حل البنك المؤتمت لبحث الغازات

قسم الطالب المبتدئ

1) B 2) C 3) A
4) A 5) C 6) B
7) B 8) C 9) C
10) B 11) D 12) B
13) D 14) D 15) B
16) B 17) C 18) A
19) C 20) C 21) B
22) A 23) B 24) B
25) A 26) B 27) D
28) C 29) C

المدرس فراس قلعه جي
إجازة في العلوم الفيزيائية والكيميائية
دبلوم في التأهيل التربوي
٠٩٨٨٤٤٠٥٧٤

قسم الطالب المتوسط

1) $P_2 = 3P_1$

$P_1V_1 = P_2V_2 \Rightarrow P_1V_1 = 3P_1V_2$

$\Rightarrow V_2 = \frac{1}{3}V_1$ الجواب: (C)

2) $V_2 = 4V_1$

$P_1V_1 = P_2V_2 \Rightarrow P_1V_1 = P_2 \times 4V_1$

$P_2 = \frac{1}{4}P_1 = \frac{1}{4}(2) = 0.5\ atm$ (D)

قسم الطالب المتقدم

1) C

2) $\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{8}{(27+273)} = \frac{V_2}{(54+273)}$

$\frac{8}{300} = \frac{V_2}{327} \Rightarrow V_2 = \frac{8 \times 327}{300} = 8.72\ L$

3) $P_1V_1 = P_2V_2$

$3.6 \times 10^5 \times 2.4 = 1.2 \times 10^6 V_2$

$V_2 = \frac{3.6 \times 10^5 \times 2.4}{1.2 \times 10^6} = 0.72\ m^3$

الجواب (B)

4) $P_t = P_1 + P_2 = 4 + 6 = 10\ atm$

الجواب (C)

5) $V = 2 \times 22.4 = 44.8\ L$

الجواب (B)

6) $\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{10}{27+273} = \frac{V_2}{327+273}$

$\frac{10}{300} = \frac{V_2}{600} \Rightarrow V_2 = \frac{600 \times 10}{300}$

$V_2 = 20\ mL$ الجواب (C)

7) $d = \frac{PM}{RT} \Rightarrow M = \frac{dRT}{P}$

$M = \frac{0.5 \times 0.082 \times (0+273)}{1}$

$M = 11.193\ g.mol^{-1}$ (D)

8) $P_1V_1 = P_2V_2$

$5 \times 10^3 \times 3 = 1.5 \times 10^5 V_2$

$V_2 = \frac{5 \times 10^3 \times 3}{1.5 \times 10^5} = 0.1\ L$ (C)

(11
$PV = nRT \Rightarrow n = \frac{PV}{RT}$
$n = \frac{4.1\times10^{6}\times10^{-5}\times2.4}{0.082\times(327+273)} = 2\ mol$ (C)

(12
$PV = nRT \Rightarrow n = \frac{PV}{RT}$
$n = \frac{1\times24.6}{0.082\times300} = 1\ mol$ (C)

(13
$3O_2 \longrightarrow 2O_3$
$\frac{V_1}{n_1} = \frac{V_2}{n_2} \Rightarrow \frac{24.6}{3} = \frac{V_2}{2}$
$V_2 = \frac{24.6\times2}{3} = 16.4\ L$ (B)

(14
$PV = nRT \Rightarrow n = \frac{PV}{RT}$
$n = \frac{4.1\times10^{6}\times10^{-5}\times2.4}{0.082\times285} = 4.21\ mol$ (D)

(15
$P_1V_1 = P_2V_2$
$4.1\times10^{6}\times10^{-5}\times2.4 = 1.2\times10^{4}\times10^{-5}V_2$
$V_2 = \frac{4.1\times10^{6}\times10^{-5}\times2.4}{1.2\times10^{4}\times10^{-5}} = 820\ L$ (A)

(16
$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{2.4}{285} = \frac{V_2}{1140}$
$V_2 = \frac{2.4\times1140}{285} = 9.6\ L$ (B)

(17
$\frac{P_1}{T_1} = \frac{P_2}{T_2}$
$\frac{4.1\times10^{6}}{285} = \frac{P_2}{570} \Rightarrow$
$P_2 = \frac{4.1\times10^{6}\times570}{285} = 8.2\times10^{6}\ Pa$ (D)

(18
$d = \frac{PM}{RT} \Rightarrow M = \frac{dRT}{P}$
$M = \frac{1.5\times0.082\times288}{20.5} = 1.728\ g\,mol^{-1}$ (C)

