Physical Chemistry_Chpt_One_Properties of Gases

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

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

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

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

1: If a gas has polar particles then the difference between the volume of this gas is:

Answer: a) $V_{Real} > V_{Perfect}$ b) $V_{Real} < V_{Perfect}$ c) $V_{Real} = V_{Perfect}$ d) $V_{Real} \neq V_{Perfect}$

2: A gas occupies 60×10^3 mL at 150 °C and 760 mmHg pressure. What would be its volume at STP?

Answer: a) 38.7 mL b) 38.7 dm^3 c) 38.7 L^{-1} d) 38.7 dm^{-3}

3: Calculate the weight of H_2O gas (18 $g.mol^{-1}$) in a 5 L cylinder at 10×10^2 kPa and 373 K.

Answer: a) 29.40 g mol^{-1} b) 29.40 g c) 29.40 mol d) 29.40 kg

4: Calculate the density of H_2O placed in a 22400 mL cylinder at 10^5 Pa and 0 °C.

Answer: a) 0.804 kg L^{-1} b) 0.804 g L^{-1} c) 0.804 g d) 0.804 L^{-1}

5: According to Graham's law the heaviest gas is?

Answer: a) H_2O b) CH_4 c) NH_3 d) Cl_2

6: A tank contains a certain amount of gas at 10^5 Pa. The gas is transferred to another tank 40 dm^3 with pressure of 200×10^3 Pa. What should be its volume?

Answer: a) 80 L b) 80 Pa L c) 80 Pa dm^3 d) 80 L^{-1}

7: According to Boyle's law the pressure of a gas is inversly proportional with?

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

8: The difference between real and ideal gas, that the real gas interested in?

Answer: a) V & p b) V & T c) p & n d) T & p

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

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

10: The behaviour of real gas is ideal when the value of Z is equal to

Answer: a) $V_m < V^O_m$ b) $V_m > V^O_m$ c) $V_m = V^O_m$ d) $V_m \neq V^O_m$

Q2: The following data have been observed for 800 mg of nitrogen gas at 273 K. Calculate the best value of the molar mass of N_2. (25 points)

$p/10^5$ Pa	0.750	0.500	0.200
V/dm^3	3.0	4.5	7.0

Q3: A perfect gas undergoes isothermal compression, which reduces its volume by 1.80 dm^3. The p_f and V_f of the gas are 2×10^2 kPa and 2.14 dm^3, respectively. Calculate the $p_{original}$ of the gas in (i) bar, (ii) torr. (25 points)

Wed_10/11/2021 Best wishes Dr Abduljabbar I. R. Rushdi

Q2 $m = 800\,mg \Rightarrow 0.8\,g$

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

$$M_1 = \frac{mRT}{P_1 V_1}$$

$$= \frac{0.8 \times 0.082 \frac{atm \cdot L}{mol \cdot K} \times 273\,K}{\frac{0.750 \times 10^5}{101325}\,atm \times 3\,L}$$

No need

$$= \frac{17.9088}{2.220577735}$$

$$M_1 = 8.064\,9296\ \frac{g}{mol}$$

$$M_2 = \frac{mRT}{P_2 V_2}$$

$$= \frac{17.9088}{\frac{0.500 \times 10^5}{101325} \times 4.5}$$

$$M_2 = 2.220\,577\,735\ \frac{g}{mol}$$

20

Q2 $M_3 = \frac{mRT}{P_3 V_3}$

$$= \frac{17.9088}{\frac{0.200 \times 10^5}{101325} \times 7}$$

$$M_3 = 1.381\,692\,573\ \frac{g}{mol}$$

Q3 $P_1 = ?$ $V_1 = 1.80\,dm^3$ $P_2 = 2 \times 10^2\,kPa$ $V_2 = 2.14\,dm^3$

$$\frac{P_1}{V_1} = \frac{P_2}{V_2}$$

10

Q4

$$\frac{P_1}{1.80\,dm^3} = \frac{2 \times 10^2\,kPa}{2.14\,dm^3}$$

$$\frac{P_1}{1.80} = 93.457$$

$$P_1 = 168.2226\,kPa$$

$$P_1 = \frac{168.2226\,kPa}{10^{-5}}$$

$$P_1 = 16822260\,atm$$

$$P_1 = 16822260\,bar$$

$$P_1 = 16822260\,atm \times 760\,torr$$

$$P_1 = 1.278 \times 10^{10}\,torr$$