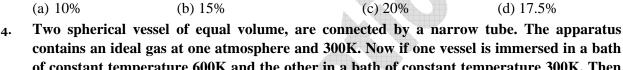
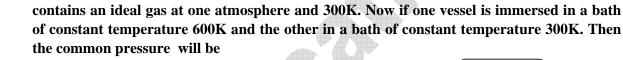
KINETIC THEORY OF GASES

One mole of an ideal monatomic gas requires 210 J heat to raise the temperature by 10 K, when heated at constant temperature. If the same gas is heated at constant volume to raise the temperature by 10 K then heat required is (a) 238 J (b) 126 J (c) 210 J (d) 350 J From the following V-T diagram we can conclude (b) $P_1 > P_2$ (c) $P_1 < P_2$ (a) $P_1 = P_2$ (d) None of these When the temperature of a gas is raised from 27°C to 90°C, the percentage increase in the 3. r.m.s. velocity of the molecules will be



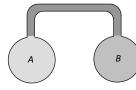








(d)
$$\frac{3}{4}$$
 atm



5. At what temperature, the mean kinetic energy of
$$o_2$$
 will be the same for H_2 molecules at -73° C

$$(c) - 73^{\circ}C$$

(d)
$$-173^{\circ}$$
C

If the r.m.s. velocity of a gas at a given temperature (Kelvin scale) is 300 m/sec. What will be the r.m.s. velocity of a gas having twice the molecular weight and half the temperature on Kelvin scale =

(b)
$$600 \text{ m/sec}$$

The energy of a gas/litre is 300 joules, then its pressure will be 7.

(a)
$$3 \times 10^5 N/m^2$$

(b)
$$6 \times 10^5 N/m^2$$

(c)
$$10^5 N/m^2$$

(d)
$$2 \times 10^5 N/m^2$$

If pressure of CO_2 (real gas) in a container is given by $P = \frac{RT}{2V - b} - \frac{a}{4b^2}$ then mass of the gas in 8. container is