قسم الطالب النجيب

(1
$\frac{P_1}{T_1} = \frac{P_2}{T_2} \Rightarrow \frac{4}{40} = \frac{P_2}{200} \Rightarrow$
$P_2 = \frac{4\times200}{40} = 20\ m^3$ (D)

(2
$PV = nRT \Rightarrow n = \frac{PV}{RT}$
$n = \frac{4.1\times4}{0.082\times400} = 0.5\ mol$ (B)

(3
$PV = nRT \Rightarrow n = \frac{PV}{RT}$
$n = \frac{4100\times10^{3}\times10^{-5}\times100}{0.082\times1000} = 50\ mol$
$n = \frac{m}{M} \Rightarrow m = n\times M = 50\times2$
$m = 100\ g$ (B)

3)

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2 \uparrow$$

65   22.4 L

m 4480×10^3

$$m = \frac{65 \times 4480 \times 10^3}{22.4} = 13 \times 10^6 \, g$$

$= 13$ ton   (B)

4)

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow$$

$$\frac{400 \times 2}{1092} = \frac{1 \times V_2}{(0 + 273)} \Rightarrow$$

$$V_2 = \frac{800 \times 273}{1092} = 200 \, L$$ (B)

5)

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow$$

$$\frac{120 \times 10}{600} = \frac{P_2 \times 25}{498} \Rightarrow$$

$$P_2 = \frac{1200 \times 498}{600 \times 25} = 39.84 \, atm$$ (B)

6)

$$n = \frac{\text{عدد الجزيئات}}{\text{عدد أفوكادرو}} = \frac{24.088 \times 10^{23}}{6.022 \times 10^{23}} = 4 \, mol$$

$$PV = nRT \Rightarrow V = \frac{nRT}{P} = \frac{4 \times 0.082 \times 400}{0.82 \times 10^{-5}}$$

$V = 16 \times 10^6 \, L$ (A)

7) حسب قانون أفوغادرو الثاني فإن
المول الواحد من أي غاز يشغل الحجم نفسه
في الشروط المتماثلة من الضغط ودرجة الحرارة

$V_A = V_B = 2L$ (C)

8) نسبة الغاز الشارد 10% أي
كل $100 \, m^3$ من غاز الهيدروجين يبقى منه $90 \, m^3$

$4032 \, m^3$ $V \, m^3$

$$V = \frac{100 \times 4032}{90} = 4480 \, m^3$$

9)

$$d = \frac{PM}{RT} \Rightarrow M = \frac{dRT}{P}$$

$$M = \frac{0.44 \times 0.082 \times 273}{1} = 9.84 \, g \, mol^{-1}$$

(B)

10)

$$M = \frac{dRT}{P} = \frac{0.44 \times 0.082 \times 288}{10}$$

$M = 1.03 \, g.mol^{-1}$ (A)

11)

$$\frac{v_A}{v_B} = \sqrt{\frac{M_B}{M_A}} \Rightarrow \frac{v_A}{4 \times 10^{-2}} = \sqrt{\frac{2}{32}}$$

$$v_A = 4 \times 10^{-2} \times \frac{1}{4} = 10^{-2} \, m.s^{-1}$$

$v_B = 4v_A$ $v_B > v_A$

لذلك يصل إلى منتصف الأنبوب الغاز B

12)

$$n_{CH_4} = \frac{m}{M} = \frac{64}{16} = 4 \, mol$$

$$PV = nRT \Rightarrow V = \frac{nRT}{P}$$

$$V_{CH_4} = \frac{4 \times 0.082 \times 200}{82} = 0.8 L$$

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

$$CH_4 \; \frac{V_1}{n_1} = \frac{V_2}{n_2} CO_2 \Rightarrow \frac{0.8}{1} = \frac{V_2}{1} \Rightarrow$$

حجم CO_2 $V_2 = 0.8 L$ (D)

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٠٩٨٨٤٤٠٥٧٤

(13

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

16g 44g

8g mg

$m = \frac{44 \times 8}{16} = 176\ g$ (B)

(14

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

16g 2mol

8g nmol

$n = \frac{2 \times 8}{16} = 1\ mol$

$PV = nRT \Rightarrow P = \frac{nRT}{V}$

$P = \frac{1 \times 0.082 \times 300}{0.6} = 41\ atm$ (C)

(15

$PV = nRT \Rightarrow n = \frac{PV}{RT}$

$n = \frac{4.1 \times 10}{0.082 \times 400} = 1.25\ mol$ (D)

(16

$n = \frac{\text{عدد الجزيئات}}{\text{عدد أفوكادرو}} = \frac{12.044 \times 10^{23}}{6.022 \times 10^{23}} = 2\ mol$

