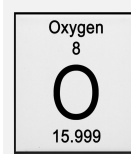
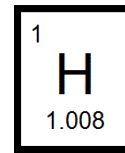


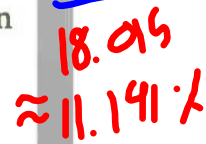
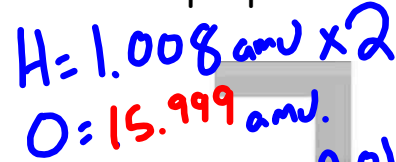
# Proportion Laws



can calculate ul  
periodic table



**Law of Definite Proportions** - A given compound always contains elements in a certain proportion by atoms and mass



2 Hydrogen  
1 Oxygen  
Ratio of 2:1

12% Hydrogen  
88% Oxygen



2 Hydrogen  
1 Oxygen  
Ratio of 2:1

12% Hydrogen  
88% Oxygen

Same  
Compound

Same  
Ratio

### Same Mass Percents

22.99 + 35.45 Find % mass of Na in NaCl

$$= 58.44$$
$$\frac{22.99}{58.44} \times 100$$
$$= 39.34\%$$

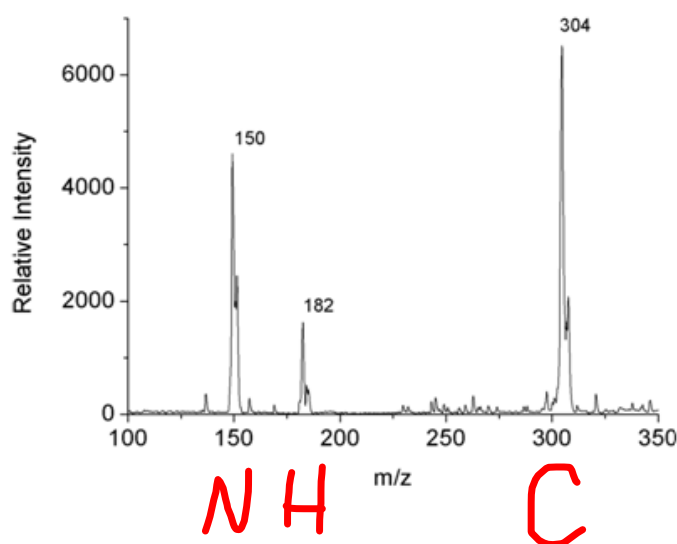
~~Find~~ Find  $\therefore$  mass of Cl in NaCl. 3545

$$\begin{array}{r} 35.45 \\ \hline 58.44 \end{array}$$

60.66%

Methamphetamine:  $\text{C}_{10}\text{H}_{15}\text{N}$

->  $m/z$  = mass to charge ratio



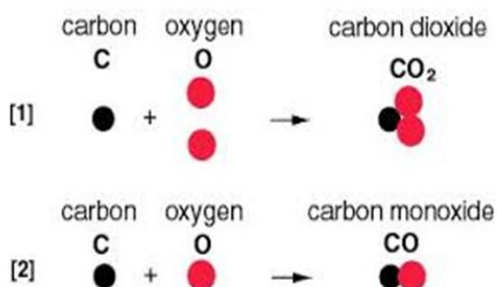
## Proportion Laws



### Law of Multiple Proportions

- When two elements, A and B, combine to form more than one compounds, the mass of A and B will combine in simple ratios.

Mass measurements would reflect the 1:2 ratio of carbon and oxygen in  $\text{CO}_2$  and the 1:1 ratio in  $\text{CO}$ .



Elements chemically bonded in different ratios (different % by mass) have different properties!

## -> CO<sub>2</sub>

- > CO<sub>2</sub> is a common gas in the atmosphere, and is required for plant life
- > CO<sub>2</sub> is a natural byproduct of human and animal respiration, fermentation, chemical reactions, and combustion of fossil fuels and wood
- > CO<sub>2</sub> poisoning is rare; however scuba divers have to watch out for it (the bends)

---

## -> CO

- > CO is produced naturally in trace amounts by the partial oxidation of methane in the atmosphere, volcanoes and forest fires
- > CO is produced at dangerous levels by oxygen-starved combustion in improperly ventilated fuel-burning appliances such as oil and gas furnaces, gas water heaters, gas ovens, gas or kerosene space heaters, fire places and wood stoves
- > It is the most common type of fatal poisoning in the world

## Periodic Trends



Elements found within the same group of the periodic table have similar **CHEMICAL** and **PHYSICAL** properties!

