Introduction, Barometer, Manometer

Course on States of Matter for Class XI

akhilesh • Lesson 9 • July 25, 2021

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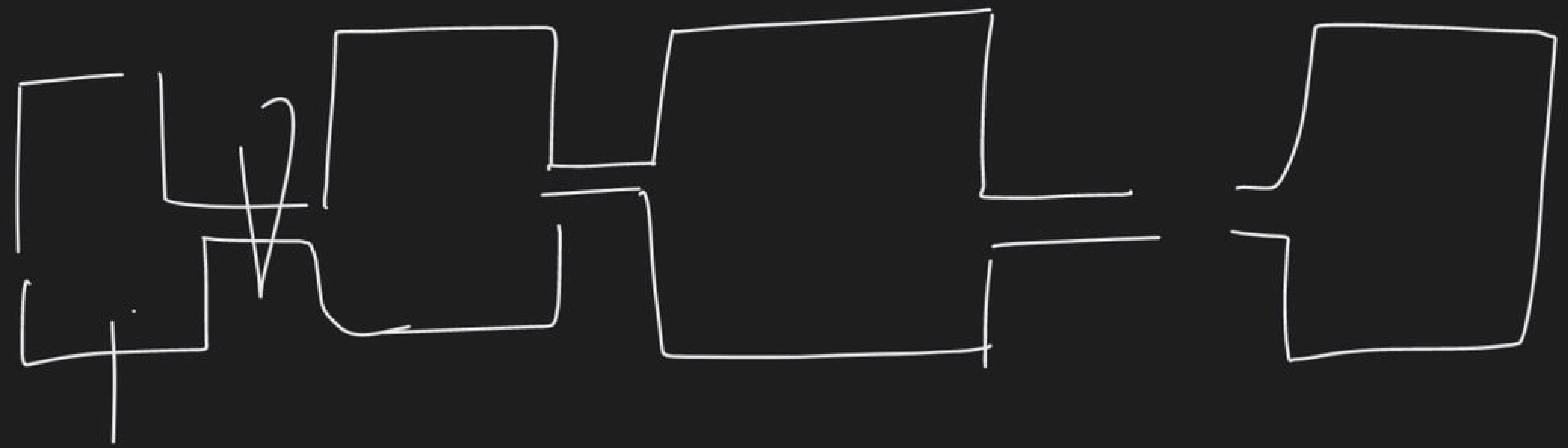


$$\frac{pV}{RT} \times n = \frac{P'}{RT}(V + 2V \ldots\ldots nV)$$

$$= \frac{P'V}{RT}\left[\frac{n(n+1)}{2}\right]$$

$$\frac{2P}{n+1} = P'$$

$He \quad O_3$

$$1 : 1/3$$

$$P : P/3$$

$$3P : P$$

2. Fixed mass of a gas is subjected to the changes as shown is diagram, calculate T_3, T_4, P_1, P_2 and V_1 as shown is diagram. Considering gas obeys $PV = nRT$ equation.

