Chemical Reactions

Set 16

1. a)

	Fe	Cl
m	2.76	3.51
n	$\dfrac{2.76}{55.85}$	$\dfrac{3.51}{35.45}$
	0.0494	0.0990
Ratio ($\div$ by smallest)	$\dfrac{0.0494}{0.0494}$	$\dfrac{0.990}{0.494}$
	1	2

E.F. = $FeC\ell_2$

b)

	C	H
m	2.06	0.430
n	$\dfrac{2.06}{12.01}$	$\dfrac{0.430}{1.008}$
	0.172	0.427
Ratio ($\div$ by smallest)	$\dfrac{0.172}{0.172}$	$\dfrac{0.427}{0.172}$
	2	5

E.F. = C_2H_5

c)

	K	Mn	O
m	3.71	5.21	6.07
n	$\dfrac{3.71}{39.1}$	$\dfrac{5.21}{54.94}$	$\dfrac{6.07}{16.00}$
	9.49×10^{-2}	9.48×10^{-2}	0.379
Ratio ($\div$ by smallest)	$\dfrac{9.49 x 10^{-2}}{9.48 x 10^{-2}}$	$\dfrac{9.48 x 10^{-2}}{9.48 x 10^{-2}}$	$\dfrac{0.379}{9.48 x 10^{-2}}$
	1	1	4

E.F. = $KMnO_4$

d)

	Na	S	O
m	3.86	5.38	10.7
n	$\dfrac{3.86}{22.99}$	$\dfrac{5.38}{32.06}$	$\dfrac{10.7}{16.00}$
	0.168	0.168	0.6688
Ratio ($\div$ by smallest)	$\dfrac{1.68}{0.168}$	$\dfrac{0.168}{0.168}$	$\dfrac{0.6688}{0.168}$
	1	1	4

E.F. = $NaSO_4$

2. a)

	Ca	O	H
m in 100 g	54.1	43.2	2.70
n	$\dfrac{54.1}{40.08}$	$\dfrac{43.2}{16.00}$	$\dfrac{2.70}{1.008}$
	1.35	2.70	2.68
Ratio ($\div$ by smallest)	$\dfrac{1.35}{1.35}$	$\dfrac{2.70}{1.35}$	$\dfrac{2.68}{1.35}$
	1	2	2

E.F. $= CaO_2H_2$ ($Ca(OH)_2$)
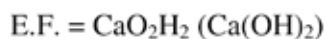
b)

	Pb	N	O
m in 100 g	62.5	8.50	29.0
n	$\dfrac{62.5}{207.2}$	$\dfrac{8.50}{14.01}$	$\dfrac{29.0}{16.00}$
	0.302	0.607	1.812
Ratio (÷ by smallest)	$\dfrac{0.302}{0.302}$	$\dfrac{0.607}{0.302}$	$\dfrac{1.812}{0.302}$
	1	2	6

E.F. $= PbN_2O_6$ ($Pb(NO_3)_2$)
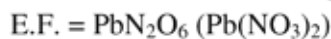
c)

	C	O	H
m in 100 g	60.0	26.7	13.3
n	$\dfrac{60.0}{12.01}$	$\dfrac{26.7}{16.00}$	$\dfrac{13.3}{1.008}$
	5.00	1.669	13.2
Ratio (÷ by smallest)	$\dfrac{5.00}{1.669}$	$\dfrac{1.669}{1.669}$	$\dfrac{13.2}{1.669}$
	3	1	8

E.F. $= C_3H_8O$
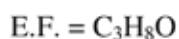
3.

	S	O
m in 100 g	40.0	60.0
n	$\dfrac{40.0}{32.06}$	$\dfrac{60.0}{16.00}$
	1.25	3.75
Ratio (÷ by smallest)	$\dfrac{1.25}{1.25}$	$\dfrac{3.75}{1.25}$
	1	3

E.F. $= SO_3$
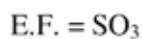
4.   %C: $\dfrac{1.25}{2.12}$ x 100 = 58.96%

%H: $\dfrac{0.161}{1.64}$ x 100 = 9.82%

%O: 100 − (58.96 + 9.82) = 31.22%

	C	O	H
m in 100 g	58.96	31.22	9.82
n	$\dfrac{58.96}{12.01}$	$\dfrac{31.22}{16.00}$	$\dfrac{9.82}{1.008}$
	4.91	1.95	9.74
Ratio (÷ by smallest)	$\dfrac{4.91}{1.95}$	$\dfrac{1.95}{1.95}$	$\dfrac{9.74}{1.95}$
	2.5	1	5
x 2	5	2	10

E.F. $= C_5H_{10}O_2$

5.

