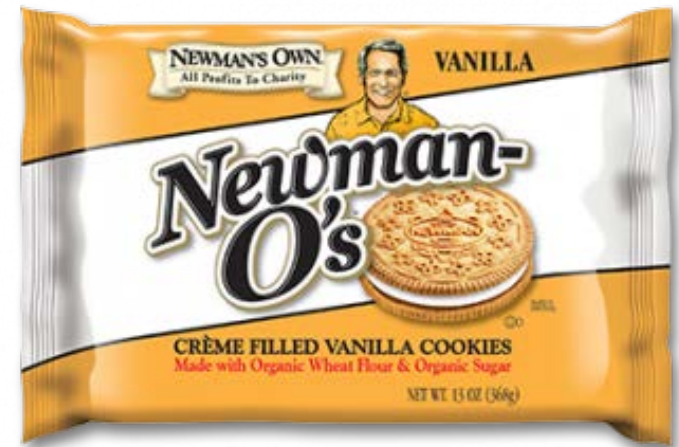




Eww, you're eating it

Innovative Approaches to Conquering Fear of the Unknown



Mac Burgess

Montana State University Plant Sciences and Plant Pathology
NACTA 2018 Ames Iowa

AGSC 356 students are diverse:

Crop Science, Horticulture, Sustainable Food Systems, Ag Business, Plant Science



Pre-req #1 Chemistry 121/141

- Demonstrate the ability to work with laboratory equipment, apparatus, and chemicals in a safe and effective manner;
- Demonstrate ability to collect data, perform appropriate calculations, and apply the scientific method to experimental situations;
- Apply the factor label method for the conversion of units, and be able to record and round measurements to the correct number of significant figures;
- Describe the basic properties of matter including mass, density and physical states;
- Write the electronic configuration of atoms and ions, and will apply the electronic structure of atoms and ions to the periodic table;
- Identify and differentiate between ionic and covalent bonding;
- Name simple inorganic compounds and predict their formulas from their names;
- Draw Lewis structures of compounds and predict molecular geometry from the Lewis structures;
- Balance chemical equations, and perform basic stoichiometric calculations involving chemical equations;
- Apply the gas laws to substances in the gaseous state;
- Predict types of reactions from, and apply concentration units to, chemical solutions;
- Describe chemical kinetics, and apply Le'Chatlier's principle to systems in chemical equilibrium;
- Perform pH calculations, define and predict the pH of buffers, and demonstrate knowledge of acid/base theory;
- Demonstrate knowledge of the application of chemistry to various aspects of their lives.

**Do not try to
read this
slide!**

Pre-req #2 Intro Soils (ENSC 245)

- **Describe** the physical, chemical and biological properties of soil;
- **Use** basic soil science terminology;
- **List** proper soil management practices;
- **Perform** basic soil laboratory tests using reagents and basic soil test equipment;
- **Describe** the role of soil as a natural resource;
- **List** the nutrients required by plants;
- **Describe** many of the common fertilizer materials available;
- **Explain** the methods of applying, handling & storing commercial fertilizers;
- **Formulate** a fertilizer mixture for given conditions;
- **Interpret** soil test results,
- **List** current recommended soil management practices.

AGSC 356 – Plant Nutrition and Soil Fertility Management

- **Upon successful completion of this course, students will:**
 - Know the essential plant nutrients, their functions in plant growth, uptake mechanisms, fertilizer sources, and deficiency/toxicity symptoms.
 - Be able to describe how soil and water store, transport, cycle, and mediate the uptake of plant nutrients.
 - Be able to calculate application rates for soil amendments, including fertilizer, manure, compost, and lime, to meet plant nutrition needs in agronomic, horticultural, rangeland, forestry, and residential settings considering economic and environmental
 - **Apply** knowledge of plant nutrition and soil fertility to real-world management scenarios in horticultural, agronomic, and rangeland settings.
 - Assess the environmental impact of soil fertility management decisions.

