

TOPIC

Chemistry – Section III – Question 3

QUESTION

1000 liters of water vapor at 25°C and a pressure of 10 mm Hg are condensed into a single liquid droplet of density 1 gr/ml. The volume of this liquid droplet in ml most nearly is

- (A) 9.720
- (B) 88.00
- (C) 116.0
- (D) 7360

HINT

Equate moles of water in the droplet to moles of water vapor at 25°C and 10 mm Hg.

SOLUTION

Apply ideal gas law to water vapor

$$n = \frac{PV}{RT}$$

$$P = 10 \text{ mm Hg (1 atm/760 mm Hg)}$$
$$= 0.0132 \text{ atm}$$

$$n = \frac{0.0132 \text{ atm} \times 1000 \text{ lit}}{0.08206 \text{ lit atm/molK} \times 298.15 \text{ K}}$$
$$= 0.54 \text{ moles}$$

Thus, there are 0.54 moles of water in the droplet. Volume of droplet is

$$V_{\text{droplet}} = 0.54 \text{ moles} \times 18 \text{ gr/mol} \times 1 \text{ ml/gr}$$
$$= 9.72 \text{ ml}$$

ANSWER

(A)

CONTRIBUTOR

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