



F39

Physical Chemistry_Chpt_One_Properties of Gases

Handwritten notes and signatures in red ink, including '25-11-2021', '1 hour', 'Jabab', and 'Dr. Abduljabbar I. R. Rushdi'.

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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 CO₂ gas (44 g mol⁻¹) in a 0.5 × 10⁴ mL cylinder at 20 × 10² kPa and 25 °C.

Answer: a) 180 g mol⁻¹ b) 180 g c) 180 mol d) 180 kg

3: Calculate the density of CO₂ placed in a 22.4 × 10³ mL cylinder at 20 × 10² 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 dm³ at 90 °C and 760 torr pressure. What would be its volume at STP?

Answer: a) 15.04 mL b) 15.04 dm³ c) 15.04 L⁻¹ d) 15.04 dm⁻³

6: A vessel contains a certain amount of gas at 80 × 10⁵ Pa. The gas is transferred to another tank 20 dm³ with pressure of 20 × 10⁵ Pa. What should be its volume?

Answer: a) 0.5 L b) 0.5 Pa L c) 0.5 Pa dm³ 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 CO₂ gas at 273 K. Calculate the best value of the molar mass of CO₂. (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 dm³. The p_i and V_i of the gas are 2 × 10² kPa and 2.14 dm³, 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 /

$$P \cdot M \cdot wt = \frac{m}{V} R T$$

? = units

$$P = 1 \times 10^2 \text{ kPa}$$

$$V = 4.00 \text{ L}$$

$$m = 10000 \text{ mg}$$

$$T = 273 \text{ K}$$

$$\textcircled{1} \quad M \cdot wt = \frac{10000}{4.00} \times 0.082 \times 273$$

$$M \cdot wt = \frac{2.5 \times 0.082 \times 273}{1 \times 10^2}$$

$$M \cdot wt = 5.5 \text{ g mol}^{-1}$$

$$\frac{\text{mg}}{\text{L}} \times \frac{\text{L} \cdot \text{atm}}{\text{K} \cdot \text{mol}} \times \text{K}$$

= g

$$P = 2 \times 10^2 \text{ kPa}$$

$$V = 7.5 \text{ L}$$

②

$$M \cdot wt = \frac{10000}{7.5} \times 0.082 \times 273$$

$$M \cdot wt = \frac{29.8}{2 \times 10^2} \Rightarrow M \cdot wt = 1.49 \text{ g mol}^{-1}$$

$$P = 3 \times 10^2 \text{ kPa}$$

$$V = 11.75 \text{ L}$$

$$\textcircled{3} \quad M \cdot wt = \frac{10000}{11.75} \times 0.082 \times 273$$

$$M \cdot wt = \frac{19.05}{3 \times 10^2} \Rightarrow M \cdot wt = 635.0 \text{ g mol}^{-1}$$

Q3 /

$$P_i V_i = P_f V_f$$

①

$$(2 \times 10^2)(2.14) = P_f (2.48)$$

$$P_f = \frac{428}{2.48} \Rightarrow P_f = 172.5 \text{ kPa}$$

$$\text{kPa} \cdot \text{dm}^3 = \text{Pa} \cdot \text{dm}^3$$

$$1 \text{ kPa} = 1 \text{ bar} \Rightarrow P_f = 172.5 \text{ bar}$$

②

$$1 \text{ kPa} = 760 \text{ torr} \Rightarrow 172.5 \times 760$$

$$P_f = 131000 \text{ torr}$$

is not V_f

Q3 / 25