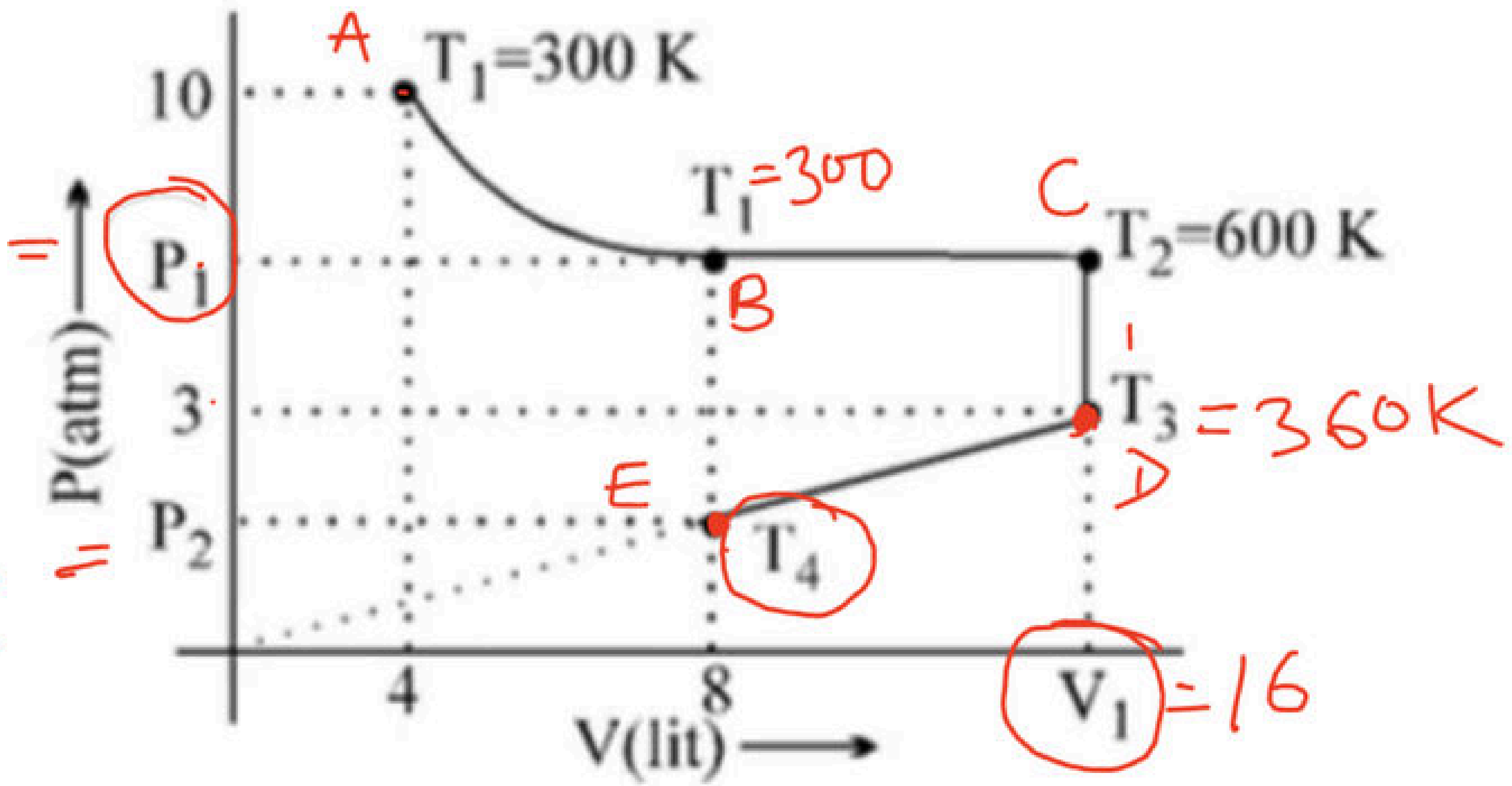
$10 \times 4 = P_1 \times 8$

$P_1 = 5$ atm

$y = mx$

$\frac{5}{600} = \frac{3}{T_3}$

$5 =$



$\frac{3}{2} =$

$\frac{3}{16} = \frac{P_2}{8}$

3

$P \propto d$ $\qquad P=1 \quad d=1 \quad n=1$

$P = C\,d$ $\qquad P=3 \quad d=3 \quad n=?$

$P = d$

$$\frac{P_1 V_1}{n_1} = \frac{P_2 V_2}{n_2}$$

$n \propto PV$

$n \propto P d^3$

$n \propto P^4$

$$V = \frac{1}{6}\pi d^3$$

$$\frac{P_1 d_1^3}{n_1} = \frac{P_2 d_2^3}{n_2}$$

$$\frac{1 \times 1}{1} = \frac{3 \times 27}{n_2}$$

$n_2 = 81$

7 atm

$36\pi \ m^3$

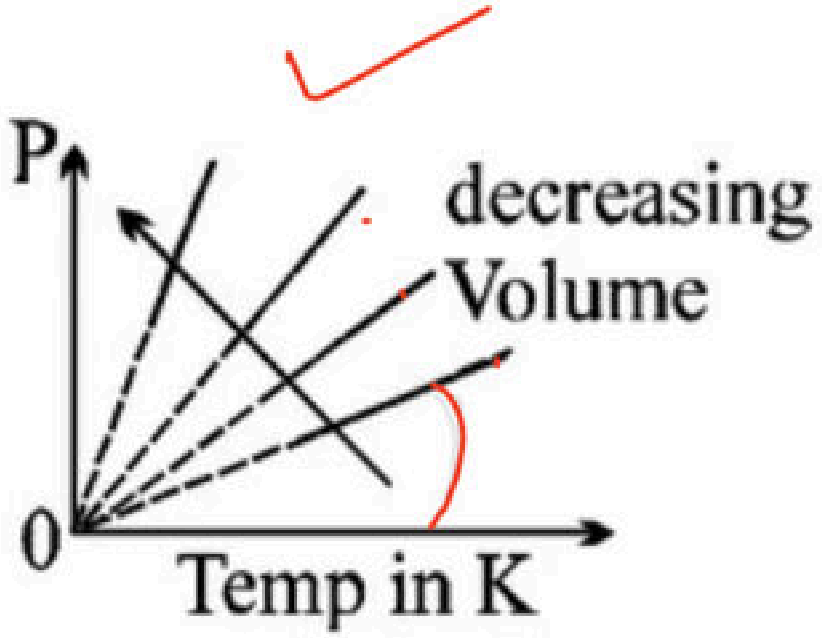
6 atm

6 atm

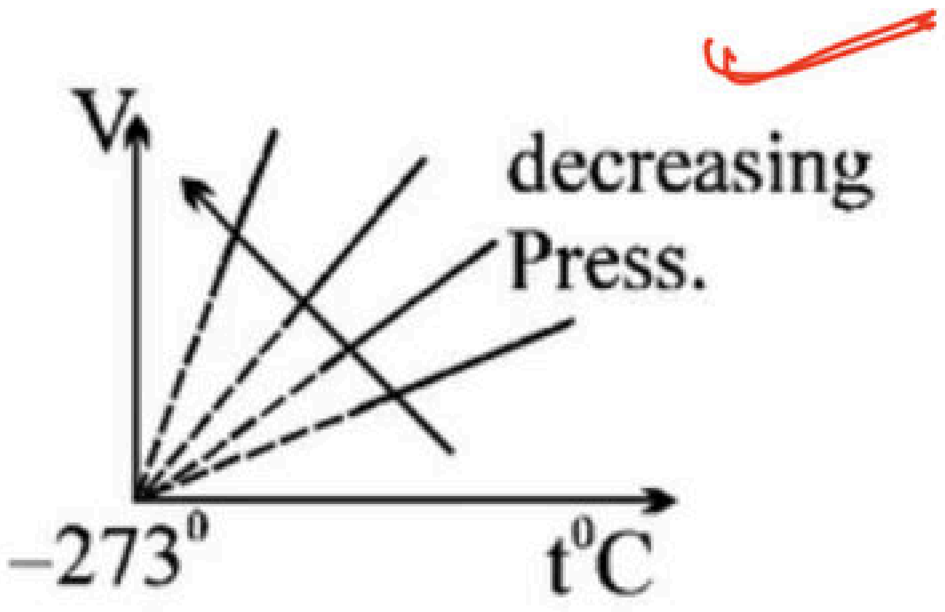
$$\frac{1}{6} \times \pi \times 6^3 = 36\pi$$

Which one of these graphs for an ideal gas having a fixed amount the arrow indication is incorrectly marked. **[3]**

