Physical Chemistry_Chpt_One_Properties of Gases

Name of a student ------------------------------ -Signature ------------------------- No. -----------

University of Mustansiriyah   1st Semester-2021

Department of Chemistry   1st Exam-paper A

Q1: Circle the right answer for all of the following: (50 points)

1: If a gas has a non-polar particle 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 300000 mL at 130 °C and 760 mmHg pressure. What would be its volume at STP?

Answer: a) 203.22 mL   b) 203.22 dm³   c) 204 L   d) 204 dm³

3: Calculate the weight of CH_4 (16 g.mol⁻¹) in a 10 L cylinder at 15 x 10⁵ Pa and 307 K.

Answer: a) 95.33 g mol⁻¹   b) 95.33 g   c) 95.33 mol   d) 95.33 kg

4: Calculate the number of moles for CH_4 in a 10000 mL cylinder at 10⁶ Pa and 32 °C.

Answer: a) 4.5 mol   b) 4.0 mol   c) 4.0 mmol   d) 4.5 mmol

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

Answer: a) H_2O b) CH_4 c) NH_3 d) CO

6: A 20 L tank contains a certain amount of gas at 10⁵ Pa. The gas is transferred to another tank 40 dm³. What should be its pressure?

Answer: a) 0.50 atm   b) 50 dm³   c) 50 atm   d) 0.50 mmHg

7: According to the Avogadro's law the amount of a substance is directly proportional with?

Answer: a) p   b) T   c) R   d) V   e) n

8: The difference between real and ideal gas is one of the following?

Answer: a) law p & high T   b) high p & law T   c) high p & high T   d) law p & law T

9: It can know the density of a gas by applying one of the following?

Answer: a) Van der Waal's law   b) Graham's law   c) Charles's law   d) Gay-Lussac's law

10: If V_m is bigger than V^0_m then this means the behaviour of a gas is?

Answer: a) Real   b) Ideal   c) Real & ideal   d) Z < 1

Q2: A (28 mol) gas sample has a mass of 10000 mg. The volume of a container is 22 dm³ at a temperature of 76 °C and a pressure of 641 Torr. What is the density of the gas?   (25 points)

Q3: An Ar gas is placed in a container at 30 °C at a pressure of 730 torr. What is the volume of the container in ml?   (25 points)

09/11/2021   Best wishes   Dr Abduljabbar I. R. Rushdi

Q2/ $n = 28 \, mol$; $M = 10000 \, mg$, $V = 22 \, dm^3$, $T = 76°C$ المطلوب $d = ?$, $P = 641 \, Torr$

~~molar mass~~ not mass

$$PM = dRT$$

نحول الضغط من Torr الى atm

$$atm = \frac{641 \, Torr}{760 \, Torr}$$
$$= 0.84 \, atm$$

$0.84 \, atm \times 10g = d \times 0.082 \, L \cdot atm/mol \cdot K \times 349 K$

$$d = \frac{0.84 \, atm \times 10g}{0.082 \, L \cdot atm/mol \cdot K \times 349 K}$$

نحول الكتلة من mg الى g

$$m = \frac{10000}{1000} = 10 g$$

$$d = 0.29 \, mol \cdot g^{-1}/L$$

نحول الحرارة $T = T°C + 273$

$$\frac{20}{25} \quad Q_2$$

$= 76 + 273$
$= 349 K$

Q3 $T = 30°C$, $P = 730 \, Torr$ المطلوب C

$$PV = nRT$$

نحول الضغط من Torr الى m

$0.9 \, atm \times V = 1 \, mol \times 0.082 \, L \cdot atm/mol \cdot K \times 303 K$

$atm = \frac{730}{760} = 0.9 \, atm$

$$V = \frac{0.9 \, atm}{1 \, mol \times 0.082 \, L \cdot atm/mol \cdot K \times 303 K}$$

نحول درجة الحرارة

$$V = 0.03 L$$

$$T = T°C + 273$$

نحول الحجم من L الى mL

$$\frac{15}{25} \quad Q_3$$

$= 30 + 273$

$$V = 0.03 \times \frac{1000}{1000}$$

$= 303 K$

$= 30 \, mL$