  $30.10 \times 10^{23}$  (b)  $3.10 \times 10^{23}$   
(c)  $12.24 \times 10^{20}$  (d)  $3.14 \times 10^{17}$
- Q 2. At what temperature, the kinetic energy of a gas molecule is half of the value at  $27^\circ\text{C}$ ?  
(a)  $123^\circ\text{C}$  (b)  $123\text{ K}$  (c)  $-123\text{ K}$  (d)  $-123^\circ\text{C}$
- Q 3. The number of degrees of freedom for a rigid diatomic molecule is  
(a) 3 (b) 5 (c) 6 (d) 7
- Q 4. The energy associated with each degree of freedom of a molecule  
(a)  $\frac{1}{2}RT$  (b)  $\frac{1}{2}kT$  (c)  $\frac{3}{2}RT$  (d)  $\frac{3}{2}kT$
- Q 5. A polyatomic gas with (n) degree of freedom has a mean energy per molecule given by  
(a)  $\frac{n}{2}RT$  (b)  $\frac{1}{2}RT$  (c)  $\frac{n}{2}kT$  (d)  $\frac{1}{2}kT$
- Q 6. The number of degrees of freedom of molecules of argon gas is  
(a) 1 (b) 3 (c) 5 (d) 7
- Q 7. Helium gas is filled in a closed vessel (having negligible thermal expansion coefficient) when it is heated from  $300\text{ K}$  to  $600\text{ K}$ , then average kinetic energy of helium atom will be  
(a)  $\sqrt{2}$  times (b) 2 times (c) unchanged (d) half
- Q 8. The average rotational kinetic energy of hydrogen molecule at a temperature  $T$  is  $E$ . The average translational kinetic energy of helium at same temperature will be:  
(a)  $\frac{2E}{3}$  (b)  $\frac{5E}{3}$  (c)  $E$  (d)  $\frac{3E}{2}$
- Q 9. The average translational energy and the rms speed of molecules in a sample of oxygen gas at  $300\text{ K}$  are  $6.21 \times 10^{-21}\text{ J}$  and  $484\text{ m/s}$  respectively. The corresponding values at  $600\text{ K}$  are nearly (assuming ideal gas behavior)  
(a)  $12.42 \times 10^{-21}\text{ J}$ ,  $928\text{ m/s}$  (b)  $8.78 \times 10^{-21}\text{ J}$ ,  $684\text{ m/s}$   
(c)  $6.21 \times 10^{-21}\text{ J}$ ,  $968\text{ m/s}$  (d)  $12.42 \times 10^{-21}\text{ J}$ ,  $684\text{ m/s}$
- Q 10. One kg of a diatomic gas is at a pressure of  $8 \times 10^4\text{ N/m}^2$ . The density of the gas is  $4\text{ kg/m}^3$ . What is the energy of the gas due to its thermal motion?  
(a)  $5 \times 10^4\text{ J}$  (b)  $6 \times 10^4\text{ J}$  (c)  $7 \times 10^4\text{ J}$  (d)  $4 \times 10^4\text{ J}$



Q 11. The average kinetic energy of  $H_2$  molecules at 300K is  $E$  at the same temperature the average kinetic energy of  $O_2$  molecules is:

(a)  $E$

(b)  $\frac{E}{4}$

(c)  $\frac{E}{16}$

(d)  $16E$

## Answer Key

<b>Q.1 a</b>	<b>Q.2 d</b>	<b>Q.3 b</b>	<b>Q.4 b</b>	<b>Q.5 c</b>
<b>Q.6 b</b>	<b>Q.7 b</b>	<b>Q.8 d</b>	<b>Q.9 d</b>	<b>Q.10 a</b>
<b>Q.11 a</b>				