Physical Chemistry-Properties of Gases

Name of a student -------- Signature -------------------- No. 35

University of Mustansiriyah

Department of Chemistry

1st Semester-2021

1st Exam-paper A

(50 degrees)

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

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

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 O_2 (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 $V°m$ 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) $p_r p_c = p$ b) $p_r p = p_c$ c) $p_r / p_c = p$ **d) $p_r = p_c p$**

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)

Wed_20/01/2021   **Best wishes**   Dr Abduljabbar I. R. Rushdi

Q2/

$wt = ?$
$V = 335\ ml$
$m.wt = 64 g/mol$
$T = 37\ c°$
$P = 745\ mmHg$

$$PV = nRT$$

$P = \dfrac{745\ mmHg}{760\ ?}$ **? ≡ Units**

$\therefore P = 0.98\ atm$ **How?**

$T_K = (t_c + 273) \implies T_K = (37 + 273) \quad \therefore T = 310\ K$

HOW?

$PV = nRT \implies 0.98 \times 0.335\ ? = n \times 0.082 \times 310$
    atm   L   L.atm/mol.K

$0.3283 = n \times 25.42$

$\therefore n = 0.0129\ mol$

$\dfrac{Q_2\ 20}{25}$

$n = \dfrac{wt}{m.wt} \implies 0.0129\ mol = \dfrac{wt}{64 g/mol} \implies \therefore wt = 0.82 g$

Q3/ $P = \dfrac{742\ ?}{760\ ?} = 0.97\ atm$

$V = ?$
$wt = 0.25 g$
$T = 25\ c°$
$P = 742\ mmHg$

$T_K = (T_c + 273) \implies T_K = (25 + 273)$

$\therefore T_K = 298\ K$ **? ≡ Units**

$PV = nRT \implies PV = \dfrac{wt}{m.wt} \times R \times T$

$O_2\ (16 \times 2)$

$0.97\ atm \times V = \dfrac{0.25 g}{32\ 16 g/mol} \times 0.082 \times 298\ K$
                    L.atm/mol.K

$0.97 \times V = 0.015\ ? \times 0.082 \times 298\ ?$

$\dfrac{Q_3\ 15}{25}$

$0.97 \times V = 6.36$

$\therefore V = \dfrac{6.36}{0.97} = 6.32\ L$