Form
~~A~~|B
C|D

mass H in 25.00 g compd = 1.595×10^{23} H atom $\left(\frac{1 \text{ mol H}}{6.022 \times 10^{23} \text{ atoms}}\right)\left(\frac{1.008 \text{ g H}}{\text{mol H}}\right) = 0.267 \text{ g H}$

mass C in 25.00 g compd = .7633(25.00 g) = 19.08 g C

mass O = 25.00 − 0.267 g H − 19.08 g C

mass O = 5.653 g O

mol O = 5.653 g O $\left(\frac{1 \text{ mol O}}{16.00 \text{ g}}\right)$ → 0.3533 mol O/0.2649 = 1.33 mol O

1 | 12
10 | 21

1. A hypothetical compound containing carbon, hydrogen, and oxygen consists of 76.33% carbon by mass. A 25.00 g sample of the compound contains 1.595×10^{23} H atoms. What is the empirical formula of this compound?

Mol C = 19.08 g C $\left(\frac{1 \text{ mol C}}{12.01 \text{ g}}\right)$ = 1.589 mol C / 0.2649 = 6 mol C

$(C_6H_1O_{1.33}) \times 3$ = $\boxed{C_{18}H_3O_4}$ is empirical formula

a) $C_6H_3O_3$ b) CH_2O_2 c) C_3HO d) $C_5H_4O_5$ [✓ e)] $C_{18}H_3O_4$

mol H = 0.267 g H $\left(\frac{1 \text{ mol H}}{1.008 \text{ g}}\right)$ = 0.2649 mol H/0.2649 = 1 mol H

2 | 13
11 | 22

2. A 1.00 g-sample of a metal chloride, MCl_2, is first dissolved in some water and then excess aqueous silver nitrate is added. A precipitate forms having a mass on 1.29 g. Calculate the molar mass of the metal, M. Silver chloride has a molar mass of 143.35 g/mol.

All Cl in compound ends up as Cl in AgCl.

mol MCl_2 = 1.29 g AgCl $\left(\frac{1 \text{ mol AgCl}}{143.35 \text{ g}}\right)\left(\frac{1 \text{ mol Cl}}{1 \text{ mol AgCl}}\right)\left(\frac{1 \text{ mol } MCl_2}{2 \text{ mol Cl}}\right) = 4.45 \times 10^{-3}$ mol MCl_2

[✓ a)] 151 g/mol b) 222 g/mol c) 76 g/mol d) 111 g/mol e) 56 g/mol

molar mass MCl_2 = $\frac{1.00 \text{ g } MCl_2}{4.45 \times 10^{-3} \text{ mol}}$ = 222.2 g/mol, 222.2 = molar mass M + 2(35.45), molar mass M = 222.2 − 70.90) = $\boxed{151 \text{ g/mol}}$

3 | 14
12 | 23

3. Consider the following four compounds: Br_2, KCl, Xe, ClBr. How many of these four compounds will have a vapor pressure greater than that of ICl at 25°C?

molar mass ICl ~ 162 g/mol; ICl has dipole forces + LDF. KCl is ionic, so has stronger
ICl is polar.

a) 0 (none) b) 1 c) 2 [✓ d) 3]

IMF and a lower vapor pressure. the other 3 compounds (Br_2, Xe and ClBr) have

e) 4 (All four of these compounds have a vapor pressure greater than ICl at 25°C).

weaker IMF, so higher vapor pressure. The nonpolar Br_2 has similar molar mass to ICl, but is not polar. Xe is nonpolar and has smaller molar mass. ClBr is polar, but has smaller molar mass than ICl so weaker LDF.

4 | 15
13 | 24

4. Consider the following balanced reaction:

30 g/mol 32 g/mol

$$2\,C_2H_6(g) + 7\,O_2(g) \rightarrow 6\,H_2O(l) + 4\,CO_2(g)$$

The molar mass of C_2H_6 and O_2 are about the same. So equal masses

Which of the following statements (a-d) is/are **true**?

indicates that we start the reaction with about equal moles of C_2H_6 and O_2.

F a) If we react equal masses of C_2H_6 and O_2, then C_2H_6 is limiting.

