Docs

6 $2Na_{(s)} + 2NH_{3(g)} \longrightarrow 2NaNH_{2(s)} + H_{2(g)}$

50g 50g

Maximum Mass of $NaNH_2$

Mols Na $= \frac{50}{23} = 2.17$mols | Mols NH_3 $\frac{50}{17} = 2.94$mols (Excess) | Mol ratio 2 : 2 : 2 | 1 : 1 : 1

2.17 : 2.17 : 2.17

Mass $NaNH_2$ $= 2.17 \times 39$

$= 84.63g$

7 $CO + 2H_2 \longrightarrow CH_3OH$

1 2 1

b. 5.75 of CO and 10.0g of H_2. What is Mass of Methanol?

Reacting ratio 1 : 2 : 1

Mols of CO $= \frac{5.75}{28} = 0.2$mol | Mols H_2 $\frac{2}{10} = 0.2$mols | Mol ratio 0.1 : 02 : 01 | Mass ethanol $= 0.1 \times 32$ $= 3.2g$

c Which reactant is the Limiting reactant?

H_2

(d) How Much of the exess reactant remains?

Exess reactant = CO

$\therefore$ 0.2mol − 0.1 mol

= 0.1 (excess mols)

$0.1 \times 28 = 2.8g$

8 $C_7H_6O_{3(s)} + C_4H_6O_{3(l)} \longrightarrow C_9H_8O_{4(s)} + CH_3COOH_{(l)}$

(Aspirin)

15.0g 15.0g Mass ↑

Mols $C_7H_6O_3$ $= \frac{15}{138} = 0.1$mol

Mols $C_4H_6O_3$ $= \frac{15}{102} = 0.15$mols

Mol ratio 1 : 1 : 1

0.1 0.1 0.1

Mass aspirin $= 0.1 \times 180$

$= 18g$

1. $5C_2H_{2(g)} + 2O_{2(g)} \longrightarrow 4CO_{2(g)} + 2H_2O_{(l)}$

25 mols

Mols of CO_2 = ??

Mole ratio = 5 : 2 : 4 : 2

Mole ratio of ethyne : CO_2

5 : 4

5 : 4
25 mol ?

$\frac{25 \times 4}{5}$ = 20 Mols

2. $9C_4H_{10(l)} + 20_{2(g)} \longrightarrow 8CO_{(g)} + 10H_2O_{(l)}$

Mass of CO produced from 5.0g of Butane

Mols C_4H_{10}

$= \frac{5}{58} = 0.086$ mols

Mol ratio C_4H_{10} : CO

9 : 4

0.086 ?

$= \frac{0.086 \times 4}{9} = 0.038$ mol

Mass CO

$= 0.038 \times 28$

$= 1.064$g

3

$2Na_{(s)} + 2NH_{3(g)} \longrightarrow 2NaNH_{2(s)} + H_{2(g)}$

15.0g

Mass of Na required ??

Mols $NaNH_2$

$= \frac{15}{39} = 0.38$ Mols

Mol ratio

$NaNH_2$: Na

1 : 1

0.38 mols : 0.38 mols

Mass Na

$= 0.38 \times 23$

$= 8.74$g

4 $C_2H_5OH + CH_3COOH \longrightarrow CH_3COOC_2H_5 + H_2O$ ⇒ reaction 35% efficient

↑ what mass to produce → 100g

Mols $CH_3COOC_2H_5$

$= \frac{100}{90} = 1$ mol

Mole ratio = 1 : 1

Mass = 1 × 60

= 60g

$\frac{35 \times 60}{100}$

= 21g

5 $CaCO_{3(s)} \longrightarrow CaO_{(s)} + CO_{2(g)}$

Mass of ↑ to produce 4.65g

Mols of CaO

$= \frac{4.65}{56} = 0.083$ mols

Mol ratio $CaCO_3$: CaO

1 : 1

0.083 : 0.083

Mass $CaCO_3$

$= 0.083 \times 100$

$= 8.3$g

Doc 4

8 82.3% N and 17.6% H. Empirical formula

Element	N	H
Percent Mass	82.3	17.6
R.A.M	14	1
Moles	82.3 / 14 = 5.9	17.6 / 1 = 17.6

Mole ratio	5.9 / 5.9	17.6 / 5.9
	1	= 3

E.F = NH_3

9 52.2% C, 13.0% H and 34.8% O. What is E.F.