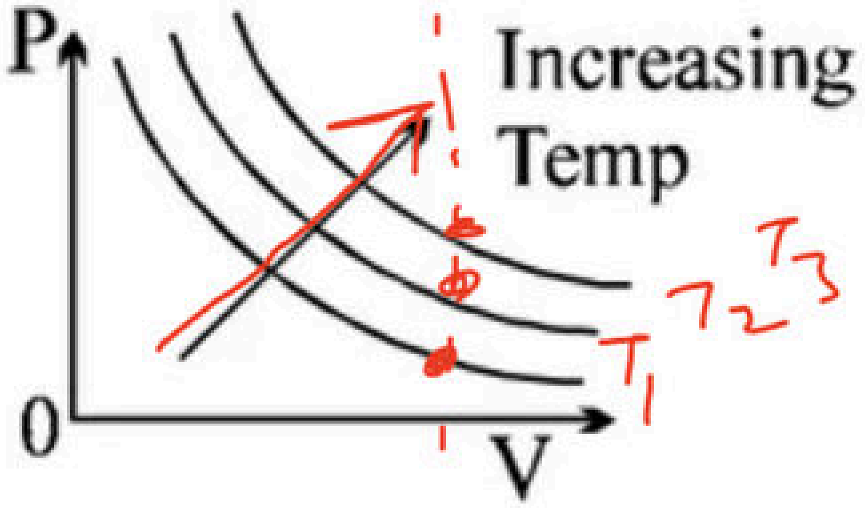
(A)



(B)

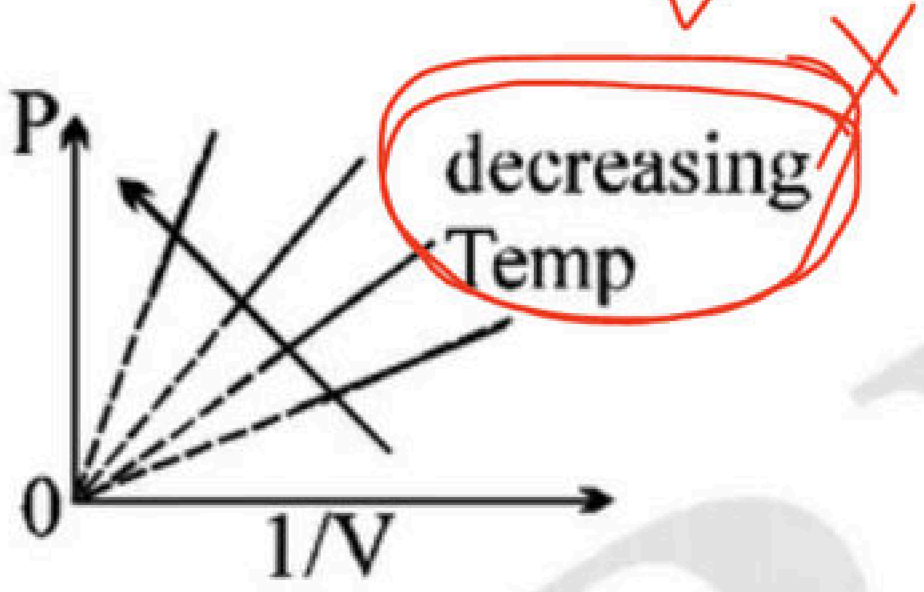


(C)



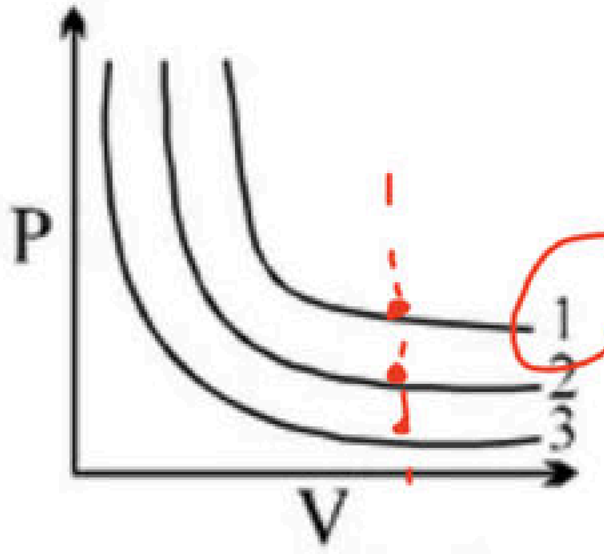
$P = nRT \cdot \frac{1}{V}$

(D)



47. P vs V curves were plotted for three different samples containing same masses of H_2, O_2 & N_2 at same temperature. Mark out which graph is applicable for which sample. **[3]**

$PV = nRT$

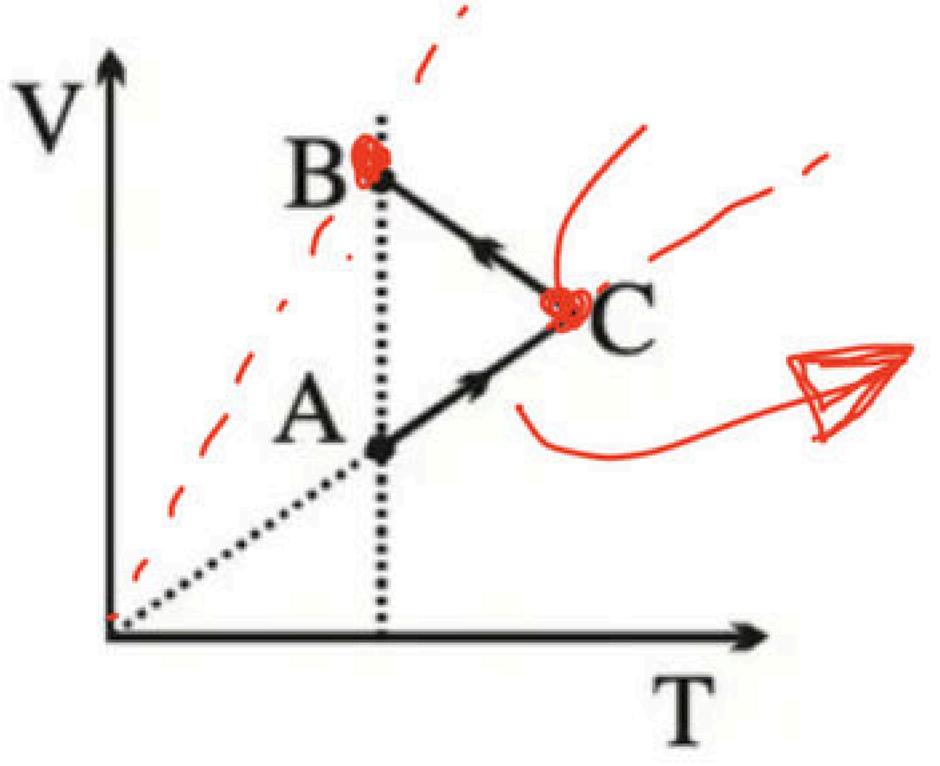


H_2
N_2
O_2

A

(A) $1 \rightarrow H_2$, $2 \rightarrow N_2$, $3 \rightarrow O_2$
(B) $1 \rightarrow O_2$, $2 \rightarrow N_2$, $3 \rightarrow H_2$
(C) $1 \rightarrow N_2$, $2 \rightarrow H_2$, $3 \rightarrow O_2$
(D) Data insufficient

4.