From the balanced equation, O_2 is used up faster than C_2H_6 from the 7:2

F b) If we react equal moles of C_2H_6 and O_2, then both reactants run out at the same time.

mol ratio. So if the mass of C_2H_6 is greater than mass of O_2, then

T [✓ c)] If the mass of C_2H_6 reacted is larger than the mass of O_2 reacted, then O_2 must be limiting. we have more moles of C_2H_6 as compared to moles of O_2.

Since O_2 is used up faster, then O_2 must be limiting in this case (answer c).

F d) If the mass of O_2 reacted is larger than the mass of C_2H_6 reacted, then C_2H_6 must be limiting.

not necessarily

e) At least two of the above statements (a-d) are true.

$$M = \frac{dRT}{P} = \frac{2.25 \text{ g/L}\left(0.08206 \frac{\text{L atm}}{\text{K mol}}\right)(393 \text{ K})}{250 \text{ torr}\left(\frac{1 \text{ atm}}{760 \text{ torr}}\right)} = 220.6 \text{ g/mol}$$

5 | 16
14 | 25

5. A compound consists of 49.0% C, 2.80% H, and 48.2% Cl by mass. The gaseous density of the compound at 120.°C and 250. torr is 2.25 g/L. What is the molecular formula of the compound? Assume 100.00 g compound.

49.0 g C $\left(\frac{1 \text{ mol C}}{12.01 \text{ g}}\right)$ = 4.08 mol C/1.36 = 3 mol C

a) C_3H_2Cl b) $C_{12}H_6Cl_2$ [✓ c)] $C_9H_6Cl_3$

2.74 g H $\left(\frac{1 \text{ mol H}}{1.008 \text{ g}}\right)$ = 2.718 mol H/1.36 = 2 mol H

d) $C_5H_{18}Cl_4$ e) C_6H_3Cl

48.2 g Cl $\left(\frac{1 \text{ mol Cl}}{35.45 \text{ g}}\right)$ = 1.36 mol Cl/1.36 = 1 mol Cl

C_3H_2Cl is empirical formular.

emp mass ≈ 3(12) + 2(1) + 35.5 ≈ 73.5 g/mol

$\frac{\text{molar mass}}{\text{empirical mass}} = \frac{220.6}{73.5} = 3$, $(C_3H_2Cl) \times 3$ = $\boxed{C_9H_6Cl_3}$ is molecular formula.

At constant T + P, V ∝ n, so $\frac{V_2}{V_1} = \frac{n_2}{n_1}$. Assume x mol N_2 and x mol Cl_2 initially. Initial total moles = n_1 = x + x = 2x

	$N_2(g)$ +	$3Cl_2(g)$ →	$2NCl_3(g)$
Initial	x	x	0
Change	− x/3	−x	+ 2/3 x
after	2/3 x	0	2/3 x

6|7
15|16

6. Equal moles of $Cl_2(g)$ and $N_2(g)$ are placed in a 4.00 L flexible container. The Cl_2 and N_2 are reacted to form $NCl_3(g)$ at some constant temperature. After the reaction has gone to completion, determine the final volume of the container. Assume a constant pressure.

final moles of gas = 2/3 x + 0 + 2/3 x = 4/3 x

a) 2.00 L [✓ b) 2.67 L] c) 3.00 L d) 4.00 L e) 6.00 L

$\frac{n_2}{n_1} = \frac{V_2}{V_1}$, $\frac{4/3\,x}{2x} = \frac{V_2}{4.00\,L}$, $\frac{4}{6} = \frac{V_2}{4.00\,L}$, $V_2 = \frac{4}{6}(4.00\,L) = \boxed{2.67\,L}$

7|8
16|17

7. How many gas particles remain in a 2.0 L flask initially filled with air which is then evacuated to a pressure of 8.0×10^{-7} torr at 20.°C?