$P = \frac{nRT}{V} = \frac{2 \times 0.082 \times 283}{2}$

$P = 23.206\ atm$ (C)

(17

$n_{C_2H_6} = \frac{m}{M} = \frac{15}{30} = 0.5\ mol$

$V_{C_2H_6} = \frac{nRT}{P} = \frac{0.5 \times 0.082 \times 200}{41}$

$V = 0.2\ mol$

(18

$C_2H_6 + \frac{7}{2}O_2 \rightarrow 2CO_2 + 3H_2O$

30g 2×44g

15g mg

$m = \frac{2 \times 44 \times 15}{30} = 44\ g$ (C)

(19

$C_2H_6 + \frac{7}{2}O_2 \rightarrow 2CO_2 + 3H_2O$

30g $\frac{7}{2}$ mol

12g n mol

$n_{O_2} = \frac{\frac{7}{2} \times 12}{30} = 1.4\ mol$

$P = \frac{nRT}{V} = \frac{1.4 \times 0.082 \times 300}{0.7}$

$P = 49.2\ atm$ (D)

تم الطالب طلتوت

(1

$n_A = \frac{m}{M} = \frac{4}{2} = 2\ mol$

$n_B = \frac{m}{M} = \frac{4}{4} = 1\ mol$

$A + B \rightarrow AB$ للتفاعل يبقى في نهاية التفاعل 1mol من A

$P = (n_A)\frac{RT}{V} = (1)\frac{0.082 \times 293}{41}$

$P_t = 0.586\ atm$ (A)

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2)

$$2NH_3 \rightleftharpoons N_2 + 3H_2$$

2 mol — 1 — 3

0.5 mol — n_1 — n_2

$$n_{N_2} = \frac{1 \times 0.5}{2} = 0.25\ mol$$

$$n_{H_2} = \frac{3 \times 0.5}{2} = 0.75\ mol$$

الجواب (C)

3)

$$2NH_3 \rightleftharpoons N_2 + 3H_2$$

حسب قانون أفوغادرو الثاني:

$$\frac{V_{NH_3}}{n_{NH_3}} = \frac{V_{N_2}}{n_{N_2}} = \frac{V_{H_2}}{n_{H_2}}$$

اعتماداً على معطيات السؤال (2)

$$\frac{24}{0.5} = \frac{V_{N_2}}{0.25} = \frac{V_{H_2}}{0.75} \Rightarrow$$

$$V_{N_2} = \frac{\frac{1}{4} \times 24}{0.5} = 12\ L$$

$$V_{H_2} = \frac{\frac{3}{4} \times 24}{0.5} = 36\ L$$

الجواب (C)

4)

$$n_{H_2} = \frac{PV}{RT} = \frac{20.5 \times 2}{0.082 \times 500} = 1\ mol$$

كل 100 mol يحوي 20 mol H_2 و 80 mol NH_3

n_{NH_3} — 1 mol

$$n_{NH_3} = \frac{80 \times 1}{20} = 4\ mol$$

$$m_{NH_3} = n \times M = 4 \times 17 = 68\ g \quad (C)$$

5) اعتماداً على السؤال رقم (4)

$$P_t = (n_1 + n_2)\frac{RT}{V} = (1+4)\frac{0.082 \times 500}{2}$$

$$P_t = 102.5\ atm \quad (D)$$

6)

$$n_{CH_4} = \frac{m}{M} = \frac{3.2}{16} = 0.2\ mol$$

$$n_{CO_2} = \frac{m}{M} = \frac{2.2}{44} = 0.05\ mol$$

$$P_t = n_t \frac{RT}{V} \Rightarrow 7.2 = n_t \frac{0.082 \times 400}{2.05}$$

$$n_t = \frac{7.2 \times 2.05}{0.082 \times 400} = 0.45\ mol$$

$$n_{مجهول} = n_t - (n_1 + n_2)$$

$$= 0.45 - (0.2 + 0.05) = 0.45 - 0.25$$

$$= 0.2\ mol \quad (B)$$

7)

$$NH_3 + HCl \rightarrow NH_4Cl$$

$$n_{NH_3} = \frac{m}{M} = \frac{34}{17} = 2\ mol$$

$$n_{HCl} = \frac{m}{M} = \frac{91.25}{36.5} = 2.5\ mol$$

نفضنا أنه بعد التفاعل يتبقى 0.5 mol من HCl

$$P = \frac{nRT}{V} = \frac{0.5 \times 0.082 \times 300}{4.1}$$

$$P = 3\ atm \quad (A)$$

8)

