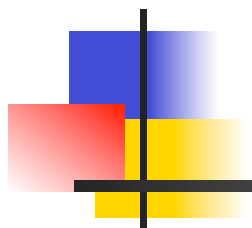


# Chem Connections: Students as Food-Scientists in the Classroom



Sarah Martinak  
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UCSB RET II



“Science is but an image of the truth.”

- Francis Bacon, British Philosopher
- 





# RET I Research



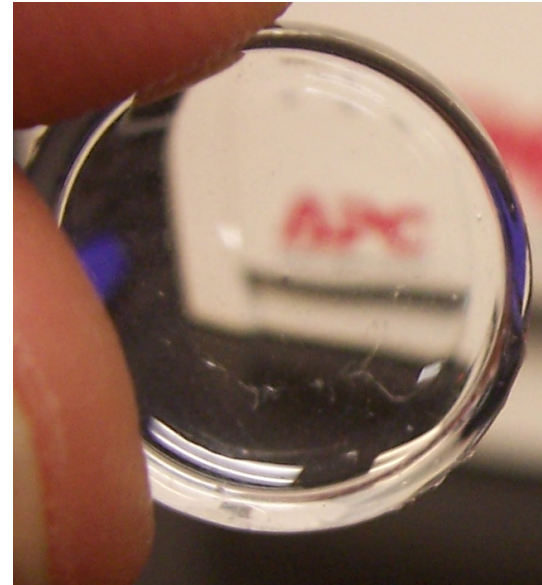
## **“Robust Materials for the Encapsulation of LED Devices”**

Supervisor: Hunaid Nulwala



# Encapsulent Material Requirements:

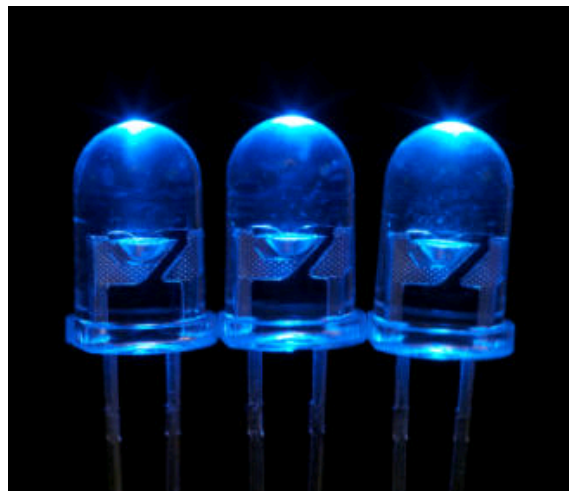
- Hydrothermal stability
- Tough
- Good barrier properties:  $O_2$ ,  $H_2O$
- Transparent
- Flexible



# RET I Research

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- Clear-cut connection
- Motivated to reach end-product
- Excitement for research & science



# Current Observations

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- Bugged down with new vocab & equations
- Lose sight of the “bigger picture”



# Current Observations

- Why do I need to learn this?
- When will I ever use this in the real world?



# Current Observations

- Rush through labs
- Struggle connecting seat-work to bench-work.







# “Robot”-type Lab

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“Determining the Specific Heat of Aluminum”





## **Mythbusters-Style Calorie Investigation:**

**Are Baked Snack Foods Really  
Healthier Than Fried?**



# RET II Project

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- Science is everywhere around us, behind everyday life.
- Make connection from classroom to real world.

**Make science relevant!**



# RET II Project

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More likely to be curious, inquisitive, and motivated to learn the material.



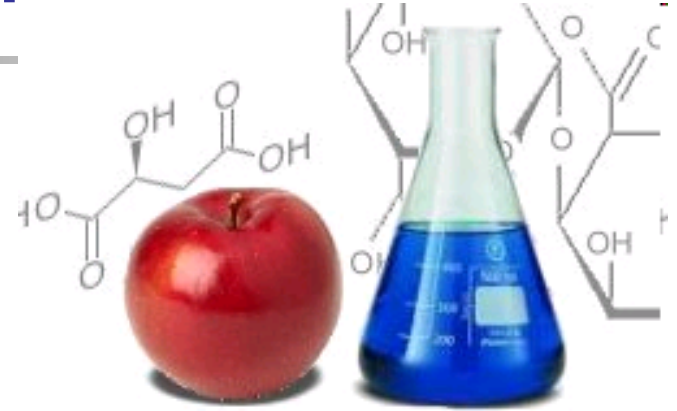
# Students as Food Scientists

Food & nutrition familiar to every student –  
creates overall theme



# Chemistry of Food

- Ingredients
- Additives
- Preservatives
- Fats, Proteins, Carbohydrates
- Vitamins
- Nutrition

