



F43

Physical Chemistry\_Chpt\_One\_Properties of Gases

25-11-21  
45/100  
Fourty five  
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1<sup>st</sup> Exam-paper €

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  $60 \times 10^3$  mL at  $150^\circ\text{C}$  and  $760$  mmHg pressure. What would be its volume at STP?

Answer:  a)  $38.7$  mL     b)  $38.7$  dm<sup>3</sup>     c)  $38.7$  L<sup>-1</sup>     d)  $38.7$  dm<sup>-3</sup>

3: Calculate the weight of H<sub>2</sub>O gas ( $18 \text{ g mol}^{-1}$ ) in a  $5$  L cylinder at  $10 \times 10^2$  kPa and  $373$  K.

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

4: Calculate the density of H<sub>2</sub>O placed in a  $22400$  mL cylinder at  $10^5$  Pa and  $0^\circ\text{C}$ .

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

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

Answer:  a) H<sub>2</sub>O     b) CH<sub>4</sub>     c) NH<sub>3</sub>     d) Cl<sub>2</sub>

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

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

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)  $V_m < V_m^0$      b)  $V_m > V_m^0$      c)  $V_m = V_m^0$      d)  $V_m \neq V_m^0$

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<sub>2</sub>. (25 points)

p/10 <sup>5</sup> Pa	0.750	0.500	0.200
V/dm <sup>3</sup>	3.0	4.5	7.0

Q3: A perfect gas undergoes isothermal compression, which reduces its volume by  $1.80 \text{ dm}^3$ . The p<sub>i</sub> and V<sub>f</sub> of the gas are  $2 \times 10^2$  kPa and  $2.14 \text{ dm}^3$ , respectively. Calculate the p<sub>original</sub> of the gas in (i) bar, (ii) torr. (25 points)

Wed 10/11/2021

Best wishes

Dr Abduljabbar I. R. Rushdi

Q2

800 mg  $\Rightarrow$  0.8g

But how?  
?  $\equiv$  Units

①  $PV = nRT$

$0.75 \times 7 = n \times 0.082 \times 273$

$n = \frac{22.386}{2.25}$

$n = 9.9$  22.386

$n = \frac{m}{M}$

$9 \times \frac{0.8}{M}$

$M = 0.08 \text{ g/mol}$

X

②  $PV = nRT$

$0.5 \times 4.5 = n \times 0.082 \times 273$

$n = \frac{2.25}{2.25}$

$n = 1$

$n = \frac{m}{M}$

$1 \times \frac{0.8}{M}$

$M = 0.01 \text{ g/mol}$

X

Q2  
10  
25

③  $PV = nRT$

$0.2 \times 7 = n \times 0.082 \times 273$

$n = \frac{14}{2.25}$

$n = 0.6$

$n = \frac{m}{M}$

$0.6 \times \frac{0.8}{M}$

$M = 1.3 \text{ g/mol}$

$P = 0.2$   $V = 7$   
best value

Q3)  $P_f = 2 \times 10^2 \text{ kPa}$   $V_f = 2.14 \text{ dm}^3$

$V_i = X - 1.80$

$X = V_f - V_i$

$X = 2.14 - 1.80$

$X = 0.34$

$V_i = 0.34 \text{ dm}^3$

$P_i \times V_i = P_f \times V_f$

$P_i \times 0.34 = 2 \times 10^2 \times 2.14$

$P_i = \frac{2 \times 10^2 \times 2.14}{0.34}$

$P_i = 12 \text{ kPa}$

$P_i = 12 \times 101.3 \text{ bar}$

$P_i = 12 \times 760 \text{ Torr}$

Q3  
10  
25