$$n_{H_2} = \frac{PV}{RT} = \frac{4.1 \times 10}{0.082 \times 100} = 5\ mol$$

كل 100 mol مزيج يحوي 40 mol H_2 و 60 mol N_2

n — 5 mol

$$n_{N_2} = \frac{60 \times 5}{40} = 7.5\ mol$$

$$P_t = (n_1 + n_2)\frac{RT}{V} = (5 + 7.5)\frac{0.082 \times 100}{10}$$

$$P_t = 10.25\ atm \quad (B)$$

(9
$$NH_3 + HCl \rightarrow NH_4Cl$$
$$n_{NH_3} = \frac{m}{M} = \frac{34}{17} = 2\,mol$$

NH_3	+ HCl	→ NH_4Cl
1 mol		53.5
2 mol		m g

$$m = \frac{53.5 \times 2}{1} = 107\ g \quad (A)$$

(10
$$n_{H_2} = \frac{PV}{RT} = \frac{20.5 \times 4}{0.082 \times 500}$$
$$n_{H_2} = 2\,mol$$

كل 100 mol يوجد
80 mol O_2 ، 20 mol H_2 مزيج

n_{O_2} — 2 mol

$$n_{O_2} = \frac{80 \times 2}{20} = 8\,mol$$

$$P_t = (n_1 + n_2)\frac{RT}{V} = \frac{(2+8)\ 0.082 \times 500}{4}$$
$$P_t = 102.5\ atm$$

(11
$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$$
$$n_{C_6H_{12}O_6} = \frac{m}{M} = \frac{36}{180} = 0.2\,mol \Rightarrow$$
$$V = \frac{nRT}{P} = \frac{0.2 \times 0.082 \times 200}{0.5} = 6.561$$
$$\frac{V_{C_6H_{12}O_6}}{n_1} = \frac{V_{CO_2}}{n_2}$$
$$\frac{6.56}{1} = \frac{V_{CO_2}}{6} \Rightarrow V = 6 \times 6.56$$
$$V = 39.36\ L \quad (D)$$

6/

(12
$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$
$$\frac{1200 \times 10^3 \times 10^{-5} \times 41}{600} = \frac{1 \times V_2}{273}$$
$$V_2 = \frac{1200 \times 10^3 \times 10^{-5} \times 41 \times 273}{600} = 233.86\,L$$
الجواب (C)

(13
$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \Rightarrow$$
$$\frac{1200 \times 10^3 \times 10^{-5}}{600} = \frac{100}{T_2} \Rightarrow$$
$$T_2 = \frac{100 \times 600}{1200 \times 10^3 \times 10^{-5}} = 5000K$$
$$t_2 = 5000 - 273 = 4727^\circ C \quad (D)$$

(14
$$PV = nRT \Rightarrow n = \frac{PV}{RT}$$
$$n = \frac{1200 \times 10^3 \times 10^{-5} \times 41}{0.082 \times 600} = 10\,mol$$
$$m = n \times M = 10 \times 2 = 20\ g \quad (A)$$

(15
$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow$$
$$\frac{1200 \times 41}{600} = \frac{P_2 \times 205}{300}$$
$$P_2 = \frac{1200 \times 41 \times 300}{600 \times 205} = 120\,kPa$$
الجواب (C)

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(16

$$n = \frac{\text{عدد الجزيئات}}{\text{عدد أفوغادرو}} = \frac{3.011 \times 10^{23}}{6.022 \times 10^{23}}$$

$$n = 0.5 \text{ mol}$$

$$P = \frac{nRT}{V} = \frac{0.5 \times 0.082 \times 600}{41} = 0.6 \text{ atm}$$

الجواب (A)

(17

$$n_{H_2} = \frac{m}{M} = \frac{3}{2} = 1.5 \text{ mol}$$

$$n_{N_2} = \frac{m}{M} = \frac{14}{14} = 1 \text{ mol}$$

$$P_t V = n_t RT \Rightarrow n_t = \frac{P_t V}{RT}$$

$$n_t = \frac{4 \times 41}{0.082 \times 400} = 5 \text{ mol}$$

$$n_{\text{مجهول}} = n_t - (n_1 + n_2) = 5 - (1.5 + 1)$$

$$= 5 - 2.5 = 2.5 \text{ mol}$$

$$X_i = \frac{n_i}{n_t} = \frac{2.5}{5} = 0.5$$

$$P_i = X_i P_t = 0.5 \times 4 = 2 \text{ atm}$$

الجواب (B)