P11

55/100 Fifty five

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)

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

Zainab Ali Hassan (A2)

Q2:-

$P_v = nRT$

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

$P = 0.750$ Pa $1\,Pa = 1\,atm$

$V = 3.0\ dm^3$ $V = 3 \times 1000 = 3000\ L$

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

$T = 273\ K$

$0.750\ atm \times 3000\ L = \frac{0.8\ g}{M} \times 0.082 \times 273\ K$? = units

$225 = \frac{17.9}{M}$

$M_{N_2} = \frac{17.9}{225} = 0.079\ M$

$Pv = nRT \Rightarrow Pv = \frac{m}{M} RT$

$0.500\ atm \times 4500\ L = \frac{0.8\ g}{M} \times 0.082 \times 273\ K$

$P = 0.500\ atm$

$V = 4.5 \times 1000 \Rightarrow 4500\ L$

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

$T = 273\ K$

$2250 = \frac{17.9}{M}$

$M_{N_2} = 7.95\ M$

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Q2 25

$Pv = nRT$

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

$P = 0.200$

$V = 7.0 \times 1000 \Rightarrow 7000$

$m = 800\ mg \Rightarrow 0.8$

$0.200\ atm \times 7000\ L = \frac{0.8\ g}{M} \times 0.082 \times 273\ K$ $T = 273\ K$

$1400 = \frac{17.9}{M}$

$M_{N_2} = 0.012\ M$

Q3!

$P_1V_1 = P_2V_2$

P_1 (kPa) $\times$ 1800 L $= 2 \times 10^2$ (kPa) $\times$ 2140 L

$V_1 = 1.80 \times 1000 \Rightarrow 1800$ L

$P_2 = 2 \times 10^2$ kPa

$V_2 = 2.14 \times 1000 \Rightarrow 2140$ L

$P_1 = \frac{2 \times 10^2 \times 2140}{1800}$? ? = units

$P_1 = \frac{4280 \times 10^2}{1800}$

$P_1 = 2.37 \times 10^2$ kPa

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$P_1 = 0.237$ Pa

$= 237 \times 10^{-3}$

$\therefore P_1 = 0.237$ bar

1 Pa = 1 atm

1 atm = 1 bar

kbar $\rightarrow$ bar

$P_1 = \frac{0.237}{750} = 3.16 \times 10^{-4}$ Torr

$\therefore P_1 = 3.16 \times 10^{-4}$ Torr

1 Pa $\rightarrow$ Torr

$\div 750$