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Special Online Speed Test

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ), 2023 අගෝස්තු

General Certificate Of Education (Adv. Level) Examination, August 2023

රසායන විද්‍යාව I Chemistry I	02	S/E	I

Universal gas constant $R = 8.314\ J\ K^{-1}\ mol^{-1}$ Plank's constant $h = 6.626\times10^{-34} J\ s$

Avogadro constant $N_A = 6.022\times10^{23}\ mol^{-1}$ Velocity of light $c = 3\times10^{8} m\ s^{-1}$

Gas Laws MCQ Discussion -2023 A/L

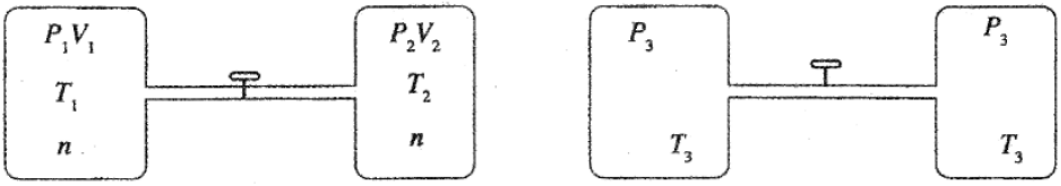
❖ **Answer all the Questions.**

1. The ideal gas equation can be expressed in the form, $P = \rho\frac{RT}{M}$ where ρ is the density of the gas, M is the molar mass (g mol^{-1}) of the gas, P is the pressure (Pa) and T is the temperature (K). If the units of R are J mol^{-1} K^{-1}, units of ρ in this equation should be,

(1) kg m^{-3} (2) g m^{-3} (3) g cm^{-3}

(4) g dm^{-3} (5) kg cm^{-3}

2. A system consisting of two rigid containers containing an ideal gas is shown in the diagram. The containers can be connected to each other by opening the tap. The system changes from configuration **A** to configuration **B** when the tap is opened. In general n, P, V and T represent number of moles, pressure, volume and temperature respectively.



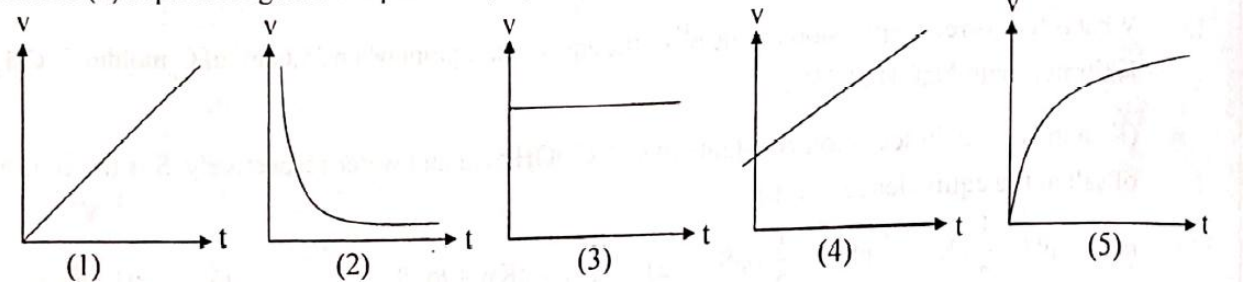
configuration **A** (tap closed) configuration **B** (tap opened)

Which of the following relations is **correct** about this system?

(1) $P_1V_1 = P_2V_2$ (2) $\frac{P_3T_1}{P_1} + \frac{P_3T_2}{P_2} = 2T_3$ (3) $\frac{T_1}{P_1} = \frac{T_2}{P_2}$

(4) $P_1T_1 = P_2T_2$ (5) $P_1V_1 + P_2V_2 = P_3(V_1 + V_2)$

3. What is the correct graph that obtained for a fixed mass of a gas that exists under constant pressure, when volume (v) is plotted against temperature (t^oc)?



