



Physical Chemistry-Properties of Gases



Handwritten notes: 20-01-2021, Wed, 53/100, Dr. Abduljabbar Rushdi

Name of a student: [Handwritten] Signature: [Handwritten] No. 26

University of Mustansiriyah

1st Semester-2021

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) r1/r2 = (M1/M2)^(1/2) b) r1/r2 = (M2/M1)^(1/2) c) d1/d2 = (M2/M1)^(1/2) d) r1/r2 = (d2/M1)^(1/2)

3: Calculate Z for a gas if T is 22 °C, Vm 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 Vm 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 Xi 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) pr.pc = p b) p.p = pc c) pr/pc = p d) pr = pc.p

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)

Q2/ $V_2 = 335 \text{ mL}$, $M = 64 \text{ g/mol}$, $t_c = 37^\circ\text{C}$, $P_2 = 745 \text{ mm Hg}$

$T_k = t_c + 273 = 37 + 273 = 310 \text{ K}$

$P_2 = \frac{745 \text{ mmHg}}{760 \text{ torr}} = 0.98 \text{ atm}$

$\frac{273}{37} = 300 \text{ K}$
 ? \equiv Units

$PV = nRT \Rightarrow PV = \frac{m}{M} RT$

$m = \frac{M P V}{R T} = \frac{64 \text{ g/mol} \times 0.98 \text{ atm} \times 335 \text{ mL}}{0.082 \text{ mol}\cdot\text{K/atm}\cdot\text{L} \times 310 \text{ K}}$

$= \frac{21011.2}{25.584} = 821.26 \text{ g}$

$Q_2 = \frac{18}{25}$

should be converted

Q3/ $V_2 = ?$, $M = 16 \text{ g/mol}$, $m = 0.25 \text{ g}$, $t_c = 25^\circ\text{C}$, $P_2 = 742 \text{ mm Hg}$

$T_k = t_c + 273 = 25 + 273 = 300 \text{ K}$

Why you increase the no. by 2

$\frac{273}{25} = 298$

$P_2 = \frac{742 \text{ mmHg}}{760 \text{ torr}} = 0.97 \text{ atm}$

$n (\text{mol}) = \frac{m (\text{g})}{M (\text{g/mol})} = \frac{0.25 \text{ g}}{16 \text{ g/mol}} = 0.0156 \text{ mol}$

$16 \times 2 = 32$

$Q_3 = \frac{15}{25}$

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

$= \frac{0.0156 \text{ mol} \times 0.082 \text{ mol}\cdot\text{K/atm}\cdot\text{L} \times 300 \text{ K}}{0.97 \text{ atm}} = 0.25 \text{ L}$