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Four partie	cles have s	speeds 2, 3	3, 4 and 5	cm/s resp	ectively. '	Their rms	speed is			
(a) 3.5 cm/s	sec	(b) 27/2 c	em/s	(c) $\sqrt{54}$	cm/sec	(d) ($\sqrt{54/2}$) cm/	/ _S		
The root m	nean squai	re speeds	of molecu	les of idea	l gases at	the same	tempera	iture are		
(a) The sam	ne									
(b) Inversel	y proporti	onal to the	square ro	ot of the m	olecular v	weight				
(c) Directly	proportion	nal to the i	molecular	weight						
(d) Inversel	y proporti	onal to the	molecula	r weight.						
		ng gases p	ossess ma	ıximum rı	ms velocit	y, all bein	g at the s	ame		
(a) Oxyg	en	(b) Air	(c) c	arbon diox	kide (d) Hydroge	n			
At 0 K whi	ich of the f	following	propertie	s of a gas	will be ze	ro?	V			
(a) Kinetic	energy	(b) Poten	tial energy	(c) Vib	rational e	nergy (d	l) Density			
.Gases exer	rt pressur	e on the w	alls of co	ntaining v	essel beca	use the ga	as molecu	les		
(a) Possess momentum				(b) collide with each other						
(c) have fi	nite volum	ne	(d) o	bey gas la	ws					
The phenor	menon of	Browniar	moveme	nt may be	taken as	evidence	of			
(a) kinetic t	heory of n	natter	(b) e	lectromag	netic theo	ory of radia	ntion			
(c) corpusc	cular theor	y of light	(d) 1	(d) photoelectric phenomenon						
Absolute to	emperatui	e can be	calculated	by						
(a) mean square velocity				(b) motion of the molecule						
(c) both (1) and (2)				(d) none of these						
			K	EY						
2) b	3) a	4) c	5) c	6) d	7) d	8) b	9) d	10) b		
	(a) 3.5 cm/s The root m (a) The sam (b) Inversel (c) Directly (d) Inversel Which of t temperatur (a) Oxyg At 0 K whi (a) Kinetic Gases exer (a) Possess (c) have fir The pheno (a) kinetic t (c) corpuso Absolute to (a) mean so (c) both (1	(a) 3.5 cm/sec The root mean square (a) The same (b) Inversely proportion (c) Directly proportion (d) Inversely proportion (d) Inversely proportion (d) Inversely proportion (d) Inversely proportion (e) Oxygen At 0 K which of the fellowing (a) Kinetic energy .Gases exert pressure (a) Possess momentum (c) have finite volum The phenomenon of (a) kinetic theory of many of the fellowing (b) Corpuscular theory Absolute temperature (c) both (1) and (2)	(a) 3.5 cm/sec (b) 27/2 compared to the root mean square speeds (a) The same (b) Inversely proportional to the red (c) Directly proportional to the red (d) Inversely proportional to the red (a) Oxygen (b) Air At 0 K which of the following (a) Kinetic energy (b) Potent (a) Possess momentum (c) have finite volume The phenomenon of Brownian (a) kinetic theory of matter (c) corpuscular theory of light (a) mean square velocity (c) both (1) and (2)	(a) 3.5 cm/sec (b) 27/2 cm/s The root mean square speeds of molecular (a) The same (b) Inversely proportional to the square root (c) Directly proportional to the molecular (d) Inversely proportional to the molecular (e) At 0 K which of the following gases possess matemperature? (a) Oxygen (b) Air (c) c At 0 K which of the following properties (a) Kinetic energy (b) Potential energy (b) Cossess exert pressure on the walls of contact (a) Possess momentum (b) contact (d) on the phenomenon of Brownian movement (a) kinetic theory of matter (b) expected (c) corpuscular theory of light (d) properties (d) mean square velocity (e) in the phenomenon of the phenomenon (d) on the p	(a) 3.5 cm/sec (b) 27/2 cm/s (c) $\sqrt{54}$ The root mean square speeds of molecules of idea (a) The same (b) Inversely proportional to the square root of the molecular weight (d) Inversely proportional to the molecular weight. Which of the following gases possess maximum retemperature? (a) Oxygen (b) Air (c) carbon diox At 0 K which of the following properties of a gas (a) Kinetic energy (b) Potential energy (c) Vib. Gases exert pressure on the walls of containing value (a) Possess momentum (b) collide with (c) have finite volume (d) obey gas late. The phenomenon of Brownian movement may be (a) kinetic theory of matter (b) electromage (c) corpuscular theory of light (d) photoelected Absolute temperature can be calculated by (e) both (1) and (2) (d) none of the KEY	(a) 3.5 cm/sec (b) 27/2 cm/s (c) √54 cm/sec The root mean square speeds of molecules of ideal gases at (a) The same (b) Inversely proportional to the square root of the molecular weight (c) Directly proportional to the molecular weight. Which of the following gases possess maximum rms velocit temperature? (a) Oxygen (b) Air (c) carbon dioxide (d) At 0 K which of the following properties of a gas will be zer (a) Kinetic energy (b) Potential energy (c) Vibrational energy (c) Vibrational energy (d) obey gas laws The phenomenon of Brownian movement may be taken as (a) kinetic theory of matter (b) electromagnetic theory of light (d) photoelectric phenomenon of the molecular of the color of the color of the color of the molecular of the color	(a) 3.5 cm/sec (b) 27/2 cm/s (c) √54 cm/sec (d) (d) The root mean square speeds of molecules of ideal gases at the same (a) The same (b) Inversely proportional to the square root of the molecular weight (c) Directly proportional to the molecular weight. Which of the following gases possess maximum rms velocity, all beint temperature? (a) Oxygen (b) Air (c) carbon dioxide (d) Hydroged At 0 K which of the following properties of a gas will be zero? (a) Kinetic energy (b) Potential energy (c) Vibrational energy (d) Gases exert pressure on the walls of containing vessel because the gasta. Possess momentum (b) collide with each other (c) have finite volume (d) obey gas laws The phenomenon of Brownian movement may be taken as evidence (a) kinetic theory of matter (b) electromagnetic theory of radia (c) corpuscular theory of light (d) photoelectric phenomenon Absolute temperature can be calculated by (a) mean square velocity (b) motion of the molecule (c) both (1) and (2) (d) none of these KEY	The root mean square speeds of molecules of ideal gases at the same tempera (a) The same (b) Inversely proportional to the square root of the molecular weight (c) Directly proportional to the molecular weight (d) Inversely proportional to the molecular weight. Which of the following gases possess maximum rms velocity, all being at the stemperature? (a) Oxygen (b) Air (c) carbon dioxide (d) Hydrogen At 0 K which of the following properties of a gas will be zero? (a) Kinetic energy (b) Potential energy (c) Vibrational energy (d) Density Gases exert pressure on the walls of containing vessel because the gas molecular of the phenomenon of Brownian movement may be taken as evidence of (a) Possess momentum (b) collide with each other (c) have finite volume (d) obey gas laws The phenomenon of Brownian movement may be taken as evidence of (a) kinetic theory of matter (b) electromagnetic theory of radiation (c) corpuscular theory of light (d) photoelectric phenomenon Absolute temperature can be calculated by (a) mean square velocity (b) motion of the molecule (c) both (1) and (2) (d) none of these KEY		