$P_A = P_C > P_B$

With reference to above graph, which of the following is/are incorrect.

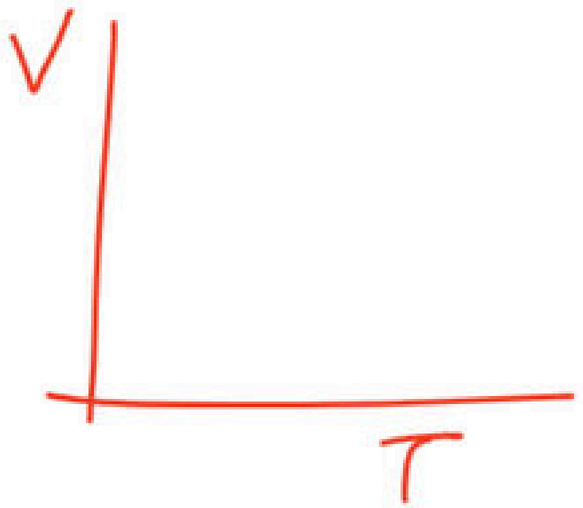
(A) $P_A = P_B = P_C$

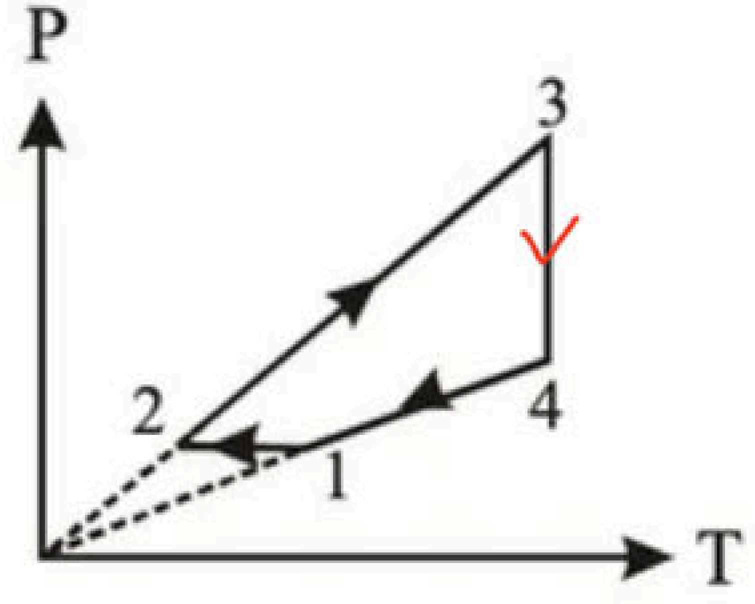
(B) Pressure first increases then decreases

(C) $P_C > P_A$

(D) $P_B < P_A$

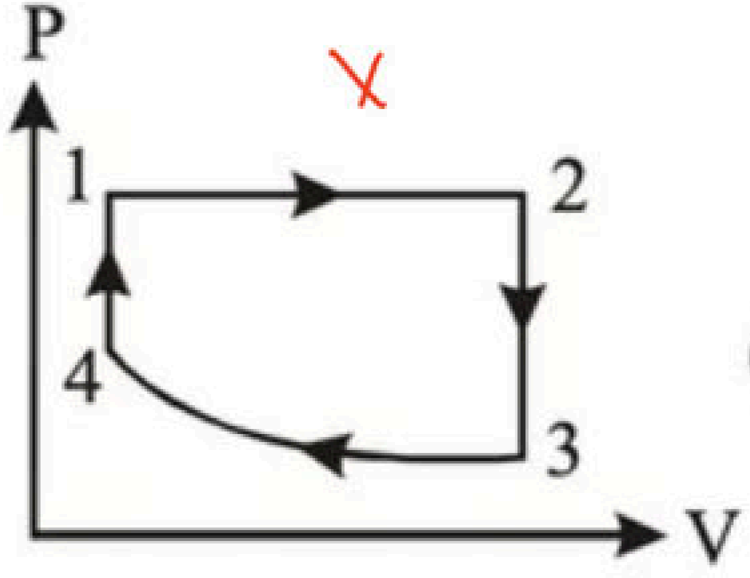
Q.8 Consider the following (P-T) graph for fixed mass of gas [3]