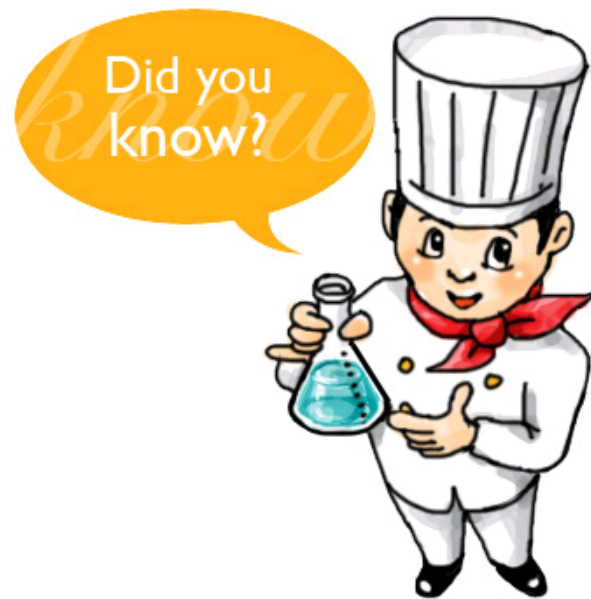




# Students as Food Scientists

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Teach students chemistry standards,  
but with a twist!



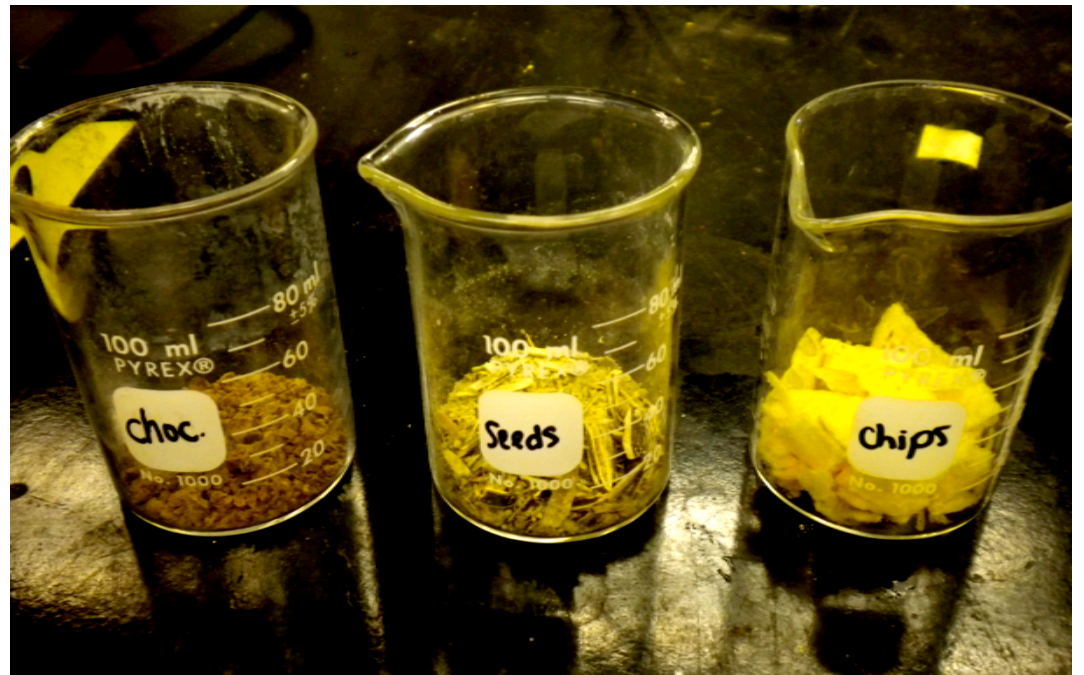
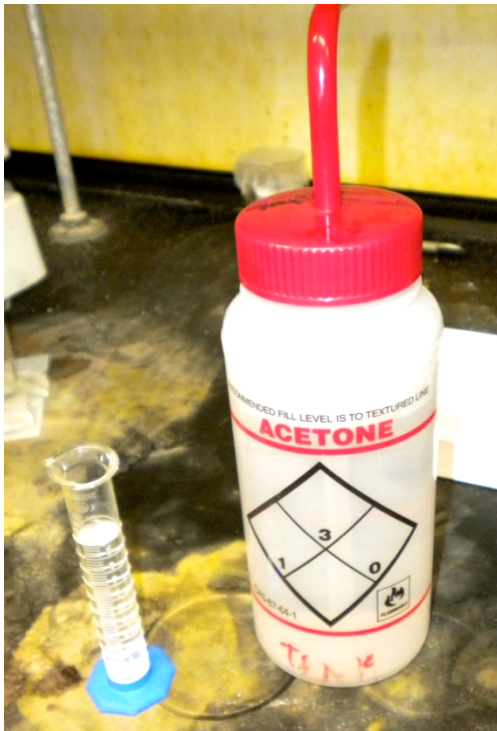
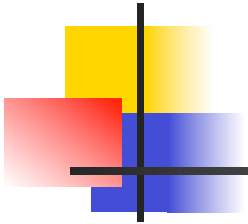
# Finding Invisible Fats in Foods