$n = \frac{PV}{RT}$ $n = \frac{8.0\times10^{-7}\,\text{torr}\left(\frac{1\,\text{atm}}{760\,\text{torr}}\right)(2.0\,L)}{0.08206\,\frac{L\cdot atm}{K\cdot mol}(293\,K)} = 8.756\times10^{-11}$ mol gas

a) 2.3×10^{10} particles b) 2.6×10^{13} particles c) 8.8×10^{-11} particles

gas particles = 8.756×10^{-11} mol $\left(\frac{6.022\times10^{23}\,\text{gas particles}}{\text{mol}}\right) = \boxed{5.27\times10^{13}\text{ gas particles}}$

[✓ d) 5.3×10^{13} particles] e) 4.6×10^{10} particles

$\left(P_{meas} + \frac{an^2}{V^2}\right)(V_{meas} - nb) = nRT$. a refers to strength of intermolecular forces and b refers to size of gas molecule.

8|9
17|18

8. Which answer bests completes the following statement. In the van der Waals equation for gases given on the constants page, the symbol labeled "b" ……

a) is expected to be a small value for polar gas molecules and a large value for nonpolar gas molecules. Both a + b values are always positive.

[✓ b) depends on the size of the gas molecule.]

c) is expected to be large for gases that exactly obey Dalton's Law of Partial Pressures.

d) often has negative values.

e) is always a negative value.

The next two questions refer to the following balanced reaction to produce the toxic insecticide DDT (the molar mass of each compound is below each name):

If CB limiting: $100.0\,g\,CB\left(\frac{1\,mol\,CB}{112.55\,g}\right)\left(\frac{1\,mol\,DDT}{2\,mol\,CB}\right)\left(\frac{354.46\,g\,DDT}{mol\,DDT}\right) = 157.46\,g = \boxed{157\,g\,DDT}$

$2\,C_6H_5Cl$	+	C_2HOCl_3	→	$C_{14}H_9Cl_5$	+	H_2O
Chlorobenzene = CB		chloral = Chl		DDT		water
112.55 g/mol		147.38 g/mol		354.46 g/mol		18.02 g/mol

If Chl limiting: $75.0\,g\,Chl\left(\frac{1\,mol\,Chl}{147.38\,g}\right)\left(\frac{1\,mol\,DDT}{1\,mol\,Chl}\right)\left(\frac{354.46\,g\,DDT}{mol\,DDT}\right) = 180.\,g\,DDT$

9|10
18|19

9. If 100.0 g of chlorobenzene is reacted with 75.0 g of chloral, what mass of DDT would be produced assuming 100% yield?

Since CB reactant produces smallest amount of DDT, CB

a) 134 g b) 145 g [✓ c) 157 g] d) 175 g e) 180 g

is limiting and 157 g DDT can be produced.

10|11
19|20

10. If 100.0 g of chlorobenzene is reacted with 75.0 g of chloral, what mass of excess reactant is left over assuming 100% yield?

mass Chl that reacts with 100.0 g CB = $100.0\,g\,CB\left(\frac{1\,mol\,CB}{112.55\,g}\right)\left(\frac{1\,mol\,Chl}{2\,mol\,CB}\right)\left(\frac{147.38\,g}{mol\,Chl}\right) = 65.47\,g$ chloral reacted

[✓ a) 9.5 g excess] b) 11.4 g excess c) 16.9 g excess

d) 22.0 g excess e) 25.0 g excess

excess Chloral = 75.0 g Chl initial − 65.47 g Chl reacted = $\boxed{9.5\,g\text{ excess Chloral}}$

Form

A|B
C|D

$0.100 L \left(\frac{0.100 mol}{L}\right) = 0.0100 mol\ FeCl_2 = 0.0100 mol\ Fe^{2+} + 0.0200 mol\ Cl^-$

$0.100 L \left(\frac{0.100 mol}{L}\right) = 0.0100 mol\ NaOH = 0.0100 mol\ Na^+ + 0.0100 mol\ OH^-$

Consider the following information for the next three questions. 100.0 mL of 0.100 *M* iron(II) chloride is added to 100.0 mL of 0.100 *M* sodium hydroxide and a precipitate forms.