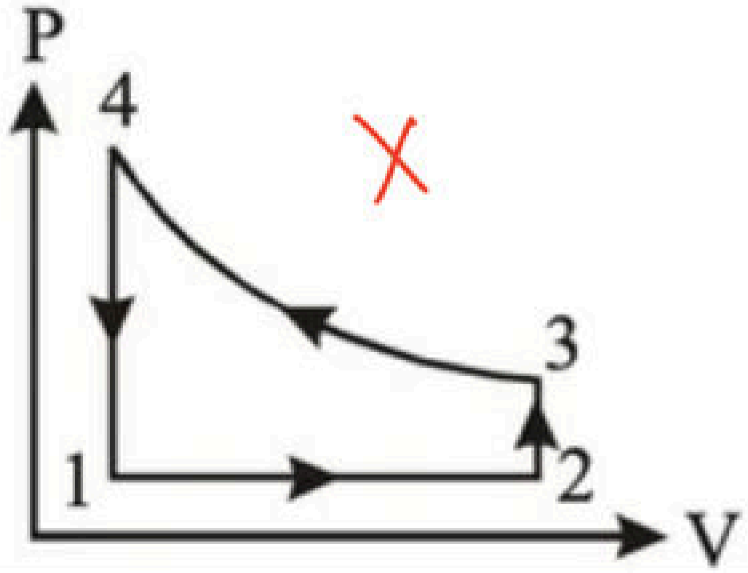


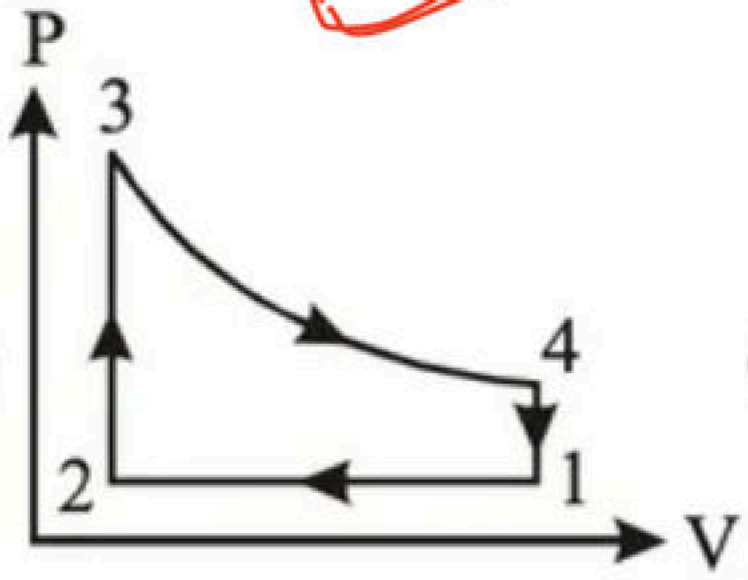


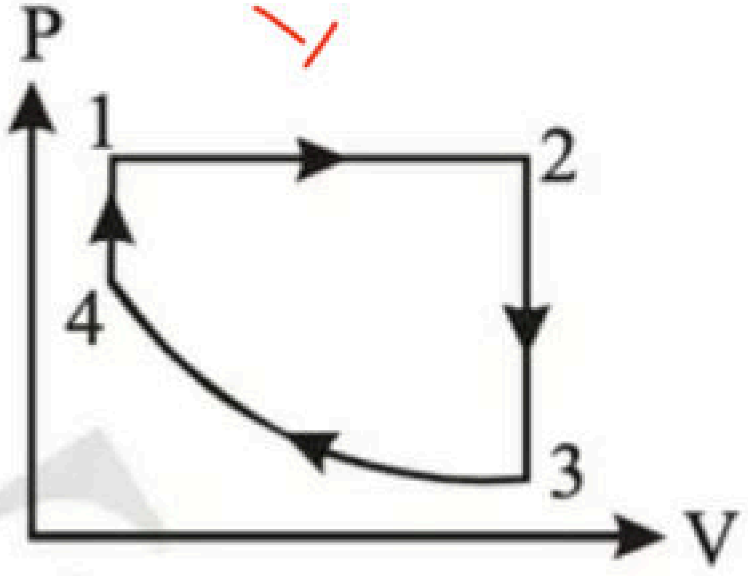
1–2 P = const
T ↓ V ↓

Correct P-V graph is-

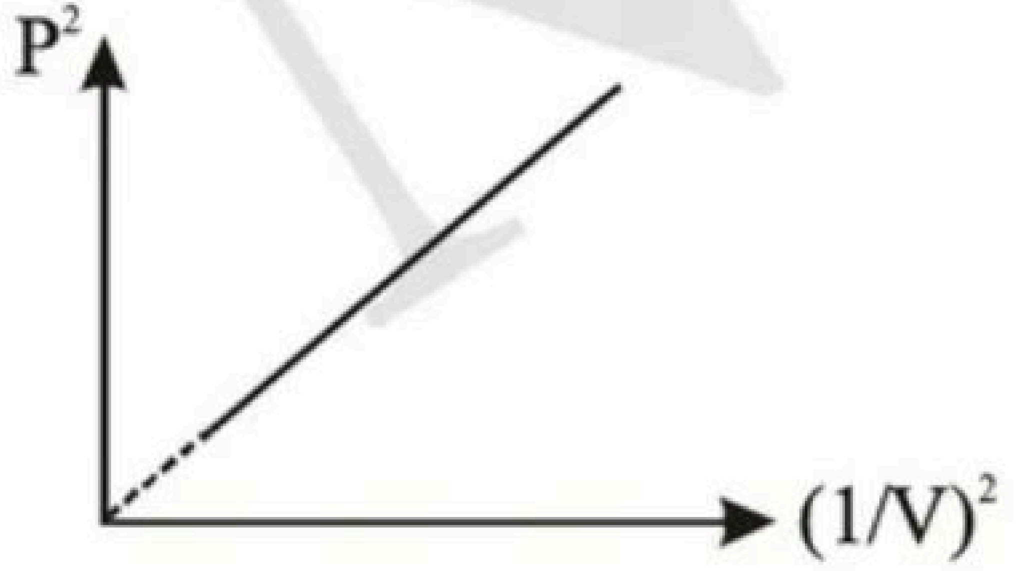
(A)


(B)


(C)


(D)


Consider the following graph



Graph is plotted for 1 mol of gas at 400K, find slope of curve. **[3]**

[Take : $R = 0.08 \dfrac{L-atm}{mol-K}$]

