

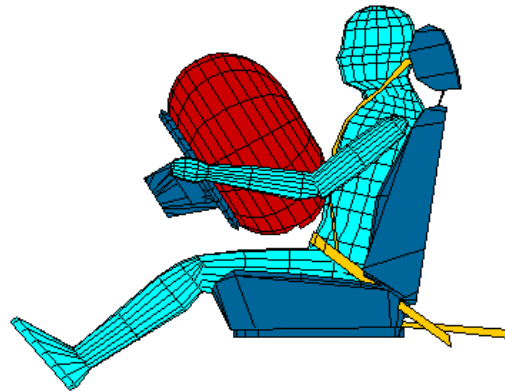
N27 - Real Life Stoichiometry Examples

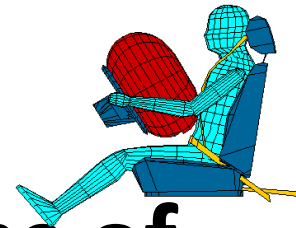
**Target: I can apply stoichiometry to
real life examples that have
context/stories behind them.**

Link to YouTube Presentation: <https://youtu.be/DK2MEqz9fFs>

Example #1 – AIR BAGS

Exact quantity of nitrogen gas must be produced in an instant.



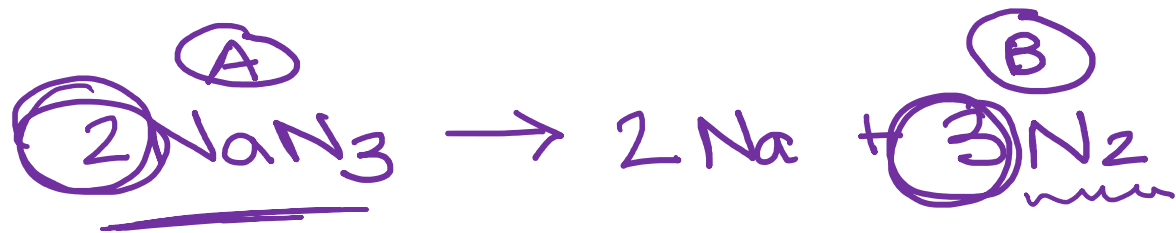


If an airbag is made with 90 grams of NaN_3 will it be safe?

Assume that 65.1 L of N_2 gas are needed to inflate an air bag to the proper size to protect you during an accident.

(Hints: Make NaN_3 your A value. The density of N_2 gas at this temperature is about 0.916 g/L).





Density
0.916 g/L

$\text{g A} \rightarrow \text{mol A} \rightarrow \text{mol B} \rightarrow \text{g B} \rightarrow \text{L B}$
 molar mass A mole ratio molar mass B Density B
 65.01 g/mol $\frac{\text{B}}{\text{A}}$ 28.02 g/mol

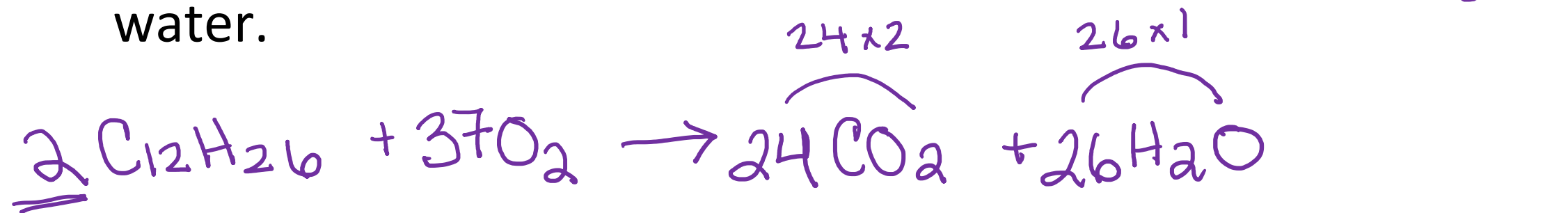
= 63.52 L
N₂(g)

90 g A	1 mol A	3 mol B	28.02 g B	1 L B
65.01 g A	2 mol A	1 mol B	0.916 g B	

- **63.52 L N₂ gas**
- **NOT SAFE! The air bag will not inflate all the way which would be dangerous.**

Example #2 – ROCKET FUEL

In 1967 the Saturn V Rocket did an unmanned test flight to the moon. It used kerosene fuel to get through the atmosphere into outer space. The kerosene ($C_{12}H_{26}$) combusts with liquid oxygen (O_2) on board the rocket to form carbon dioxide and water.



