



Physical Chemistry-Properties of Gases



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University of Mustansiriyah

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Department of Chemistry

1st Exam-paper A

Q1: Circle the right answer for all of the following:

(50 degrees)

1: A vessel of 100 L capacity contains a certain amount of gas at 50 °C and 0.5 bar pressure. The gas is transferred to another vessel has a pressure of 5 bar at 50 °C. What should be the volume of the vessel?

Answer: a) 10 bar b) 10 dm³ c) 0.1 dm³ d) 0.1 bar

2: What is the right formula of the Graham's law of effusion?

Answer: a) $\frac{r_1}{t_2} = \left(\frac{r_2}{M_1}\right)^{\frac{1}{2}}$ b) $\frac{r_1}{r_2} = \left(\frac{M_1}{M_2}\right)^{\frac{1}{2}}$ c) $\frac{d_1}{d_2} = \left(\frac{M_2}{M_1}\right)^{\frac{1}{2}}$ d) $\frac{r_1}{r_2} = \left(\frac{d_2}{M_1}\right)^{\frac{1}{2}}$

3: Calculate Z for a gas if T is 22 °C, V_m is 5 dm³ mol⁻¹ and p is 3 bar.

Answer: a) 0.62 °C b) 6.2 K c) 0.62 d) 6.2

4: Calculate the molar mass of O₂ (16 g.mol⁻¹) in a 4 L cylinder at 9 atm and 281 K.

Answer: a) 32 g.mol⁻¹ b) 32 g c) 50 g.mol⁻¹ d) 50 g

5: Calculate the V^o_m of a gas, if p is 1 atm and temperature is 32 °C.

Answer: a) 25 K b) 25 atm c) 25 L mol⁻¹ d) 25 mol

6: If the attraction forces are negligible, that means the gas is?

Answer: a) real b) noble c) perfect d) expands

7: According to the Dalton's law the unit of the mole fraction is?

Answer: a) mol b) dm³ c) psi d) free of units

8: What is the partial pressure of a gas in a mixture if the X_i is 0.1, and under atmospheric pressure?

Answer: a) 760 mmHg b) 10 bar c) 0.1 atm d) 1 bar

9: If the value of R is 0.082 then the unit of pressure is?

Answer: a) Pascal b) mmHg c) Psi d) bar

10: What is the right equation of one of the following?

Answer: a) p_rp_c = p b) p_rp = p_c c) p_r/ p_c = p d) p_r = p_cp

Q2: Calculate the mass of 335 mL of sulfur dioxide (64 g mol⁻¹) measured at 37 °C and 745 mm Hg pressure.? (25 degrees)

Q3: Calculate the volume of 0.25 g of oxygen at 25 °C and 742 mm Hg pressure. (25 degrees)

35
Q1 50

$$Q2/ \quad T = 37^{\circ}\text{C} + 273 = 310\text{K}$$

$$P = \frac{745 \text{ mmHg}}{760 \text{ mmHg}} = 0.98 \text{ atm}$$

$$\text{M.wt} = 64 \text{ g/mol}$$

$$m = ?$$

$$V = \frac{335 \text{ mL}}{1000} = 0.335 \text{ L}$$

$$PV = nRT$$

$$(0.98 \text{ atm}) * 0.335 \text{ L} = \frac{m}{64 \text{ g/mol}} * 0.082 (\text{L} \cdot \text{atm} / \text{mol} \cdot \text{K}) * 310 \text{ K}$$

$$0.328 = \frac{m}{64 \text{ g/mol}} * 25.42$$

$$m = \frac{0.328 * 64 \text{ g/mol}}{25.42}$$

$$m = 0.825 \text{ g}$$

Q2 $\frac{25}{25}$

$$Q2/ \quad T = 25^{\circ}\text{C} + 273 = 298\text{K}$$

$$m = 0.25 \text{ g}$$

$$\text{M.wt } O = 16$$

$$P = \frac{742 \text{ mmHg}}{760 \text{ mmHg}} = 0.97 \text{ atm}$$

$$V = ?$$

$$PV = nRT$$

$$(0.97 \text{ atm}) V = \frac{0.25}{16} * 0.082 (\text{atm} \cdot \text{L} / \text{mol} \cdot \text{K}) * 298 \text{ K}$$

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

$$V = \frac{0.015 * 0.082 (\text{L} \cdot \text{atm} / \text{mol} \cdot \text{K}) * 298 \text{ K}}{0.97 \text{ atm}}$$

$$V = 0.37 \text{ L}$$

Q3 $\frac{15}{25}$