4. **Questions 25 and 26 refer to the following data :**

One gas bulb contains gas **A** and another gas bulb contains gas **B**. Both gas bulbs are at the same temperature. The density of gas **A** is half that of gas **B**. The mean square speed of gas **B** is twice the mean square speed of gas **A**. Pressure of gas **A** = 1000 kPa .

The pressure of gas **B** in kPa is

(1) 4000 (2) 2000 (3) 1000 (4) 500 (5) 250

If the volumes of the two gas bulbs are the same, the ratio of the number of molecules of gas **A** · number of molecules of gas **B** is

(1) 4 : 1 (2) 2 : 1 (3) 1 : 1 (4) 1 : 2 (5) 1 : 4

5. The density of an ideal gas is 1·20 $kg\,m^{-3}$ at a pressure of $10^5\,N\,m^{-2}$ and a temperature of 727 °C The relative molecular mass of the gas is

(1) 96 (2) 98 (3) 100 (4) 102 (5) 104

6. A rigid-closed container contains n_1 moles of an ideal gas at temperature T_1(K) and pressure P_1(Pa). When an additional amount of the gas was inserted into the container, the new temperature and pressure were T_2 and P_2, respectively. The total number of moles of the gas now in the container is,

(1) $\frac{n_1 T_1 P_1}{T_2 P_2}$ (2) $\frac{n_1 T_1 P_2}{T_2 P_1}$ (3) $\frac{T_2 P_2}{n_1 T_1 P_1}$ (4) $\frac{n_1 T_2 P_2}{T_1 P_1}$ (5) $\frac{n_1 T_2 P_1}{T_1 P_2}$

7. **The mean square speed of H_2 at absolute temperature T is equal to the mean square speed of N_2 at absolute temperature T'. Which of the following equations gives the correct relationship between T and T'? (Relative atomic mass: H = 1, N = 14)**

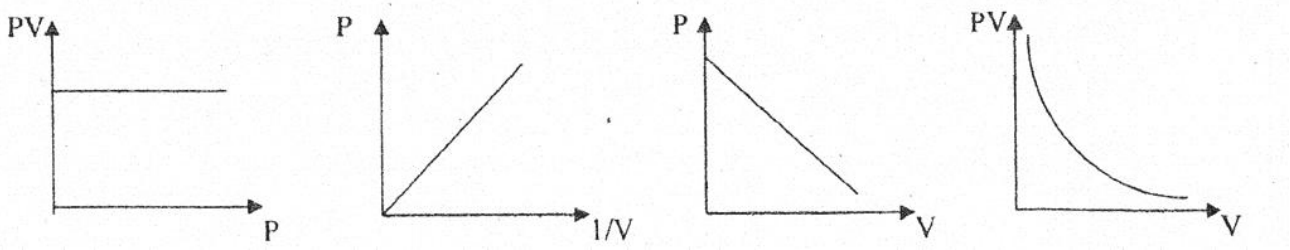
(1) $T = T'$ (2) $T = 14T'$ (3) $T = \frac{T'}{4}$ (4) $T = 7T'$ (5) $T = \frac{T'}{14}$

8. Volume of one mole of a gas in a variable container is kept at 27°C and under certain pressure. Another 1.5 moles of the same gas was added and heated at a certain temperature (T). It was found that both the pressure and the volume of the container has doubled at temperature (T). If the gas behaves ideally, the new temperature T is,

1) 800°C 2) 527°C 3) 500°C 4) 280°C 5) 207°C

9. Which of the following graph/s is/are correct regarding a fixed mass of an ideal gas at constant temperature ?

(a) (b) (c) (d)



10. Vessel **A** contains helium gas at 27 °C. Vessel **B** contains oxygen gas at 127 °C. The ratio of the root mean square velocities of the gases in vessel **A** and vessel **B**, $\frac{\sqrt{\overline{C_A^2}}}{\sqrt{\overline{C_B^2}}}$ is, (He = 4, O = 16)

(1) 0.4 (2) 1.7 (3) 2.4 (4) 4.9 (5) 25