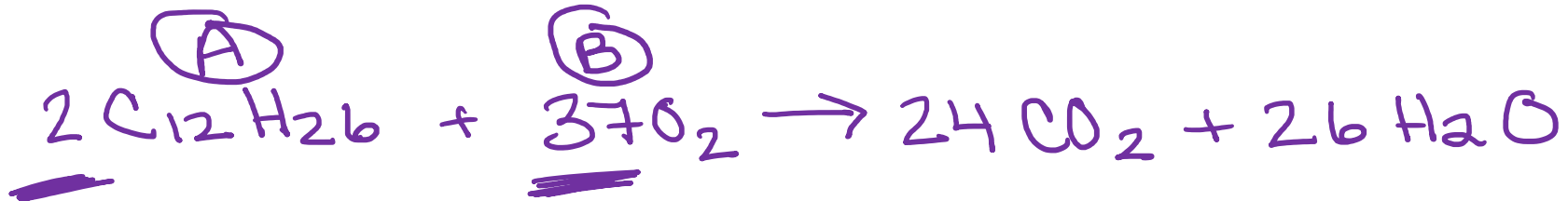
Example #2 – ROCKET FUEL



If the Saturn V rocket was loaded with 770,886 Liters of kerosene fuel and 890,650 Liters of liquid oxygen, would it have enough liquid oxygen on board to use up all the kerosene in order to get out of the atmosphere?

*(Hints: Make kerosene your A value.
The density of kerosene is 749g/L,
and the density of liquid oxygen
is 1141 g/L)*





water density
1 g / 1 mL
only
density
to memorize



Density A

m.m
A

m.r
B

m.m
B

Density B

749 g A / 1 L A

170.33

g A / 1 mol A

B
A

37 mol B

2 mol A

32 g B

1 mol B

1141 g B

1 L B

=
1,758,801
2.02

770886 LA	749 g A	1 mol A	37 mol B	32 g B	1 L B
1 L A	170.33 g A	2 mol A	1 mol B	1141 g B	

Brought 890,650 L need ☹

- **1,758,801 L of liquid O₂ needed**
- **NOT ENOUGH liquid O₂ on board to burn all the kerosene! Uh oh...**

Example#3 - HYDROGEN POWERED BICYCLES

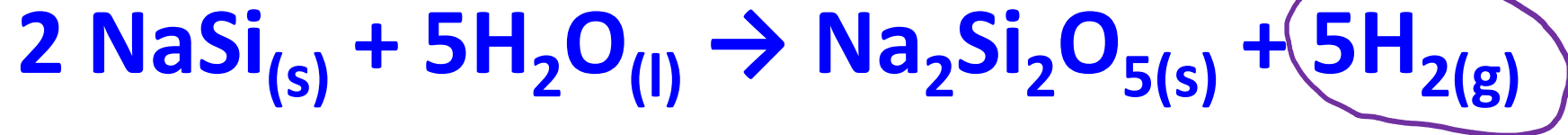
Electric Bicycles are becoming very popular these days. They typically have a rechargeable battery pack and electric hub motor.

A new electricity source combines a hydrogen fuel cell with a "*sodium silicide*" fuel cartridge (winner of a "Green Chemistry Challenge Award")



Example#3 – H₂ POWERED BICYCLES

The sodium silicide reacts with water to make the hydrogen fuel to run the bicycle.



If you start with 1Kg of sodium silicide, and your tank can hold 500mL of water, will you have enough water to use up the battery?

*(Hints: Use 1kg of sodium silicide as your A value.
The Density of water is 1g/mL)*

memorize!



Density doesn't
always have the
same units!

$$\text{Kg A} \rightarrow \text{g A} \rightarrow \text{mol A} \rightarrow \text{mol B} \rightarrow \text{g B} \rightarrow \text{mL B}$$

metric
conversion!

Linnaeus...
or 1000 g / 1 kg

m.m
A

$$\frac{51.08 \text{ g A}}{1 \text{ mol A}}$$

m.R
B / A

$$\frac{5 \text{ mol B}}{2 \text{ mol A}}$$

m.m
B

$$\frac{18.02 \text{ g B}}{1 \text{ mol B}}$$

Density
B

$$\frac{1 \text{ mL B}}{1 \text{ g B}}$$

1 Kg A	1000 g A	1 mol A	5 mol B	18.02 g B	1 mL B	=
1 Kg A		51.08 g A	2 mol A	1 mol B	1 g B	

$$881.95 \text{ mL H}_2\text{O}$$

- **881.95 mL of H₂O needed to use up all the NaSi in the battery.**
- ☆ • **NOT ENOUGH water in the water tank to use up the entire battery.**

holds 500 mL H₂O

Need 881.95 mL

- Balanced Eq
- pathway
- label pathway
- Dimensional Analysis - LINE METHOD
 - units (A is B or formulas)
 - cancel units
- Final Ans. w/ units AND formula
- Box your ans.
- Answer the story question Also!

YouTube Link to Presentation

- <https://youtu.be/DK2MEqz9fFs>