Physicsaholics

DPP – 2 (KTG)

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Q 1. Four molecules have speeds 2 km/sec, 3 km/sec, 4 km/sec and 5 km/sec. The root mean square speed of these molecules (in km/sec) is:

(a) $\sqrt{\frac{27}{2}}$ (b) $\sqrt{27}$ (c) 3.5 (d) $3\sqrt{3}$

Q 2. At what temperature will the particles in a sample of helium gas have an rms speed of 1 km/s?

(a) 160°C (b) 222 K (c) 160 K (d) 222°C

Q 3. The temperature of a gas is increased from 27°C to such an extent that its rms speed be double the speed at 27°C. The final temperature will be

(a) 927°C (b) 250°C (c) 600°C (d) 1200°C

Q 4. At what temperature is the root mean square speed of an atom in an argon gas cylinder equal to the rms speed of a helium gas atom at −20°C? (atomic mass of Ar = 39.9 u, and of He = 4.0 u)

(a) 2.52×10^3°C (b) $2.52 \times 10^3 K$

(c) $25.2 \times 10^3 K$ (d) 25.2×10^3

Q 5. N (< 100) molecules of a gas have velocities 1, 2, 3,..... N km/s respectively. Then ratio of rms speed and average speed is:

(Given: The sum of squares of the first n natural numbers = $\frac{n(n+1)(2n+1)}{6}$

(a) 1 (b) $\sqrt{\frac{(2N+1)(N+1)}{6N}}$

(c) $\sqrt{\frac{(2N+1)(N+1)}{6}}$ (d) $2\sqrt{\frac{(2N+1)}{6(N+1)}}$

Q 6. Find the ratio of the mean speed of hydrogen molecules to the mean speed of nitrogen molecules in a sample containing a mixture of the two gases

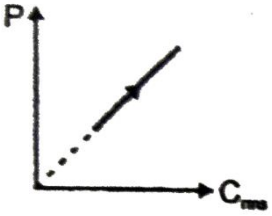
(a) 14 (b) $\sqrt{14}$ (c) $\frac{1}{28}$ (d) $\frac{1}{\sqrt{14}}$

Q 7. The mean speed of the molecules of a hydrogen sample equals the mean speed of the molecules of a helium sample. Calculate the ratio of the temperature of the hydrogen sample to the temperature of the helium sample

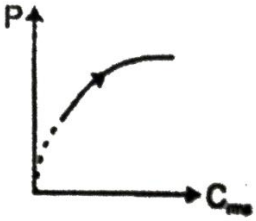
(a) $\frac{1}{2}$ (b) 2 (c) $\frac{1}{4}$ (d) 4

Q 8. The ratio of rms speed of an ideal gas molecules at pressure p to that at pressure 2p is
(a) $\frac{1}{2}$ (b) 2 (c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{2}$

Q 9. In a closed rigid container an ideal gas is filled. If the gas is heated, the graph of pressure (P) v/s root mean square speed (rms) will be :

(a) 

(b) 

(c) 

(d) None of these

Q 10. A gas is filled in a rigid container at pressure P_0. If the mass of each molecule is halved keeping the total number of molecules same and their r.m.s speed is doubled then find the new pressure
(a) $\sqrt{2}P_0$ (b) $3P_0$ (c) $\sqrt{3}P_0$ (d) $2P_0$

Q 11. At what temperature most probable speed of SO_2 molecule have the same value as root mean square speed of O_2 molecules at 300 K?
(a) $150K$ (b) $600K$ (c) $750K$ (d) $900K$

Q 12. Most probable velocity, average velocity and root mean square velocity are related as:
(a) 1: 1.128: 1.224 (b) 1: 1.128: 1.424
(c) 1: 2.128: 1.224 (d) 1: 1.428: 1.442

Answer Key

Q.1 a	**Q.2 c**	**Q.3 a**	**Q.4 b**	**Q.5 d**
Q.6 b	**Q.7 a**	**Q.8 c**	**Q.9 b**	**Q.10 d**
Q.11 d	**Q.12 a**			