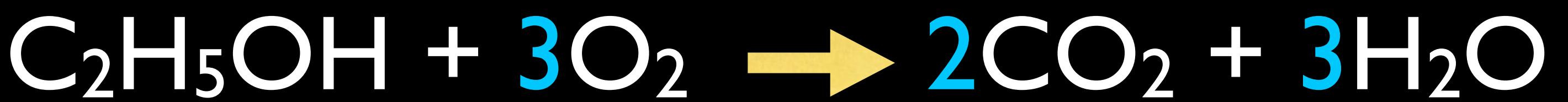


# The Mole



Chemistry Essentials - 003

# The Mole



Chemistry Essentials - 003

Mole

Avogadro's Number

$6.02 \times 10^{23}$

Atoms in 12  
grams of  $^{12}\text{C}$

Bridge

Chemical  
Reactions

Particles

Mass

Coefficients  
 $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$

# Avogadro's Number



$$\frac{V}{n} = k$$



# Avogadro's Number

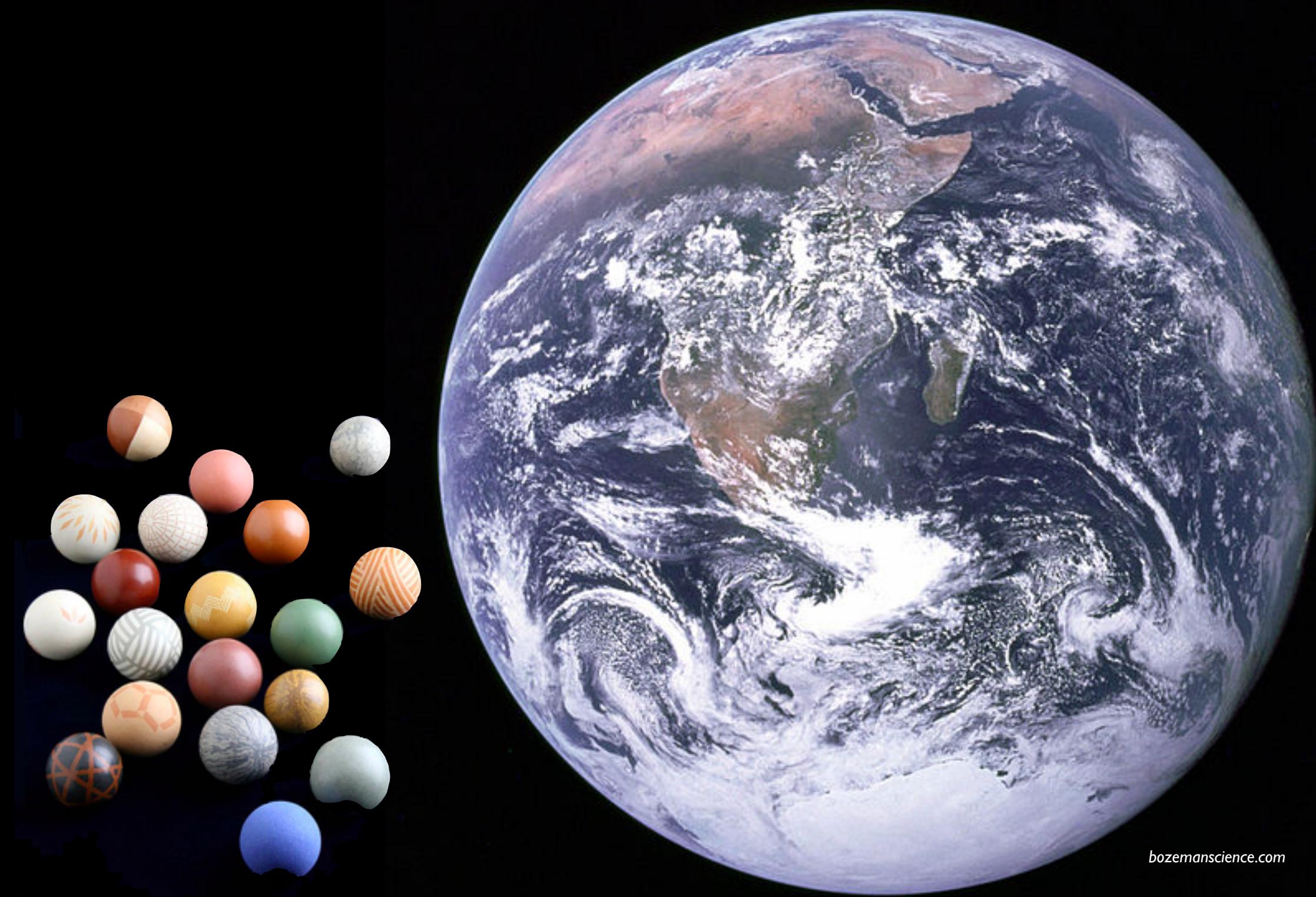
$$1 \text{ mol} = 6.02 \times 10^{23}$$



Dozen

# Avogadro's Number

$$1 \text{ mol} = 6.02 \times 10^{23}$$

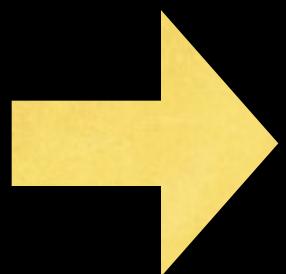


# Bridge





atomic mass unit (amu)