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HINTS

1. $(\Delta Q)_P = \mu C_P \Delta T$ and $(\Delta Q)_V = \mu C_V \Delta T$

$$\Rightarrow \frac{(\Delta Q)_V}{(\Delta Q)_P} = \frac{C_V}{C_P} = \frac{\frac{3}{2}R}{\frac{5}{2}R} = \frac{3}{5} \qquad \left[\because (C_V)_{mono} = \frac{3}{2}R, (C_P)_{mono} = \frac{5}{2}R \right]$$

$$\Rightarrow (\Delta Q)_V = \frac{3}{5} \times (\Delta Q)_P = \frac{3}{5} \times 210 = 126 J$$

In case of given graph, V and T are related as V = aT - b, where a and b are constants.

From ideal gas equation, $PV = \mu RT$

We find
$$P = \frac{\mu RT}{aT - b} = \frac{\mu R}{a - b/T}$$

Since $T_2 > T_1$, therefore $P_2 < P_1$.

3.
$$v_{rms} = \sqrt{\frac{3RT}{M}} \Longrightarrow \frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{(273 + 90)}{(273 + 30)}} = 1.1$$

% increase = $\left(\frac{v_2}{v_1} - 1\right) \times 100 = 0.1 \times 100 = 10\%$

4. $\mu = \mu_1 + \mu_2$

$$\frac{P(2V)}{RT_1} = \frac{P'v}{RT_1} + \frac{P'V}{RT_2} \Longrightarrow \frac{2P}{RT_1} = \frac{P'}{R} \left[\frac{T_2 + T_1}{T_1 T_2} \right]$$

$$P' = \frac{2PT_2}{(T_1 + T_2)} = \frac{2 \times 1 \times 600}{(300 + 600)} = \frac{4}{3} atm$$

Mean kinetic energy of molecule depends upon temperature only. For o_2 it is same as that of H_2 at the same temperature of -73°C.

6.
$$v_{rms} = \sqrt{\frac{3RT}{M}} \Rightarrow v_{rms} \propto \sqrt{\frac{T}{M}}$$

$$\frac{v_2}{v_1} = \sqrt{\frac{M_1}{M_2} \times \frac{T_2}{T_1}} = \sqrt{\frac{1}{2} \times \frac{1}{2}} \implies v_2 = \frac{v_1}{2} = \frac{300}{2} = 150 \text{m/sec}$$

7. Energy =
$$300 J/litre = 300 \times 10^3 J/m^3$$

$$P = \frac{2}{3}E = \frac{2 \times 300 \times 10^{3}}{3} = 2 \times 10^{5} \ N/m^{2}$$

8. (b) Vander wall's gas equation for μ mole of real gas

$$\left(P + \frac{\mu^2 a}{V^2}\right)(V - \mu b) = \mu RT \implies P = \frac{\mu RT}{V - \mu b} - \frac{\mu^2 a}{V^2}$$

on comparing the given equation with this standard equation we get $\mu = \frac{1}{2}$. Hence $\mu = \frac{m}{M} \Rightarrow$ mass of gas $m = \mu m = \frac{1}{2} \times 44 = 22 \, gm$.