Element	C	H	O
Mass %	52.2	13.0	34.8
R.A.M	12	1	16
Moles	52.2 / 12 = 4.35	13.0 / 1 = 13.0	34.8 / 16 = 2.175

Mole ratio	4.35 / 2.175	13 / 2.175	2.175 / 2.175
	2	6	= 1

E.F = C_2H_6O

10 74.03% C, 8.70% H, and 17.27% N. What is the E.F

Element	C	H	N
% mass	74.03	8.70	17.27
R.A.M	12	1	14
Moles	74.03 / 12 = 6.17	8.70 / 1 = 8.70	17.27 / 14 = 1.2

Mole ratio	6.17 / 1.2	8.7 / 1.2	1.2 / 1.2
	= 5	= 7	= 1

E.F = C_5H_7N

11. 82.66% C. What is E.F of the hydrocarbon

Element	C	H
% Mass	82.66	(100 − 82.66) = 17.34
RAm	12	1
Moles	82.66 / 12 = 6.89	17.34 / 1 = 17.34

Mole ratio	6.89 / 6.89	17.34 / 6.89
	= 1 × 2 = 2	2.5 × 2 = 5

EF = C_2H_5

12 0.252g titanium and 0.748g Chlorine. Determine the E.F.

Element	Ti	Cl
Mass in grams	0.252	0.748
RAm	48	35.5
Moles	0.252 / 48 = 0.005	0.748 / 35.5 = 0.02
	5	20
	1	4

E.F $TiCl_4$

Doc 4

e $Ca_3(PO_4)_2$

RFM = (40×3) + (31×2) + (16×8)
= 310

Percent Ca	Percent P	Percent O
$\frac{120}{310} \times 100$	$\frac{62}{310} \times 100$	$\frac{128}{310} \times 100$
= 38.71%	= 20%	41.29%

5. 11.66g Fe and 5.01g O. Percent of each element in the Compound.

Total Mass of Fe and O	Percent of Fe	Percent O
= 16.66 + 5.01	$\frac{11.66}{16.67} \times 100$	$\frac{5.01}{16.67} \times 100$
= 16.67g	= 69.94%	= 30.05%

6. 0.590g C, 0.071g H, 0.262g O, and 0.077g N. Percent of each element in the Compound.

Total Mass	Percent C	Percent H	Percent O	Percent N
= 0.590	$\frac{0.59}{1} \times 100$	$\frac{0.071}{1} \times 100$	$\frac{0.262}{1} \times 100$	$\frac{0.077}{1} \times 100$
+ 0.071				
0.262				
0.077				
1.000g	= 59%	= 7.1%	= 26.2%	= 7.7%

7. Copper(II) Sulphate (hydrated) = [redacted]

Original Mass = 24.50g

dried Sample = 15.66g

Percent of water in the Compound.

Mass of water = 24.50 − 15.66
= 8.84g

Percent of water = $\frac{8.84}{24.5} \times 100$

= 36.08%

Doc 4

1. Percentage of C in C_2H_4

RFM = 24+4 = 28

Percent C = $\frac{24}{28} \times 100 = 85.71\%$

Percent of H $\frac{4}{28} \times 100 = 14.28\%$

2. Percent of Carbon and Hydrogen in C_3H_6.

RFM = 36+6 = 42

Percent of C $\frac{36}{42} \times 100 = 85.71$

Percent of H $\frac{6}{42} \times 100 = 14.28\%$

3. The percentage of Carbon and Hydrogen in 1 and 2 are the same. The ratio of Carbon atom to Hydrogen in 1 and 2 is **1:2**

4. Percent in each element in

(a) $MgSO_4$

RFM = 24+32+64 = 120

Percent Mg = $\frac{24}{120} \times 100 = 20\%$

Percent S $\frac{32}{120} \times 100 = 26.67\%$

Percent O $\frac{64}{120} \times 100 = 53.33\%$

b $MgSO_4 \cdot 7H_2O$

RFM = 24+32+64+126 = 246

Percent Mg $\frac{24}{246} \times 100 = 9.75\%$

Percent S $\frac{32}{246} \times 100 = 13\%$

Percent O $\frac{64}{246} \times 100 = 26.01\%$

Percent H_2O $\frac{126}{246} \times 100 = 51.21\%$

c $(CH_3)_2SO$

RFM = 24+6+32+16 = 78

Percent C $\frac{24}{78} \times 100 = 30.76\%$

Percent H $\frac{6}{78} \times 100 = 7.69\%$

Percent S $\frac{32}{78} \times 100 = 41.03\%$

Percent O $\frac{16}{78} \times 100 = 20.51\%$

d C_5H_5N

RFM = 60+5+14 = 79

Percent C $\frac{60}{79} \times 100 = 75.94\%$

Percent H $\frac{5}{79} \times 100 = 6.32\%$

Percent N $\frac{14}{79} \times 100 = 17.72\%$

Sec 3

8 Acetic acid CH_3COOH and Salicylic acid $C_7H_6O_3$
5g 10.53g

Moles of each used to form aspirin

Mole CH_3COOH
$= \frac{5}{60}$
$= 0.083$ moles

Mols $C_7H_6O_3$
$= \frac{10.53}{138} = 0.076$ mols

9. $CH_3(CH_2)_3CH(OH)CH_3$ ⇒ 500.Kg - Used. How Many Moles?