	Te	O

m	4.00	1.00
n	$\dfrac{4.00}{127.6}$	$\dfrac{1.00}{16.00}$
	3.13×10^{-2}	6.25×10^{-2}
Ratio (÷ by smallest)	$\dfrac{3.13x10^{-2}}{3.13x10^{-2}}$	$\dfrac{6.25x10^{-2}}{3.13x10^{-2}}$
	1	2

E.F. = TeO_2

6. %O: 100 = (52.0 + 13.0) = 35.0%

	C	O	H
m in 100 g	52.0	35.0	13.0
n	$\dfrac{52.0}{12.01}$	$\dfrac{35.0}{16.00}$	$\dfrac{13.0}{1.008}$
	4.33	2.19	12.9
Ratio (÷ by smallest)	$\dfrac{4.33}{2.19}$	$\dfrac{2.19}{2.19}$	$\dfrac{12.9}{2.19}$
	2	1	6

E.F. = C_2H_6O

7.

	Fe	O
m	7.83	11.2-7.83 = 3.37
n	$\dfrac{47.83}{55.85}$	$\dfrac{3.37}{16.00}$
	0.140	0.211
Ratio (÷ by smallest)	$\dfrac{0.140}{0.140}$	$\dfrac{0.211}{0.140}$
	1	1.5
x 2	2	3

E.F. Fe_2O_3

8.

	Fe	Cℓ	Fe	Cℓ
m	44.0	100 – 44.0 = 56.0	34.4	100 – 34.4 = 65.6
n	$\dfrac{44.0}{55.85}$	$\dfrac{56.5}{35.45}$	$\dfrac{34.4}{55.85}$	$\dfrac{65.6}{35.45}$
	0.788	1.58	0.616	1.85
Ratio (÷ by smallest)	$\dfrac{0.788}{0.788}$	$\dfrac{1.58}{1.58}$	$\dfrac{0.616}{0.616}$	$\dfrac{1.85}{0.616}$
	1	2	1	3

E.F. = $FeC\ell_2$ E.F. = $FeC\ell_3$

9.

	N	O
m in 100 g	63.6	36.4
n	$\dfrac{63.6}{14.01}$	$\dfrac{36.4}{16.00}$
	4.54	2.275

Ratio (÷ by smallest)	$\dfrac{4.54}{2.275}$	$\dfrac{2.275}{2.275}$
	2	1

E.F. = N_2O

	N	O
m in 100 g	46.7	53.3
n	$\dfrac{46.7}{14.01}$	$\dfrac{53.3}{16.00}$
	3.33	3.33
Ratio (÷ by smallest)	$\dfrac{3.33}{3.33}$	$\dfrac{3.33}{3.33}$
	1	1

E.F. = NO

	N	O
m in 100 g	30.4	69.6
n	$\dfrac{30.4}{14.01}$	$\dfrac{69.6}{16.00}$
	2.17	4.35
Ratio (÷ by smallest)	$\dfrac{2.17}{2.17}$	$\dfrac{4.35}{2.17}$
	1	2

E.F. = NO_2

10. $n(Cl^-) = n(AgCl)$

$= \dfrac{9.47}{143.35}$

$= 6.61 \times 10^{-2}$ mol

$m(Cl^-) = (6.61 \times 10^{-2}) \times 35.45$

$= 2.34$ g

	Ti	Cℓ
M	3.40 – 2.34 = 1.06	2.34
n	$\dfrac{1.06}{47.88}$	$\dfrac{2.34}{35.45}$
	2.21×10^{-2}	6.61×10^{-2}
Ratio (÷ by smallest)	$\dfrac{2.21x10^{-2}}{2.21x10^{-2}}$	$\dfrac{6.61x10^{-2}}{2.21x10^{-2}}$
	1	3