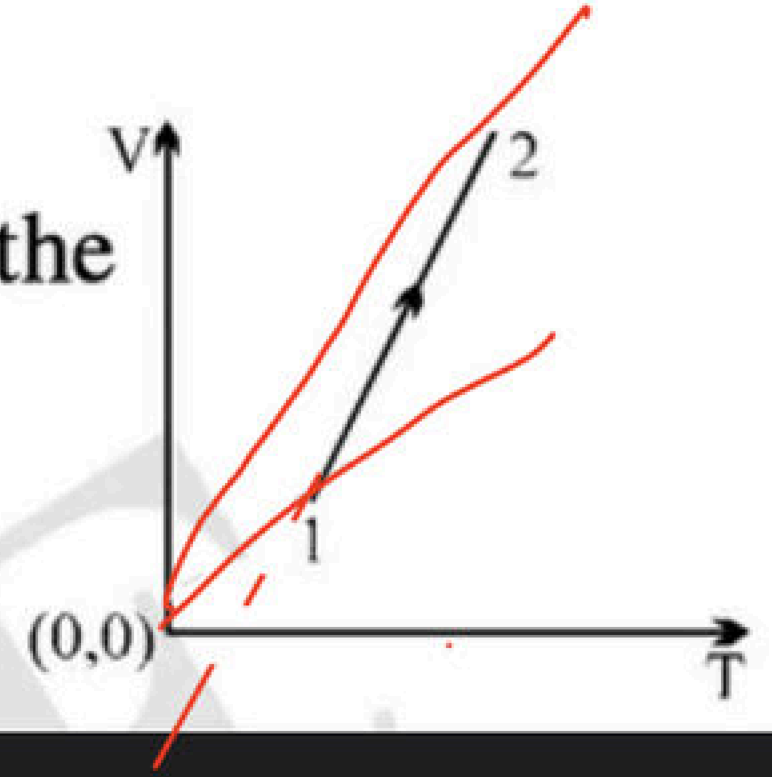
(A) $(32)^2$ (B) $(16)^2$ (C) $(8)^2$ (D) $(4)^2$

(A) $P_2 = P_1$

(B) $P_2 > P_1$

(C) $P_2 < P_1$

(b) Use the volume temperature curve to find graphically the nature of change in the pressure of a gas during heating [constant moles].

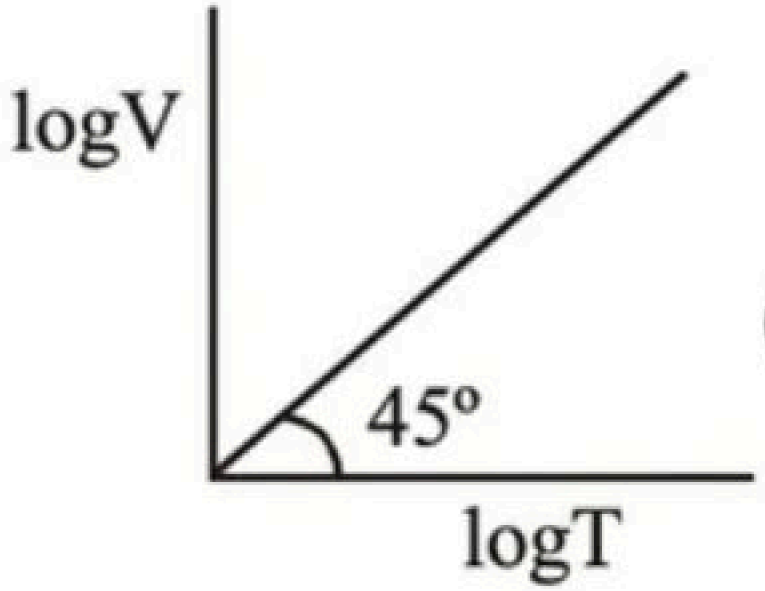


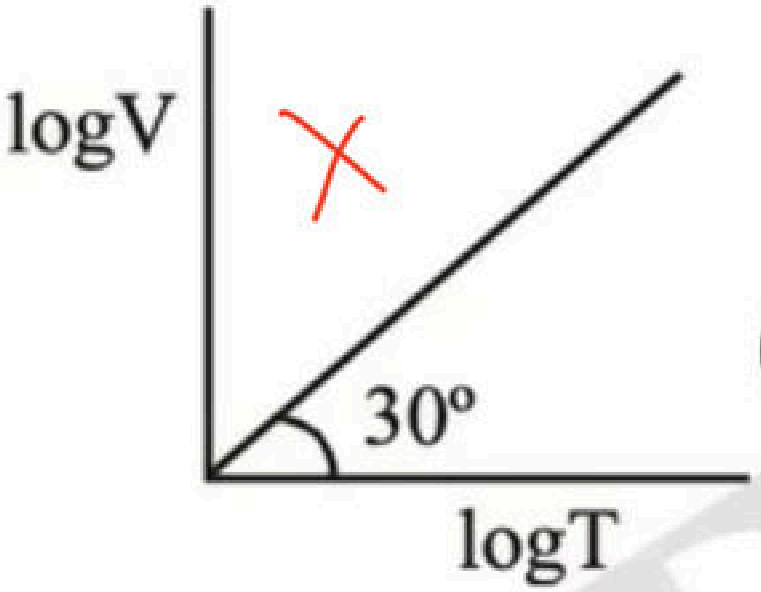
$\log V = \log \frac{nR}{P} + \log T$

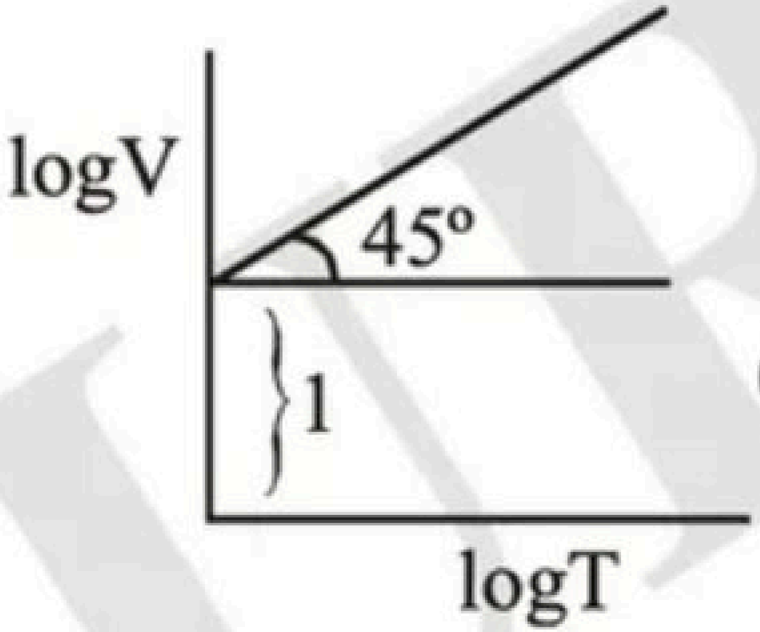
$\frac{10 \times 0.0\cancel{821}}{\cancel{0.821}}$