Mols = $\frac{\text{Mass in g}}{RFM}$ RFM = 102

$= 500 \times 1000$
$= 500,000$g

$= \frac{500,000}{102}$
$= 4901.96$ Mols

10 Moles in 5.0kg of $CaCl_2 \cdot 6H_2O$

Mols = $\frac{\text{Mass in g}}{RFM}$

5Kg x 1000
= 5,000g

RFM
$= 40 + 71 + 108$
$= 165$

$= \frac{5000}{165}$
$= 30.30$ Mols

11 1.5mol NaOH. What is equivalent grams

Mass in gram = Mols x RFM
$= 1.5 \times 40$
$= 60$g

12 0.123 Mole $AgNO_3$. How Many grams necessary?

Mass in grams = Mols x RFM
$= 0.123 \times (108 + 14 + 48)$
$= 0.123 \times 170$
$= 20.71$g

DOC 3

1. CH_3COOH (Acetic acid)
Molar Mass = 12+3+12+16+16+1
= 60

2 formaldehyde HCHO
Molar Mass = 1+12+1+16
= 30

3 2-Dodeconal $CH_3(CH_2)_3CH(OH)CH_3$
Molar Mass = (12×6)+(1×14)+16
= 102

4 Glucose $C_6H_{12}O_6$
Molar Mass = (12×6)+(1×12)+(16×6)
= 180

5 Ethanol C_2H_5OH
Molar Mass = (12×2)+(1×6)+16
= 46

6 Phosphonic Acid H_3PO_4
Molar Mass = (1×3)+31+(16×4)
= 98

7 Cobalt (II) Chloride hexahydrate $CoCl_2 \cdot 6H_2O$

Molar Mass = 12+16+71+108
= 207

DOC 2

10 1 mol of any gas = 22.4 L, 273 K and 1 atm
? = 98 L, 292 K and 2.8 atm

$\therefore \frac{98 \times 292 \times 2.8}{22.4 \times 273 \times 1}$

= 13.1 Mols

Doc 2

6 $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$P_1 = 1.0 atm$ $P_2 = 0.60 atm$

$V_1 = 4.5 DL$ $V_2 = ??$

$T_1 = 20+273 = 293K$ $T_2 = -20+273 = 253K$

$$V_2 = \frac{P_1V_1T_2}{P_2T_1}$$

7. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$P_1 = 1.0 atm$ $P_2 = 175 atm$

$V_1 = 4.25 \times 10^4 L$ $V_2 = ??$

$T_1 = 273+15 = 288K$ $T_2 = 3+273 = 276K$

$$V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{1 \times 4.25 \times 10^4 \times 276}{288 \times 175}$$

8 $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$P_1 = 900 mmHg$ $P_2 = ??$

$V_1 = 1$ $V_2 = 1$

$T_1 = 27+273 = 300K$ $T_2 = -183+273 = 90K.$

$$P_2 = \frac{P_1V_1T_2}{V_2T_1} = \frac{900 \times 1 \times 90}{1 \times 300}$$

$= 270 mmHg$

9 $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

P_1 = Intial pressure ; P_2 = final pressure

V_1 = Intial volume V_2 = final volume

T_1 = Intial temperature T_2 = final temperature.

4. $P_1V_1 = P_2V_2$

$P_1 = 1.0\ atm$ $\quad P_2 = 0.75\ atm$

$V_1 = 35L$ $\quad V_2 = ??$

$$V_2 = \frac{P_1V_1}{P_2} \quad \frac{1 \times 35}{0.75}$$

$$= 46.67L$$

5. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$P_1 = 6atm$; $P_2 = ??$

$V_1 = 20L$ $\quad V_2 = 20L$

$T_1 = 273+20$ $\quad T_2 = 273+77$

$= 293K$ $\quad = 350K$

$$P_2 = \frac{P_1V_1T_2}{T_1V_2}$$

$$= \frac{6 \times 20 \times 350}{293 \times 20}$$

$$= 7.16\ atm$$

doc 1

1. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$; $V_1 = 35.0L$ $V_2 = ??$

$T_1 = 273+20 = 293K$ $T_2 = 273+45 = 318K$

$V_2 = \frac{V_1 T_2}{T_1}$

$= \frac{35 \times 318}{293}$

$= 37.9863\ L$

2. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $V_1 = 135L$ $V_2 = 75\ L$

$T_1 = 273+260 = 532k$ $T_2 = ??$

$T_2 = \frac{V_2 T_1}{V_1}$; $\frac{75 \times 532}{135}$

$= 295.5K$

$= 23.5°C$

3. $P_1 V_1 = P_2 V_2$

$P_1 = 1.0atm$ $P_2 = ??$

$V_1 = 6.0L$ $V_2 = 3.5L$

$P_2 = \frac{P_1 V_1}{V_2}$; $\frac{1 \times 6}{3.5}$

$= 1.71\ atm$