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Physical Chemistry\_Chpt\_One\_Properties of Gases

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1<sup>st</sup> Exam-paper D

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  $CO_2$  gas ( $44 \text{ g.mol}^{-1}$ ) in a  $0.5 \times 10^4 \text{ mL}$  cylinder at  $20 \times 10^2 \text{ kPa}$  and  $25^\circ\text{C}$ .

Answer: a)  $180 \text{ g mol}^{-1}$     b) 180 g    c)  $180 \text{ mol}$     d) 180 kg

3: Calculate the density of  $CO_2$  placed in a  $22.4 \times 10^3 \text{ mL}$  cylinder at  $20 \times 10^2 \text{ kPa}$  and  $298 \text{ K}$ .

Answer: a)  $36.06 \text{ kg L}^{-1}$     b)  $36.06 \text{ g L}^{-1}$     c)  $36.06 \text{ g}$     d)  $36.06 \text{ L}^{-1}$

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  $20 \text{ dm}^3$  at  $90^\circ\text{C}$  and  $760 \text{ torr}$  pressure. What would be its volume at STP?

Answer: a)  $15.04 \text{ mL}$     b)  $15.04 \text{ dm}^3$     c)  $15.04 \text{ L}^{-1}$     d)  $15.04 \text{ dm}^3$

6: A vessel contains a certain amount of gas at  $80 \times 10^5 \text{ Pa}$ . The gas is transferred to another tank  $20 \text{ dm}^3$  with pressure of  $20 \times 10^5 \text{ Pa}$ . What should be its volume?

Answer: a) 0.5 L    b) 0.5 Pa L    c)  $0.5 \text{ Pa dm}^3$     d)  $0.5 \text{ L}^{-1}$

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  $CO_2$  gas at  $273 \text{ K}$ . Calculate the best value of the

molar mass of  $CO_2$ .

p/ $10^2 \text{ kPa}$	1.00	2.00	3.00
V/L	4.00	7.50	11.75

(25 points)

Q3: A perfect gas undergoes isothermal expansion, which increases its volume by  $2.48 \text{ dm}^3$ . The  $p_i$  and  $V_i$  of the gas are  $2 \times 10^2 \text{ kPa}$  and  $2.14 \text{ dm}^3$ , respectively. Calculate the  $p_f$  of the gas in (i) bar, (ii) torr. (25 points)

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Best wishes

Dr Abduljabbar I. R. Rushdi

Q 2 / Sol:-

$$m_{CO_2} = 10000 \text{ mg}$$

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

$$= 10 \times 10^6 \text{ g}$$

$$1- P = 1 \text{ kPa}$$

$$P = 1 \times 10^{-3} \text{ atm}$$

$$V = 4 \text{ L}$$

$$M = ?$$

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

$$(10^{-3} \text{ atm})(4 \text{ L}) = \frac{10 \times 10^6 \text{ g}}{M} (0.082 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}}) (273 \text{ K})$$

$$4 \times 10^{-3} = \frac{223860000}{M} \Rightarrow M = 55965 \times 10^{10} \text{ g/mol}$$

$$2- P = 2 \text{ kPa}$$

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

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

$$(2 \times 10^{-3} \text{ atm})(7.5 \text{ L}) = \frac{223860000}{M}$$

$$0.015 = \frac{223860000}{M}$$

$$M = 1.4924 \times 10^{10}$$

Q 2  $\frac{10}{25}$

Q 3  $\frac{0}{25}$

NO ANSWER

Why?