F11

30/100 Thirty only

Physical Chemistry_Chpt_One_Properties of Gases

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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)**

Q1 10/50

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) $V_{Real} = V_{Perfect}$] 0/5 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] 0/5 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. 0 NO ANSWER
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}] 0/5 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] 0/5 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] 0/5 d) 80 L^{-1}

7: According to Boyle's law the pressure of a gas is inversly proportional with?
Answer: [✓ a) p] 0 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] 5/5 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] 5/5

10: The behaviour of real gas is ideal when the value of Z is equal to
Answer: a) $V_m < V^O_m$ [✓ b) $V_m > V^O_m$] 0/5 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 - $PV = \frac{m}{M} RT$? ≡ units

$$0.750 \times 3 = \frac{\overset{9.8g}{800mg}}{M} \times 0.082 \times 273$$

$$M = \frac{800 \times 0.082 \times 273}{0.750} = 23.8 \text{ mol}$$

g/mol

Q2 $\frac{10}{25}$

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

$$M = \frac{mRT}{PV} \Rightarrow M = \frac{800mg \times 0.082 \times 273}{0.500 \times 10^5 \times 4.5} = 230 \text{ mol}$$

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

$$M = \frac{mRT}{PV} \Rightarrow M = \frac{800 \times 0.082 \times 273}{0.200 \times 10^5 \times 7} = 6.26 \text{ mol}$$

Q3

$V_2 = 1.80$
$P_2 = ?$
$V_1 = 2.14$
$P_1 = 2 \times 10^2$

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

$$\frac{2 \times 10^2}{2.14} = \frac{P_2}{1.80}$$

$$P_2 = \frac{2 \times 10^2 \times 1.80}{2.14} = 168.22$$

Q3 $\frac{10}{2}$