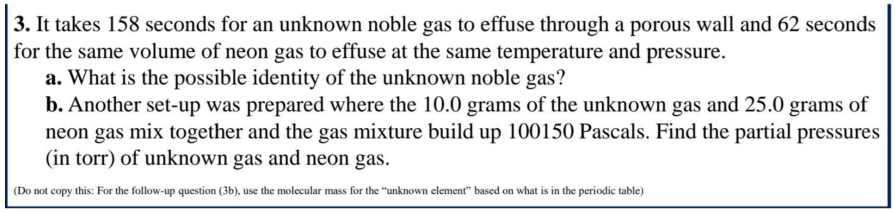
Question: It takes 158 seconds for an unknown noble gas to effuse throu...

It takes 158 seconds for an unknown noble gas to effuse through a porous wall and 62 seconds for the same volume of neon gas to effuse at the same temperature and pressure.

a. What is the possible identity of the unknown noble gas?
b. Another set-up was prepared where the 10.0 grams of the unknown gas and 25.0 grams of neon gas mix together and the gas mixture build up 100150 Pascals. Find the partial pressures (in torr) of unknown gas and neon gas.

*Please show a legible step-by-step process of this, whether typewritten or *neat handwriting. Would appreciate it.



3. It takes 158 seconds for an unknown noble gas to effuse through a porous wall and 62 seconds for the same volume of neon gas to effuse at the same temperature and pressure.

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(Do not copy this: For the follow-up question (3b), use the molecular mass for the "unknown element" based on what is in the periodic table)

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Expert Answer

Karunakar Ravada answered this
1,570 answers

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$\propto \frac{1}{\sqrt{\text{Molar mass}}}$

$$\Rightarrow \frac{\text{Molar mass of X}_{\text{unknown}}}{\text{Molar mass of Ne}} = \left(\frac{62}{158}\right)^2$$

$$\frac{\text{Molar mass of X}}{20} = \left(\frac{62}{158}\right)^2$$

$\therefore$ Molar mass of X_2 = 3.1 g/mol

X can be Helium (close to 4 g/mol)

b) Partial Pressure = Mole fraction × Total Pressure

$$\chi_X = \frac{n_X}{n_X + n_{Ne}} \quad (n: \text{no. of moles})$$

(χ_X: Mole fraction)

$$= \frac{10/3.1}{10/3.1 + 25/20} = 0.72$$

$\therefore \chi_{Ne} = 1 - 0.72 = 0.28$

$p_X = 0.72 \times 100150\ Pa = 72108\ Pa$

$p_{Ne} = 0.28 \times 100150\ Pa = 27969.8\ Pa$

Comment

Up next for you in Chemistry

Part B: Draw the structure of 4-bromo-2-hexyne.

See answer

3. Give the mechanism, reagents and catalysts for the sulfonation of benzene.

3. Give the mechanism, reagents and catalysts for the sulfonation of benzene. Include the formation of the electrophile.

See answer

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