$FeCl_2(aq) + 2 NaOH(aq) \rightarrow Fe(OH)_2(s) + 2 NaCl(aq)$

11|21
1|11

11. Which of the following is the correct net ionic equation for the precipitation reaction?

Net Ionic equation = $Fe^{2+}(aq) + 2OH^-(aq) \rightarrow Fe(OH)_2(s)$

a) $Fe^{2+}(aq) + 2 Cl^-(aq) \rightarrow FeCl_2(s)$

[✓ b) $Fe^{2+}(aq) + 2 OH^-(aq) \rightarrow Fe(OH)_2(s)$] Na^+ and Cl^- are spectator ions.

12|22
2|12

c) $Na^+(aq) + Cl^-(aq) \rightarrow NaCl(s)$

d) $Na^+(aq) + OH^-(aq) \rightarrow NaOH(s)$

If Fe^{2+} limiting: $0.0100 mol\ Fe^{2+} \left(\frac{1 mol\ Fe(OH)_2}{1 mol\ Fe^{2+}}\right) = 0.0100 mol\ Fe(OH)_2$

12. How many moles of precipitate form assuming 100% yield?

If OH^- limiting: $0.0100 mol\ OH^- \left(\frac{1 mol\ Fe(OH)_2}{2 mol\ OH^-}\right) = \boxed{0.00500 mol\ Fe(OH)_2}$

a) 0.0100 mol b) 0.00750 mol c) 0.00667 mol

Since OH^- produces smallest amount of precipitate, OH^- is

[✓ d) 0.00500 mol] e) 0.00333 mol

limiting and 0.00500 mol $Fe(OH)_2$ precipitate can form.

13|23
3|13

13. Calculate the molarity of the Fe^{2+} ions after precipitation is complete.

excess mol Fe^{2+} = 0.0100 mol Fe^{2+} − mol Fe^{2+} in precipitate

a) 0 *M* b) 0.0500 *M* c) 0.0750*M*

mol Fe^{2+} in precipitate = $0.00500 mol\ Fe(OH)_2 \left(\frac{1 mol\ Fe}{mol\ Fe(OH)_2}\right) = 0.00500 mol\ Fe^{2+}$

d) 0.0330 *M* [✓ e) 0.0250 *M*]

excess Fe^{2+} = 0.0100 − 0.00500 = 0.00500 excess mol Fe^{2+}, $M_{Fe^{2+}} = \frac{0.00500 mol\ Fe^{2+}}{0.2000 L} = \boxed{0.0250 M}$

14|24
4|14

14. Consider four different solutions that are each prepared by adding the same mass of solute dissolved in the same volume of solution. The solutes are LiCl, KCl, KOH, and NaOH. Which solution has the largest molar concentration of solute?

42.4 74.6 56.1 40.0 g/mol

molarity = $\frac{moles\ solute}{Volume\ solution}$; the solution with the largest concentration

a) LiCl b) KCl c) KOH [✓ d) NaOH]

has the largest number of moles present. Since all are made from

e) All four of these solutions would have the same concentration of solute.

the same mass of solute, the solute with the smallest molar mass will have the most moles present: This is NaOH (40.00 g/mol).

15|25
5|15

15. Consider the following four conditions (I-IV) describing 1.0 mol of a gas sample.

A gas behaves most ideally at low pressures and high temps.

F I. ~~small~~ large container volume

[✓ T II. high container temperature]

[✓ T III. low container pressure]

F IV. ~~slow~~ fast moving gas particle velocities

This corresponds to relatively large container volumes and the molecules of gas moving very rapidly (at high T, gas particles are moving very fast).

How many of these conditions help a "real" gas behave more ideally?

a) 0 (none) b) 1 [✓ c) 2] d) 3

e) 4; (All of these conditions help a "real" gas behave more ideally.)

Form A|B / C|D

If Fe limiting: 5.00 mol Fe $\left(\frac{1\text{ mol }Fe_3O_4}{3\text{ mol }Fe}\right)$ = 5/3 mol Fe_3O_4

If H_2O limiting: 4.00 mol H_2O $\left(\frac{1\text{ mol }Fe_3O_4}{4\text{ mol }H_2O}\right)$ = 1.0 mol Fe_3O_4

16|1 / 20|5

16. Since H_2O produces smallest amount of product, H_2O is limiting

Consider the following reaction: $3\ Fe(s) + 4\ H_2O(l) \rightarrow Fe_3O_4(s) + 4\ H_2(g)$

and 1.0 mol Fe_3O_4 is the theoretical yield.