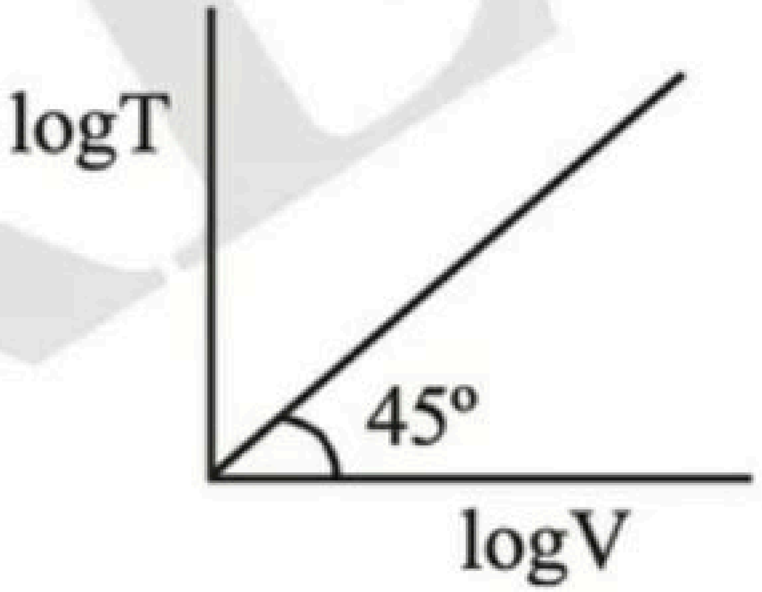
$\log V = 0 + \log T$

For a closed container containing 10 moles of an ideal gas, at constant pressure of 0.821 atm, which graph correctly represent variation of log V v/s log T where volume is in litre & temp in kelvin

(A) 

(B) 

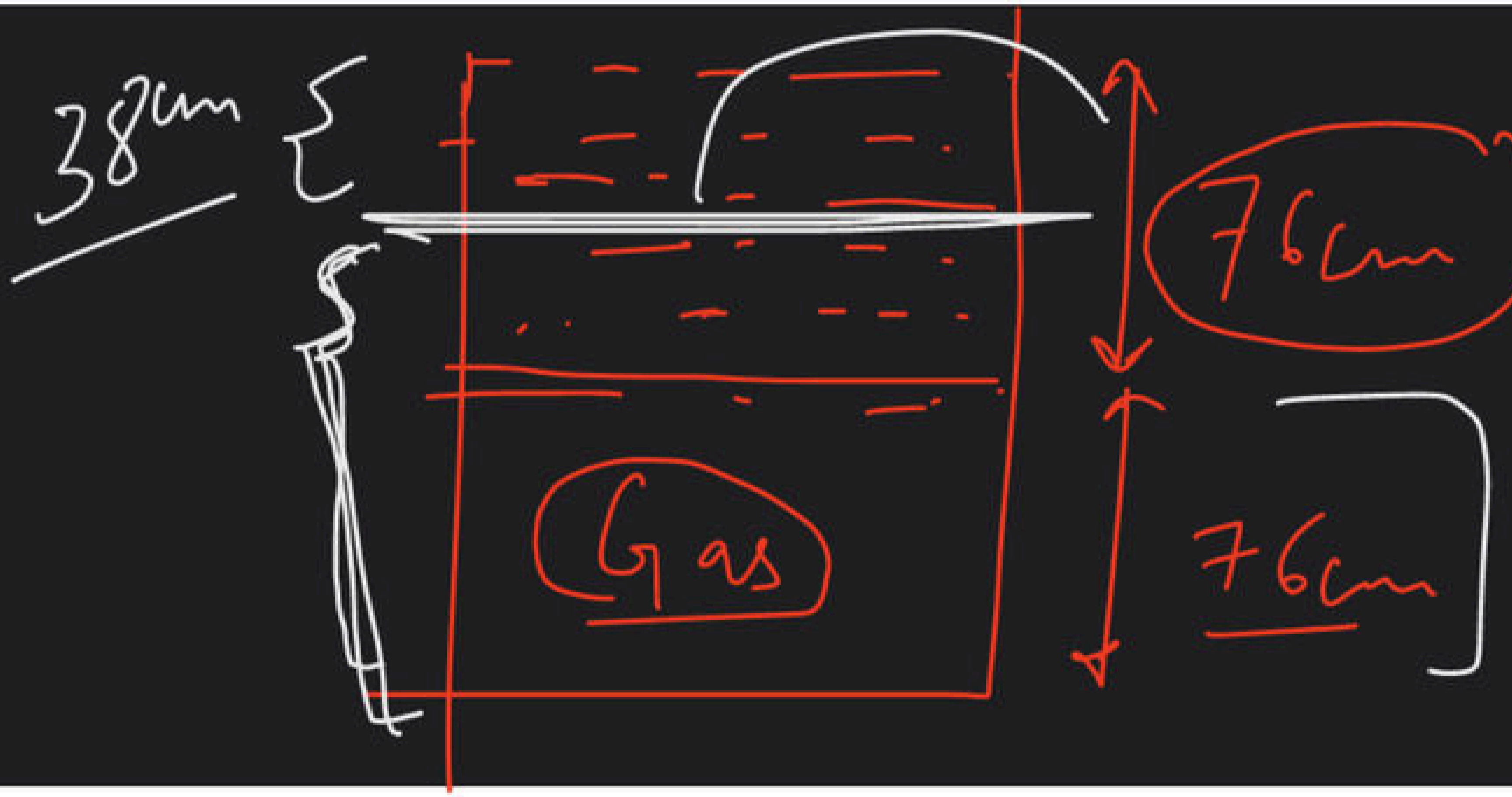
(C) 

(D) 

$$\frac{0.44}{P_{N_2}} = \frac{\frac{W}{32}}{\frac{W}{28}}$$

Q.6 Equal weight of N_2 and O_2 are put in a flask at 27°C.Calculate the partial pressure of N_2 if partial pressure of O_2 = 0.44 atm. **[3]**

