TOPIC
Thermodynamics – Section XII – Question 4

QUESTION
Air in a closed-rigid vessel at 2 bars and $25°C$ is heated until its temperature is $100°C$. The final pressure in bars most nearly is

(A) 2.50
(B) 4.40
(C) 8.00
(D) 256.0

HINTS
- Closed means constant mass of air
- Rigid means constant volume
- Constant mass and constant volume mean constant specific volume
- Use absolute temperature

SOLUTION
For an ideal gas,

$$V = \frac{RT}{P}.$$

Since

$$V_1 = V_2$$

it follows that

$$\frac{RT_1}{P_1} = \frac{RT_2}{P_2}$$

or

$$\frac{P_2}{P_1} = \frac{T_2}{T_1}$$

Thus

$$\frac{P_2}{2.0} = \frac{100 + 273}{25 + 273}$$

or

$$P_2 = 2.5\text{bars}$$

ANSWER
(A)

CONTRIBUTOR
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