5.00 mol of Fe is reacted with 4.00 mol of H_2O. If the actual yield of Fe_3O_4 is 0.50 mol, what is the percent yield of the reaction?

% yield = $\frac{\text{actual}}{\text{theoretical}}$ x100 = $\frac{0.50\text{ mol}}{1.00\text{ mol}}$ x100 = $\boxed{50.\%}$

a) 10.%　b) 13%　c) 29%　d) 42%　[✓ e) 50.%]

LiH is ionic (metal in a compound) so LiH has the highest boiling pt.

17|2 / 21|6

17. Consider the compounds PH_3, CH_4, LiH, and NH_3. Rank these compounds in order of increasing boiling point (from lowest to highest boiling point).

Of the remaining covalent compounds, NH_3 can form H-bonding so it has the next highest boiling point. Between PH_3 and CH_4, PH_3 has the larger molar mass so it will have stronger London dispersion forces and a higher b.p. than CH_4. Answer e is correct.

a) $LiH < PH_3 < CH_4 < NH_3$
b) $PH_3 < LiH < CH_4 < NH_3$
c) $NH_3 < LiH < PH_3 < CH_4$
d) $LiH < CH_4 < PH_3 < NH_3$
[✓ e) $CH_4 < PH_3 < NH_3 < LiH$]

18|3 / 22|7

18. A binary compound consisting of an unknown element Z and oxygen contains 43.64% Z by mass. If the formula of the compound is Z_4O_{10}, what is the identity of element Z?

In 100.00 g compound, there are 43.64 g Z and 100.00 − 43.64 = 56.36 g O.

[✓ a) P]　b) C　c) Se　d) I　e) Ni

mol Z = 56.36 g O $\left(\frac{1\text{ mol O}}{16.00\text{ g O}}\right)\left(\frac{4\text{ mol Z}}{10\text{ mol O}}\right)$ = 1.409 mol Z; molar mass Z = $\frac{43.64\text{ g Z}}{1.409\text{ mol Z}}$ = 30.97 g/mol

Z = Phosphorus

19|4 / 23|8

19. A balloon contains equal moles of $SO_2(g)$ and He(g). If a small leak in the balloon occurs, which of the following statements (a-d) about gas escaping from this leak is **true**?

molar mass SO_2 = 64 g/mol; molar mass He = 4 g/mol

F a) $SO_2(g)$ leaks four times faster from the balloon as compared to the He(g).
F b) Only helium will escape from the balloon.　$\frac{\text{rate}_{He}}{\text{rate}_{SO_2}} = \sqrt{\frac{M_{SO_2}}{M_{H}}} = \sqrt{\frac{64}{4}} = 4$
F c) He(g) leaks 16 times faster from the balloon as compared to the $SO_2(g)$.
F d) $SO_2(g)$ and He(g) leak at the same rate from the balloon.
[✓ e) None of the above statements (a-d) are correct.]

The rate that He leaks from the balloon will be 4 times faster than the rate that the larger SO_2 molecules leak. None of the statements says this.

20|5 / 24|9

20. A 70.8 g-sample of $N_2(g)$ reacts with excess $O_2(g)$ to form a compound N_xO_y. The final product has a mass of 111.2 g. Assuming all of the nitrogen gas has reacted, which of the following could be the compound? mass O in compd = 111.2 − 70.8 = 40.4 g O

70.8 g N_2 $\left(\frac{1\text{ mol }N_2}{28.02\text{ g }N_2}\right)\left(\frac{2\text{ mol N}}{1\text{ mol }N_2}\right)$ = 5.054 mol N / 2.525 = 2

40.4 g O $\left(\frac{1\text{ mol O}}{16.00\text{ g O}}\right)$ = 2.525 mol O / 2.525 = 1

Empirical formula = N_2O. Compound could be N_2O or N_4O_2 or N_6O_3, etc. Only N_2O answer is possible.