BAN

**DIHYDROGEN
MONOXIDE**

The Invisible Killer

DHMO.org



- Byproduct of coal burning
- Nuclear power
- Greenhouse gas
- Found in acid rain
- Causes soil erosion
- Causes severe burns
- Used by the military

20-30% of students don't get this*

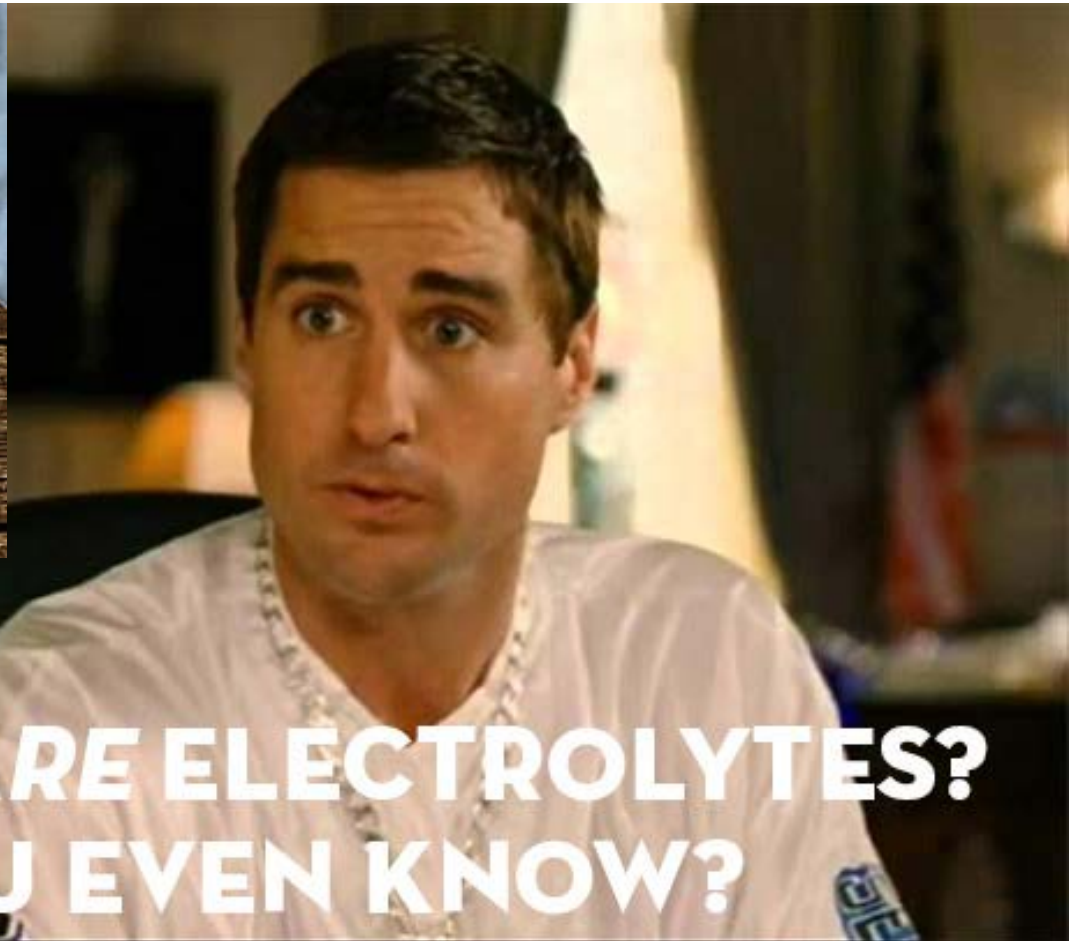
* or don't do the reading, or are messing with me?