molar mass (g)

$$12.01 + 16.00 + 16.00$$

44.01

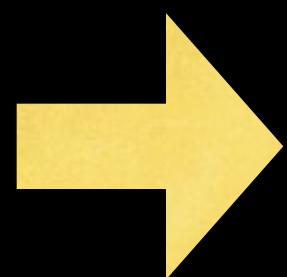
1 mole of  $\text{CO}_2$

44.01 grams

5 <b>B</b> Boron 10.81	6 <b>C</b> Carbon 12.01	7 <b>N</b> Nitrogen 14.01	8 <b>O</b> Oxygen 16.00	9 <b>F</b> Fluorine 19.00	10 <b>Ne</b> Neon 20.18
13 <b>Al</b> Aluminum 26.98	14 <b>Si</b> Silicon 28.09	15 <b>P</b> Phosphorus 30.97	16 <b>S</b> Sulfur 32.07	17 <b>Cl</b> Chlorine 35.45	18 <b>Ar</b> Argon 39.95

# NO

atomic mass unit (amu)



molar mass (g)

$$14.01 + 16.00$$

30.01

1 mole of  $\text{CO}_2$

30.01 grams

5 <b>B</b> Boron 10.81	6 <b>C</b> Carbon 12.01	7 <b>N</b> Nitrogen 14.01	8 <b>O</b> Oxygen 16.00	9 <b>F</b> Fluorine 19.00	10 <b>Ne</b> Neon 20.18
13 <b>Al</b> Aluminum 26.98	14 <b>Si</b> Silicon 28.09	15 <b>P</b> Phosphorus 30.97	16 <b>S</b> Sulfur 32.07	17 <b>Cl</b> Chlorine 35.45	18 <b>Ar</b> Argon 39.95

# Bridge

Mass

The  
Mole

Particles

~~9.01 grams  
of water~~

$$\times \frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ molecules of H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 3.01 \times 10^{23} \text{ molecules of water}$$

1 <b>H</b> Hydrogen 1.01	8 <b>O</b> Oxygen 16.00
-----------------------------------	----------------------------------

# Convert:

5.72 grams  
of  $\text{C}_6\text{H}_{12}\text{O}_6$



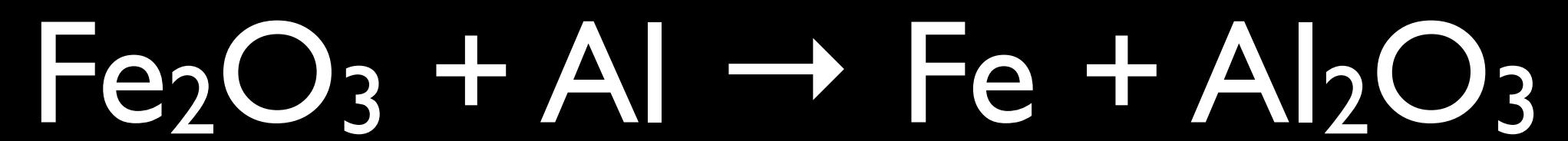
molecules  
of  $\text{C}_6\text{H}_{12}\text{O}_6$

6	C
Carbon	
12.01	

1	H
Hydrogen	
1.01	

8	O
Oxygen	
16.00	

# Chemical Reactions



Mole

Avogadro's Number

Bridge

Mass

Coefficients  
 $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$

Atoms in 12  
grams of  $^{12}\text{C}$

quantify

Mole

Avogadro's Number

$6.02 \times 10^{23}$

Atoms in 12  
grams of  $^{12}\text{C}$

Bridge

Chemical  
Reactions

Particles

Mass

Coefficients  
 $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$

Did you learn?

Connect the number of particles, moles, mass and volumes to one another both qualitatively and quantitatively.

## Acknowledgements

*File:04500.jpg*, n.d. <http://commons.wikimedia.org/wiki/File:04500.jpg>.

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*File:Yellow Toy Balloon.svg*, n.d. [http://commons.wikimedia.org/wiki/File:Yellow\\_toy\\_balloon.svg](http://commons.wikimedia.org/wiki/File:Yellow_toy_balloon.svg).



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