[✓ a) N_2O]　b) NO　c) NO_2　d) N_2O_2　e) N_2O_4

21|6 / 25|10

21. What volume of 0.0521 *M* KOH is required to react completely with 14.20 mL of 0.141 *M* H_3PO_4?

$H_3PO_4(aq) + 3KOH(aq) \rightarrow 3H_2O(l) + K_3PO_4(aq)$

[✓ a) 115 mL]　b) 19.4 mL　c) 57.6 mL　d) 25.0 mL　e) 38.4 mL

$0.01420\text{ L} \times \frac{0.141\text{ mol }H_3PO_4}{\text{L}} \times \frac{3\text{ mol KOH}}{1\text{ mol }H_3PO_4} \times \frac{1\text{ L KOH}}{0.0521\text{ mol KOH}}$ = 0.115 L = $\boxed{115\text{ mL KOH solution}}$

Form
A|B
C|D

All of these compounds can form H-bonding due to -OH group on compound. So difference in boiling points must be due to another type of intermolecular force (IMF). Notice as the more carbons and hydrogens are added to each compound (as molar mass increases), the boiling point of the compound increases. London dispersion (LD) forces depend on molar mass.

22|17
6|1

22. Consider the following boiling point data:

Compound	Formula	Boiling Point
methanol	CH_3OH	65°C
ethanol	CH_3CH_2OH	78 °C
propanol	$CH_3CH_2CH_2OH$	97 °C
butanol	$CH_3CH_2CH_2CH_2OH$	117 °C
pentanol	$CH_3CH_2CH_2CH_2CH_2OH$	138 °C

So the ~~increase in~~ London dispersion forces ~~in the compounds~~ increases as we go from methanol to pentanol, so the boiling points increase as we go from methanol to pentanol.

The boiling points of these compounds increase steadily from methanol to pentanol. Which type of intermolecular force is primarily responsible for the steady increase in boiling points from methanol to pentanol?

a) Ionic forces
b) Hydrogen bonding forces
c) Dipole forces
[✓ d) London Dispersion forces]

Cations present: NH_4^+, Ag^+, Na^+, Ba^{2+}; anions present: CO_3^{2-}, SO_4^{2-}, Br^-, NO_3^-

23|18
7|2

23. Aqueous solutions of $(NH_4)_2CO_3$, Ag_2SO_4, NaBr, and $Ba(NO_3)_2$ are mixed together. Several different colored precipitates form. Which of the following compounds did **not** form as a precipitate? NH_4^+ and Na^+ ions never form precipitates; the same is true for NO_3^-. The only insoluble bromide salt that would form here is AgBr. $BaBr_2$ will not form. From the carbonate rule, Ag_2CO_3 and $BaCO_3$ will both form. From the sulfate rule, $BaSO_4$ will form.

a) Ag_2CO_3 [✓ b) $BaBr_2$] c) $BaCO_3$ (see rule 3 of solubility rules) d) $BaSO_4$ e) AgBr

24|19
8|3

24. Which of the following statements is **false**?

More IMF are broken when water boils than when water melts, so

T a) For a typical covalent compound, the enthalpy of vaporization should be greater (more positive) than the enthalpy of fusion. ΔH_{vap} should be greater than ΔH_{fus}.

T b) The solid phase exhibits the strongest amount of intermolecular forces.

T c) As temperature increases, the vapor pressure of a liquid increases. At higher temps, more molecules have sufficient energy to break off from the liquid phase.

[✓ F] d) The intermolecular forces between covalent compounds are stronger than the covalent bonds holding the atoms together within the compound. Intermolecular forces are much weaker than covalent bonds. If this wasn't the case, when ~~water~~ heat is added to water, $H_2(g)$ and $O_2(g)$ would form. It doesn't; water just boils as temp increases.

T e) Ideal gases are assumed to exert no intermolecular forces.