E.F. = $TiCℓ_3$

11. $n(CO_2) = \dfrac{0.660}{12.01}$ $n(H_2O) = \dfrac{0.270}{18.016}$

$= 1.50 \times 10^{-2}$ mol $= 1.50 \times 10^{-2}$ mol

$n(C) = N(CO_2)$ $n(H) = 2\, n(H_2O)$

$m(C) = 12.01 \times (1.50 \times 10^{-2})$ $n(H) = 2 \times 1.008 \times (1.50 \times 10^{-2})$

$= 0.180$ g $= 0.0302$ g

$m(O) = 0.290 – (0.180 + 0.0302)$

$$= 0.0798 \text{ g}$$

$$N(O) = \frac{0.0798}{16.00}$$

$$= 4.99 \times 10^{-3} \text{ mol}$$

		C	H	O
N		1.50×10^{-2}	3.00×10^{-2}	4.99×10^{-3}
Ratio		$\dfrac{1.50 x 10^{-2}}{4.99 x 10^{-3}}$	$\dfrac{3.00 x 10^{-2}}{4.99 x 10^{-3}}$	$\dfrac{4.99 x 10^{-3}}{4.99 x 10^{-3}}$
		3	6	1

E.F. $= C_3H_6O$

12. $(CO_2) = \dfrac{0.403}{12.01}$ $n(H_2O) = \dfrac{0.165}{18.016}$

$\quad\quad\quad = 9.16 \times 10^{-3} \text{ mol}$ $= 9.16 \times 10^{-3} \text{ mol}$

$n(C) = N(CO_2)$ $n(H) = 2\, n(H_2O)$

$m(C) = 12.01 \times (9.16 \times 10^{-3})$ $n(H) = 2 \times 1.008 \times (9.16 \times 10^{-3})$

$\quad\quad\quad = 0.110 \text{ g}$ $= 0.0185 \text{ g}$

$m(O) = 0.275 - (0.110 + 0.0185)$

$\quad\quad\quad = 0.147 \text{ g}$

$N(O) = \dfrac{0.147}{16.00}$

$\quad\quad\quad = 9.16 \times 10^{-3} \text{ mol}$

		C	H	O
N		9.16×10^{-3}	1.83×10^{-2}	9.16×10^{-3}
Ratio		$\dfrac{9.16 x 10^{-3}}{9.16 x 10^{-3}}$	$\dfrac{1.83 x 10^{-2}}{9.16 x 10^{-3}}$	$\dfrac{9.16 x 10^{-3}}{9.16 x 10^{-3}}$
		1	2	1

E.F. $= CH_2O$

13. $(CO_2) = \dfrac{1.600}{12.01}$ $n(H_2O) = \dfrac{0.770}{18.016}$

$\quad\quad\quad = 3.64 \times 10^{-2} \text{ mol}$ $= 4.274 \times 10^{-2} \text{ mol}$

$n(C) = n(CO_2)$ $n(H) = 2\, n(H_2O)$

$m(C) = 12.01 \times (3.64 \times 10^{-2})$ $n(H) = 2 \times 1.008 \times (4.274 \times 10^{-2})$

$\quad\quad\quad = 0.437 \text{ g}$ $= 0.0862 \text{ g}$

$n(N) = \dfrac{0.1697}{14.01}$

$\quad\quad\quad = 1.21 \times 10^{-2} \text{ mol}$

$m(O) = 1.279 - (0.437 + 0.0862 + 0.1697)$

$\quad\quad\quad = 0.586 \text{ g}$

$n(O) = \dfrac{0.586}{16.00}$

$\quad\quad\quad = 3.66 \times 10^{-2} \text{ mol}$

	C	H	O	N
N	3.64×10^{-2}	8.62×10^{-2}	3.66×10^{-2}	1.21×10^{-2}
Ratio	$\dfrac{3.64 \times 10^{-2}}{1.21 \times 10^{-2}}$	$\dfrac{8.62 \times 10^{-2}}{1.21 \times 10^{-2}}$	$\dfrac{3.66 \times 10^{-2}}{1.21 \times 10^{-2}}$	$\dfrac{1.21 \times 10^{-2}}{1.21 \times 10^{-2}}$
	3	7	3	1

E.F. = $C_3H_7O_3N$