F-23

35/100 Thirty Five

# Physical Chemistry_Chpt_One_Properties of Gases

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**University of Mustansiriyah** — **1st Semester-2021**

**Department of Chemistry** — **1st Exam-paper F**

**Q1: Circle the right answer for all of the following:** **(50 points)**

**1: According to van der Waal's corrections if $V_{Real} < V_{Perfect}$ of any gas that means the gas has:**

**Answer:** a) non-polar particles b) polar particles c) small particles d) big particles

**2:** Calculate the weight of $CO_2$ gas (44 g $mol^{-1}$) in a $0.5 \times 10^4$ mL cylinder at $20 \times 10^2$ kPa and 25 °C.

**Answer:** a) 180 g $mol^{-1}$ b) 180 g c) 180 mol d) 180 kg

**3:** Calculate the density of $CO_2$ placed in a $22.4 \times 10^3$ mL cylinder at $20 \times 10^2$ kPa and 298 K.

**Answer:** a) 36.06 kg $L^{-1}$ b) 36.06 g $L^{-1}$ c) 36.06 g d) 36.06 $L^{-1}$

**4:** According to Graham's law the heaviest gas has?

**Answer:** a) low rate b) high rate c) middle rate d) low density

**5:** A gas occupies 20 $dm^3$ at 90 °C and 760 torr pressure. What would be its volume at STP?

**Answer:** a) 15.04 mL b) 15.04 $dm^3$ c) 15.04 $L^{-1}$ d) 15.04 $dm^{-3}$

**6:** A vessel contains a certain amount of gas at $80 \times 10^5$ Pa. The gas is transferred to another tank 20 $dm^3$ with pressure of $20 \times 10^5$ Pa. What should be its volume?

**Answer:** a) 0.5 L b) 0.5 Pa L c) 0.5 Pa $dm^3$ d) 0.5 $L^{-1}$

**7:** According to Avogadro's law n is directly proportional with volume at constant?

**Answer:** a) p & V b) T & p c) T & V d) p & n e) R & P

**8:** Attractive and repulsive forces between particles are present in a?

**Answer:** a) perfect gas b) non-ideal gas c) ideal gas d) noble gas

**9:** It can follow the direct proportional between temperature and volume through the law of

**Answer:** a) Van der Waal b) Graham c) Charles d) Gay-Lussac

**10:** The mol fraction of atmospheric pressure is equal to?

**Answer:** a) zero b) one c) two d) three

**Q2: The following data have been observed for 10000 mg of $CO_2$ gas at 273 K. Calculate the best value of the molar mass of $CO_2$.** **(25 points)**

| $p/10^2$ kPa | 1.00 | 2.00 | 3.00 |
|---|---|---|---|
| V/L | 4.00 | 7.50 | 11.75 |

**Q3: A perfect gas undergoes isothermal expansion, which increases its volume by 2.48 $dm^3$. The $p_i$ and $V_i$ of the gas are $2 \times 10^2$ kPa and 2.14 $dm^3$, respectively. Calculate the $p_f$ of the gas in (i) bar, (ii) torr. (25 points)**

**Thur_11/11/2021** **Best wishes** **Dr Abduljabbar I. R. Rushdi**

Q2

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

$\Rightarrow 1,00\ KSP * 4,00L = \frac{10000(mol)}{M(\frac{mol}{L})} 0,082\ mol^{-1}.atm.K^{-1} * 273K$

$\Rightarrow \frac{1,00\ KSP * 4,00\ M(mol)}{1000} = 10000 * 0,082\ atm + 273$ ?

$\Rightarrow$ $M = 0,95.440\ mol * KSP$ what is this

(2) $PV = \frac{m}{M}RT \Rightarrow 2,00(KSP) * 7.50(L) = \frac{10000(mol)}{M}(0,082)_{atm.K^{-1}.mol^{-1}} * 273K$

$\Rightarrow 15M = 223.860 \Rightarrow$ $14.924\ mol * KSP\ (M)$

(3) $PV = \frac{m}{M}RT \Rightarrow 3,00(KSP) * 11.75 = \frac{1000(mol)}{M}(0,082)_{mol^{-1}.atm.K^{-1}} * 273K$

$M = 61.350\ (mol * KSP)$ Q2 10/25

Q3 $P_1V_1 = V_2P_2$

$2 * 10^2(KSP) * 2.14\ dm^3 = 2.48\ dm^3 * P_2$ ($dm^3$ is not $V_1$)

$\Rightarrow P_2 = 1.725 * 10^2\ KSP = atm = P_{as}$ HOW? Q3 10/25

760 mm Torr = 1 atm

$P_2(Torr) = \frac{1.725 * 10^2(atm)}{760(atm.Torr)} =$ $2.270 * 10^2\ Torr$