25|20
9|4

25. An organic compound contains only carbon, hydrogen, and oxygen. Combustion of 3.50 g of the compound produced 4.80 g of CO_2 and 1.31 g of H_2O. What is the mass percent of oxygen in the organic compound?

$$\text{mass C in 3.50 g cmpd} = 4.80\text{ g } CO_2\left(\frac{1\text{ mol }CO_2}{44.01\text{ g}}\right)\left(\frac{1\text{ mol C}}{1\text{ mol }CO_2}\right)\left(\frac{12.01\text{ g C}}{\text{mol C}}\right) = 1.310\text{ g C}$$

[✓ a) 58.4% O] b) 37.4% O c) 4.19% O

$$\text{mass H in 3.50 g compd} = 1.31\text{ g }H_2O\left(\frac{1\text{ mol }H_2O}{18.02\text{ g}}\right)\left(\frac{2\text{ mol H}}{\text{mol }H_2O}\right)\left(\frac{1.008\text{ g H}}{\text{mol H}}\right) = 0.1466\text{ g H}$$

d) 2.09% O e) 74.8% O

$$\text{mass O in 3.50 g compd} = 3.50 - 1.310 - 0.1466 = 2.043\text{ g O}$$

$$\text{mass \% O} = \frac{2.043\text{ g O}}{3.50\text{ g cmpd}} \times 100 = \boxed{58.4\%\text{ O}}$$

Form
A|B
C|D

Let x = mass H_2 = mass He

moles $H_2 = \frac{x}{2.0}$, moles He $= \frac{x}{4.0}$

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$\frac{\text{moles } H_2}{\text{moles He}} = \frac{\frac{x}{2.0}}{\frac{x}{4.0}} = 2.0$

Consider the following information for the next 2 problems. A 50.0 L rigid container holds a certain mass of H_2(g) and the same mass of He(g) (mass of hydrogen gas = mass of helium gas). The total pressure in the container is 3.0 atm at 25°C. At constant V and T, $P \propto n$. Since we have twice the number of moles of H_2 as we have of He, the partial pressure of H_2 will be twice the partial pressure of He. $P_{TOT} = P_{H_2} + P_{He}$, $3.0 \text{ atm} = 2P_{He} + P_{He}$, $P_{He} = 1.0 \text{ atm}$

$P_{H_2} = 3.0 - 1.0 = \boxed{2.0 \text{ atm}}$

26|26
26|26

26. What is the partial pressure of H_2(g) in this container?

a) 0.50 atm b) 1.0 atm c) 1.3 atm d) 1.7 atm [✓ e) 2.0 atm]

27|27
27|27

27. The container is heated to 125°C? Calculate the total pressure in the container at 125°C?

$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$; total moles of gas is constant, volume is constant.

a) 15 atm [✓ b) 4.0 atm] c) 1.2 atm d) 1.7 atm e) 6.0 atm

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$, $P_2 = P_1\left(\frac{T_2}{T_1}\right) = 3.0\text{atm}\left(\frac{398 K}{298 K}\right) = \boxed{4.0 \text{atm}}$

28|28
28|28

28. Which of the following four (I-IV) statements is/are **not** postulates of the kinetic molecular theory?

yes I. The volume of each individual gas particle is assumed to be negligible (zero).

yes II. Gas particle are assumed to exert no forces on each other; they are assumed to neither attract nor repel each other.

yes III. The average kinetic energy of a collection of gas particles is assumed to be directly proportional to the Kelvin temperature of the gas. $KE_{AVE} = 3/2 RT$

NO IV. At a constant temperature, all gas particles are assumed to move at the same average velocity. At constant T, the lighter gas molecules must be moving with a faster average velocity in order for the average kinetic energy to be equal to each other.

a) II only b) I and II [✓ c) IV only] d) II and III e) III and IV

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29. Which of the following statements about electrolytes is **false**?

Acids are either weak electrolytes (weak acids) or strong electrolytes (strong acids).

T a) Acids dissolved in water are either strong electrolytes or weak electrolytes.

T b) Soluble ionic compounds are all strong electrolytes.

[✓ F c)] Covalent compounds are all nonelectrolytes. – acids, which are covalent compds, are either weak or strong electrolytes.

T d) Weak acids in water are all weak electrolytes.

T e) Strong electrolytes are either strong acids or soluble ionic compounds.

30. My answers for this Chemistry 102 exam should be graded with the answer sheet associated with:

a) Form A b) Form B c) Form C d) Form D e) Form E