### THE PERIODIC TABLE OF ELEMENTS

1

H

HYDROGEN

1.008

3

Li

LITHIUM

6.941

11

Na

SODIUM

22.990

4

Be

BERYLLIUM

9.012

12

Mg

MAGNESIUM

24.305

1

H

HYDROGEN

1.008

1

Atomic number

1

H

Element symbol

1

H

Element name

1.008

Relative atomic mass

Block

Symbol Key

s block elements

p block elements

d block elements

f block elements

Colour Key

2

He

HELIUM

4.003

10

Ne

NEON

20.180

18

Ar

ARGON

39.948

36

Kr

KRYPTON

83.798

54

Xe

XENON

131.294

86

Rn

RADON

(222.018)

118

Og

OGANESSIUM

(294.000)

6

C

CARBON

12.011

14

Si

SILICON

28.086

32

Ge

GERMANIUM

72.640

50

Sn

TIN

118.710

82

Pb

LEAD

207.2

126

Fl

FLEROVIUM

(289.000)

7

N

NITROGEN

14.007

15

P

PHOSPHORUS

30.974

33

As

ARSENIC

74.922

51

Sb

ANTIMONY

121.760

83

Bi

BISMUTH

208.980

115

Mc

MOSCOWIUM

(290.000)

8

O

OXYGEN

15.999

16

S

SULFUR

32.065

34

Se

SELENIUM

78.971

52

Te

TELLURIUM

127.603

84

Po

POLONIUM

(209.982)

9

F

FLUORINE

18.998

17

Cl

CHLORINE

35.453

35

Br

BROMINE

79.904

53

I

IODINE

126.905

81

At

ASTATINE

(210.987)

5

B

BORON

10.811

13

Al

ALUMINUM

26.982

31

Ga

GALLIUM

69.723

49

In

INDIUM

114.818

80

Hg

MERCURY

200.592

112

Cn

COOPERSIUM

(285.000)

20

Ca

CALCIUM

40.078

38

Sr

STRONTIUM

87.620

56

Ba

BARIUM

137.327

88

Ra

RADIUM

(226.025)

21

Sc

SCANDIUM

44.956

39

Y

YTTRIUM

88.906

57-71

22

Ti

TITANIUM

47.867

40

Zr

ZIRCONIUM

91.224

72

Hf

HAFNIUM

178.492

104

Rf

RUTHENIUM

(261.109)

23

V

VANADIUM

50.942

41

Nb

NIOBIUM

92.906

73

Ta

TANTALUM

180.948

105

Db

DUBNIUM

(262.104)

24

Cr

CHROMIUM

51.996

42

Mo

MOLYBDENUM

95.94

74

W

TUNGSTEN

183.84

106

Sg

SEABORGIUM

(266.123)

25

Mn

MANGANESE

54.938

43

Tc

TECHNETIUM

97.907

75

Re

RHENIUM

186.207

107

Bh

BOHRIUM

(264.107)

26

Fe

IRON

55.845

44

Ru

RUTHENIUM

101.07

76

Os

OSMIUM

190.23

108

Hs

HASSIUM

(277.000)

27

Co

COBALT

58.933

45

Rh

RHODIUM

102.906

77

Ir

IRIDIUM

192.22

109

Mt

MEITNERIUM

(268.109)

28

Ni

NICKEL

58.693

46

Pd

PALLADIUM

106.42

78

Pt

PLATINUM

195.084

110

Ds

DARMSTADTIUM

(281.000)

29

Cu

COPPER

63.546

47

Ag

SILVER

107.868

79

Au

GOLD

196.967

111

Rg

ROENTGENIUM

(282.000)

30

Zn

ZINC

65.382

48

Cd

CADMIUM

112.411

80

Hg

MERCURY

200.592

112

Cn

COOPERSIUM

(285.000)

31

Ga

GALLIUM

69.723

49

In

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114.818

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Tl

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204.383

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Ge

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207.2

114

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(289.000)

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Te

TELLURIUM

127.603

84

Po

POLONIUM

(209.982)

116

Lv

LIVERMORIUM

(293.000)

35

Br

BROMINE

79.904

53

I

IODINE

126.905

85

At

ASTATINE

(210.987)

117

Ts

TENNESSIUM

(294.000)

36

Kr

KRYPTON

83.798

54

Xe

XENON

131.294

86

Rn

RADON

(222.018)

118

Og

OGANESSIUM

(294.000)

57

La

LANTHANUM

138.905

58

Ce

CELIUM

140.116

59

Pr

PRASEODYMIUM

140.908

60

Nd

NEODYMIUM

144.242

61

Pm

PROMETHIUM

(144.912)

62

Sm

SAMARIUM

150.362

63

Eu

EUROPEUM

151.964

64

Gd

GADOLINIUM

157.253

65

Tb

TERBIUM

158.925

66

Dy

DYSPROSIUM

162.503

67

Ho

HOLMIUM

164.930

68

Er

ERBIUM

167.259

69

Tm

THULIUM

168.934

70

Yb

YTERBIUM

173.054

71

Lu

LUTETIUM

174.967

89

Ac

ACTINIUM

(227.028)

90

Th

THORIUM

(232.038)

91

Pa

PROACTINIUM

(231.036)

92

U

URANIUM

(238.029)

93

Np

NEPTUNIUM

(237.048)

94

Pu

PLUTONIUM

(244.064)

95

Am

AMERICIUM

(243.061)

96

Cm

CURIUM

(247.070)

97

Bk

BERKELIUM

(247.070)

98

Cf

CALIFORNIUM

(251.080)

99

Es

EINSTEINIUM

(252.083)

100

Fm

FERMIUM

(257.091)

101

Md

MEDEVIUM

(258.098)

102

No

NOBELIUM

(259.101)

103

Lr

LAWRENCIUM

(262.105)



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