(A) 0.44 atm (B) 0.50 atm (C) 0.94 atm (D) 0.38 atm



= 1atm

$$\frac{2\,\text{atm}}{} \quad V \quad 300$$

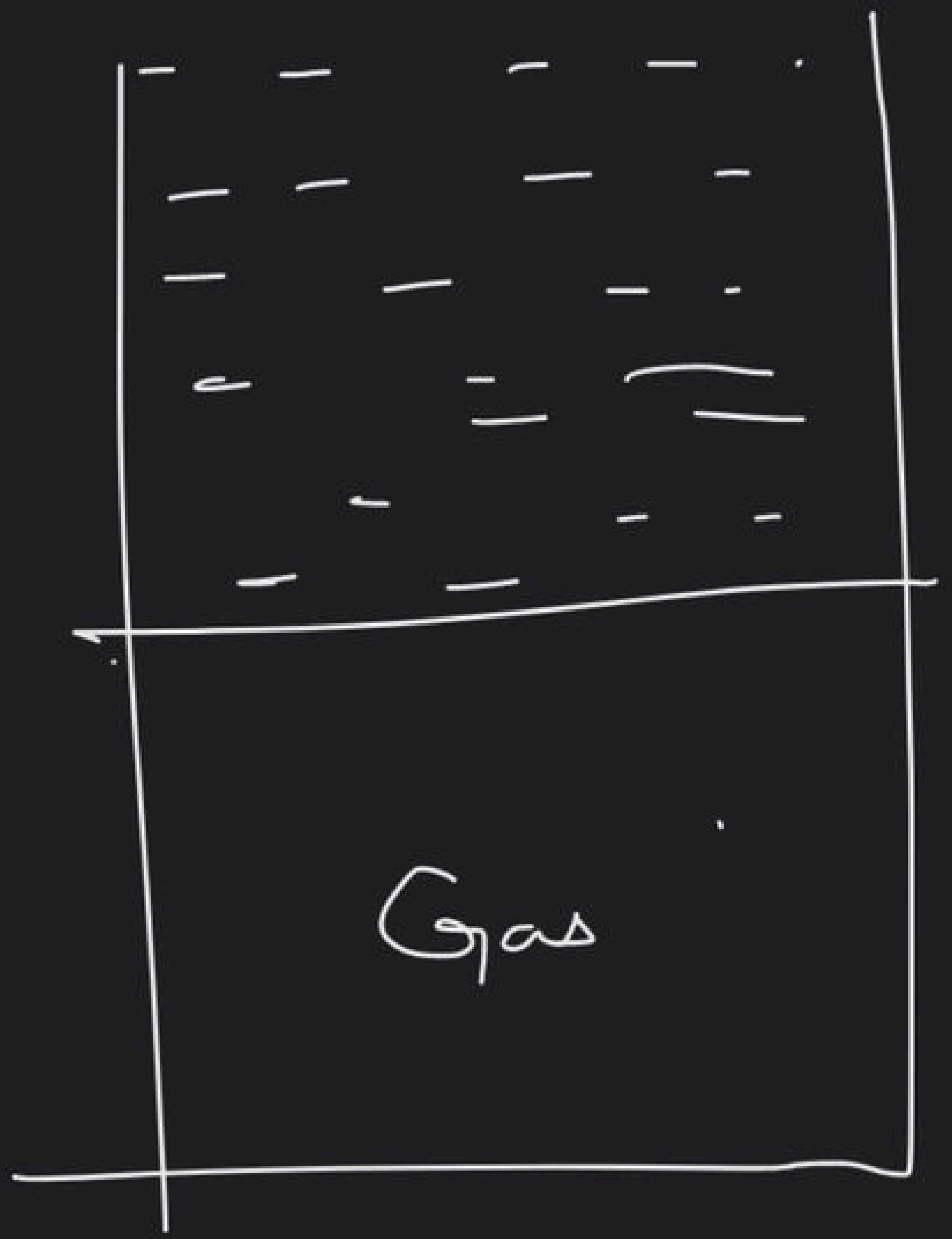
$$\frac{1.5\,\text{atm}}{} \quad 1.5V \quad T$$

A vertical hollow cylinder height 1.52 m is fitted with a movable piston of negligible mass and thickness. The lower half of the cylinder contains ideal gas and upper half is filled with Hg. The cylinder is initially at 300 K. When the temperature is raised half of the mercury comes out of cylinder. The temperature is (Assume no thermal expansion for Hg). **[3]**

(A) 337.5 K (B) 364.5 K (C) 546 K (D) 600 K

$$\frac{2 \times \cancel{V}}{300} = \frac{1.5 \times 1.5\cancel{V}}{T}$$

$$T =$$



$$PV = nRT$$

A) $\frac{3 \times 65}{10}$

(C) $\frac{3 \times 60}{10}$

B) $\frac{3 \times 76}{10}$

(D) None.

An ideal gas at 650 Torr occupies a bulb of unknown volume. A certain amount of gas is withdrawn and found to occupy 1.52 cm^3 at one atmp. The pressure of the gas remaining in the bulb is 600 Torr. Calculate the volume of the bulb taking temperature constant. (cm^3) **[3]**

650 torr

600 torr

1.5 cm^3 at 760

$$650V - 600V = 760 \times 1.5$$

A) 0.2

B) 0.075

C) 0.1

D) None

mmoles/min

2 mmol

A diver at a depth of 10.336 m exhales a bubble of air of volume 24.63 ml. The bubble catches an organism which survives on the exhaled air trapped in the bubble. ~~Find out what will be the volume of the bubble when it reaches the surface after 10 min. The organism just inhales the air at the rate of 0.05 millimoles per minute & exhales nothing. Also~~ find out the ~~average~~ rate which organism should inhale so that volume of bubble remains constant at the depth & the surface. **[4]**

[Given : P atm =1 atmp; d H_2O = 1 gm / cm^3; g = 1000 cm / s^2; T_{H_2O} = 300 K(throughout)]

$$\frac{2 \times 24.63 \times 10^{-3}}{R \times 300} = 2 \times 10^{-3} = 2 \text{ mmoles}$$

1 mmoles

thin skin

thick skin