Physical Chemistry-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 degrees)

1: A vessel of 100 L capacity contains a certain amount of gas at 50 °C and 0.5 bar pressure. The gas is transferred to another vessel has a pressure of 5 bar at 50 °C. What should be the volume of the vessel?

Answer: a) 10 bar   b) 10 dm³   c) 0.1 dm³   d) 0.1 bar

2: What is the right formula of the Graham's law of effusion?

Answer: a) $\frac{r_1}{t_2} = (\frac{r_2}{M_1})^{\frac{1}{2}}$ b) $\frac{r_1}{r_2} = (\frac{M_1}{M_2})^{\frac{1}{2}}$ c) $\frac{d_1}{d_2} = (\frac{M_2}{M_1})^{\frac{1}{2}}$ d) $\frac{r_1}{r_2} = (\frac{d_2}{M_1})^{\frac{1}{2}}$

3: Calculate Z for a gas if T is 22 °C, V_m is 5 dm³ mol⁻¹ and p is 3 bar.

Answer: a) 0.62 °C   b) 6.2 K   c) 0.62   d) 6.2

4: Calculate the molar mass of O_2 (16 g.mol⁻¹) in a 4 L cylinder at 9 atm and 281 K.

Answer: a) 32 g.mol⁻¹   b) 32 g   c) 50 g.mol⁻¹   d) 50 g

5: Calculate the $V°_m$ of a gas, if p is 1 atm and temperature is 32 °C.

Answer: a) 25 K   b) 25 atm   c) 25 L mol⁻¹   d) 25 mol

6: If the attraction forces are negligible, that means the gas is?

Answer: a) real   b) noble   c) perfect   d) expands

7: According to the Dalton's law the unit of the mole fraction is?

Answer: a) mol   b) dm³   c) psi   d) free of units

8: What is the partial pressure of a gas in a mixture if the X_i is 0.1, and under atmospheric pressure?

Answer: a) 760 mmHg   b) 10 bar   c) 0.1 atm   d) 1 bar

9: If the value of R is 0.082 then the unit of pressure is?

Answer: a) Pascal   b) mmHg   c) Psi   d) bar

10: What is the right equation of one of the following?

Answer: a) $p_r p_c = p$ b) $p_r p = p_c$ c) $p_r / p_c = p$ d) $p_r = p_c p$

Q2: Calculate the mass of 335 mL of sulfur dioxide (64 g mol⁻¹) measured at 37 °C and 745 mm Hg pressure.? (25 degrees)

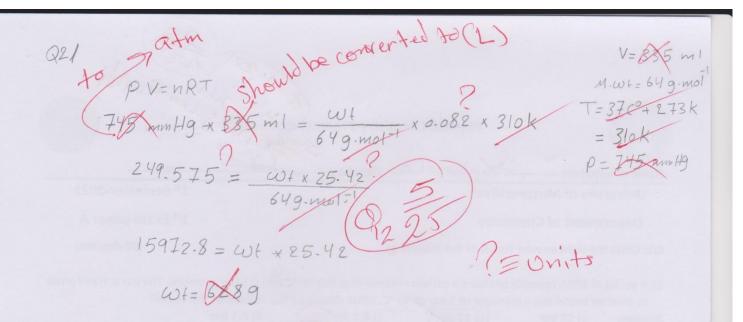**Q3:** Calculate the volume of 0.25 g of oxygen at 25 °C and 742 mm Hg pressure. (25 degrees)

Wed_20/01/2021   **Best wishes**   **Dr Abduljabbar I. R. Rushdi**

Q2/

to → atm

should be converted to (L)

V = ~~835~~ ml

M.wt = 64 g.mol⁻¹

$PV = nRT$

$$745 \text{ mmHg} \times 835 \text{ ml} = \frac{wt}{64 \text{ g.mol}^{-1}} \times 0.082 \times 310k$$

? (over 835)
? (over fraction)
? (over 0.082)

T = 37C° + 273k
= 310k
P = ~~745~~ mmHg

$$249.575 \text{ ?} = \frac{wt \times 25.42 \text{ ?}}{64 \text{ g.mol}^{-1}}$$

(Q2 5/25) (circled)

$$15972.8 = wt \times 25.42$$

? = units

$$wt = \cancel{628} \text{ g}$$

Q3/

$pV = nRT$

V = ?

Wt = 0.25 g

$$742 \times V = \frac{0.25}{16\,?} \times 0.082 \times 298 \text{↑}$$

? (over 742) ? (over 0.082) ? (over 298)

T = 25 + 273
= 298 k
P = 742 mmHg

$$742 \times V = 0.38$$

$$V = \frac{0.38}{742}$$

(Q3 5/25) (circled)

$$V = 0.0005 \text{ ml}$$

Q2/

to → atm

should be converted to (L)

V = ~~855~~ ml
M.wt = 64 g.mol⁻¹
T = 37C° + 273k
= 310k
P = ~~745~~ ~~mmHg~~

$$PV = nRT$$

$$~~745~~ \, mmHg \times ~~855~~ \, ml = \frac{wt}{64 g.mol^{-1}} \times 0.082 \times 310k$$ (?)

$$249.575 \, (?) = \frac{wt \times 25.42 \, (?)}{64 g.mol^{-1}}$$

(?) ≡ units

$$15972.8 = wt \times 25.42$$

$$wt = ~~628~~ \, g$$

(circled: Q₂ 5/25)

Q3/

V = ?
wt = 0.25 g
T = 25 + 273
= 298 k
P = 742 mmHg

$$pV = nRT$$

$$742 \times V = \frac{0.25 \,(?)}{16 \,(?)} \times 0.082 \times 298 \,(?)$$

$$742 \times V = 0.38$$

$$V = \frac{0.38}{742}$$

$$V = 0.0005 \, ml$$

(circled: Q₃ 5/25)