- Extraction of fat
  - Acetone: “like dissolves like”



- Description of extracted fat
  - Color, texture, odor, viscosity

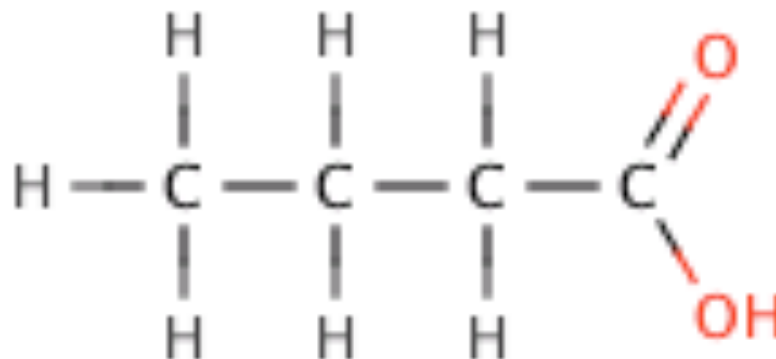




# Pre-Lab Question



- **Butanoic acid** is the **saturated fatty acid** responsible for the characteristic flavor of butter. The chemical structure of butanoic acid is shown below. Calculate the **mass percent of C, H, and O** in the compound.





# Lab Experiment

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- Question students during experiment
  - “Doing” the science or “know” the science?
  
- Ex: “When we add acetone to the crushed chocolate chips, where is the fat going?”

# Fat Extraction



**Extracted fat – white solid**  
**Saturated fat**



**Dried chocolate after**  
**fat extraction**

# Fat Extraction



**Extracted fat – yellow liquid**  
**Unsaturated fat**



**Dried chips after**  
**fat extraction**

# Fat Extraction



**Extracted fat – yellow liquid**  
**Unsaturated fat**



**Dried seeds after**  
**fat extraction**

# Conclusion – “the big picture”

- Compare mass % results to nutritional labels
- More saturated or unsaturated fat?
- \* Chemical structure of fats





# Students as Food Scientists

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- Motivated to reach end-product
- Nutritional component
- Interesting, fun, & educational!

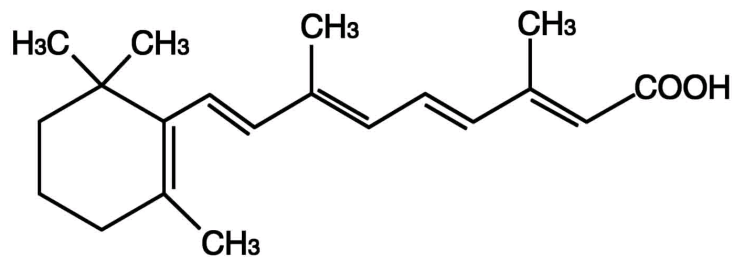


# “Like Dissolves Like”: Solubility of Vitamins in the Body

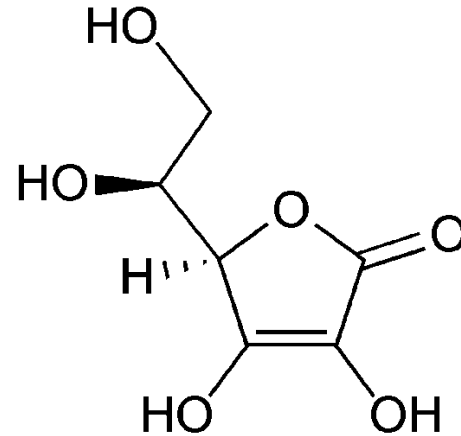
- Fat vs. Water Soluble
  - Fat soluble stored in fat tissue
  - Water soluble pass through body



# Chemical Structure vs. Solubility



**Vitamin A**



**Vitamin C**

# How Much Citric Acid is in Your Soda?

- Titration Lab
- Teams: 7-Up, Sierra Mist, Squirt, etc.
  - Most citric acid?



# If Your Dog Took Ms. Martinak's Chemistry Class, Would He Eat This?

## Ingredients in Kibbles 'n Bits Original Dog Food: Chicken & Beef Flavor:

corn, soybean meal, beef and bone meal, ground wheat flour, **salt, hydrochloric acid, potassium chloride**, caramel color, sorbic acid **sodium carbonate**, minerals (**ferrous sulfate, zinc oxide, manganous oxide, copper sulfate, calcium iodate, sodium selenite**), **calcium sulfate, titanium dioxide,**.





## In-Class Activity

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- Ingredient lists of “mystery” snacks
  - Nutritional info
- Write chemical names & formulas
- Guess the “mystery” snack

# Homework

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- Search cabinets, grocery stores, etc.
  - Check ingredient lists - provide name & formula



# Conclusion

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Students need to be...

- Motivated
- Engaged
- **Learning!**





# Conclusions

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- Students act as food scientists
- Make course content significant
- Practice connecting seat work to real-world situations





# Acknowledgements

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