Based on a graded quiz question asking if DHMO should be banned in schools

- DHMO is H_2O
- What they say is true, water will kill you



Electrolytes are what plants crave



**BUT WHAT ARE ELECTROLYTES?
DO YOU EVEN KNOW?**

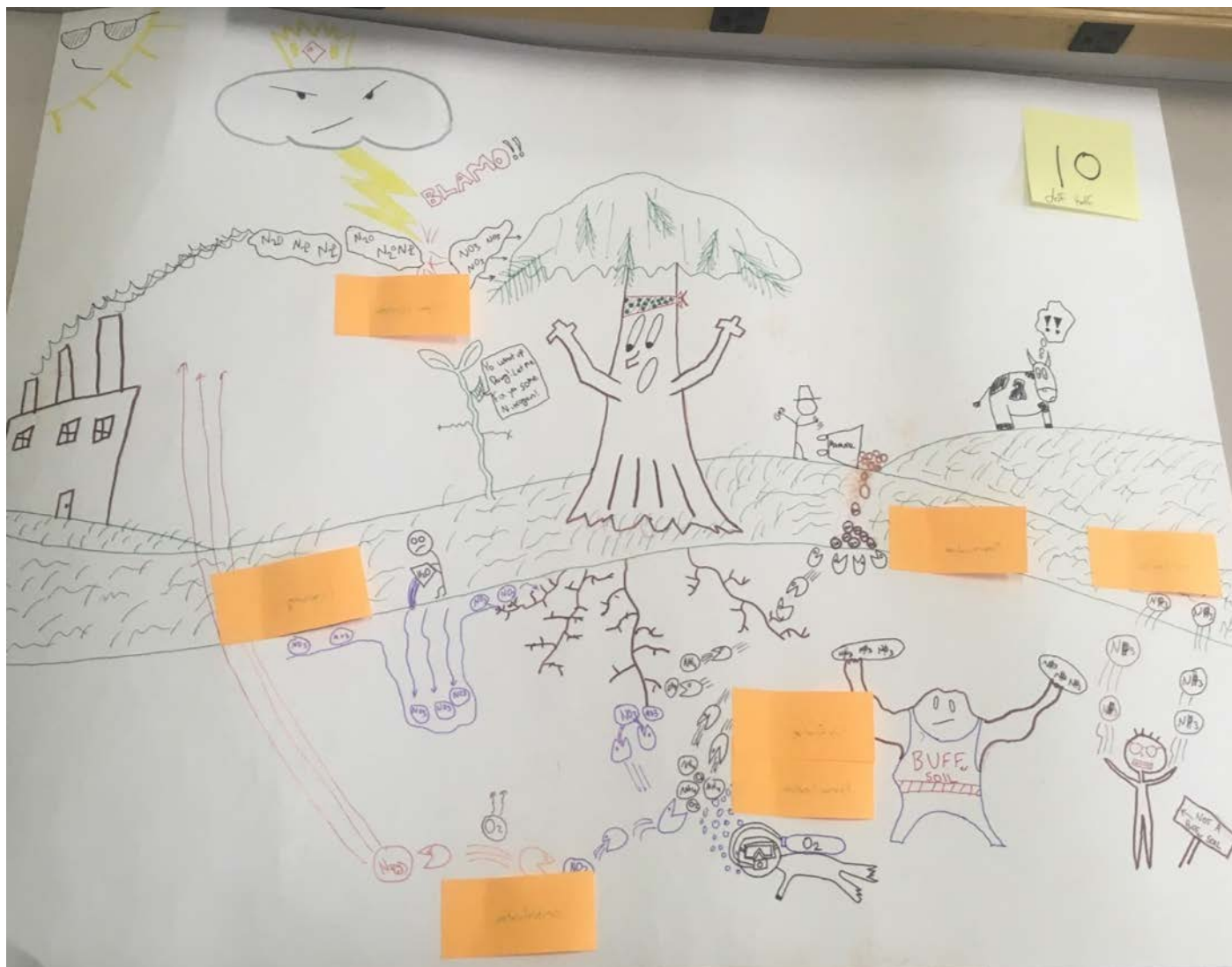
Why are these sheep licking a highway?



1/3 adult Americans have high blood pressure. 8% meet the RDA for Potassium

Nitrogen Cycle Art Project

Nitrogen Trioxide is even more misunderstood than Dihydrogen Monoxide



Some of the real ways Nitrogen is bad for you and the environment... but lets move beyond dualism

- Marine Eutrophication
- Groundwater pollution in Des Moines Iowa
 - Blue Baby Syndrome, lawsuits, farm "runoff"
- Ammonium Nitrate – used by terrorists
- Anhydrous Ammonia – kills soil microbes destroys soil
- Urea- leads to Ammonium Volatilization
- Sodium Nitrate – a war was fought over it

MEOCD cognitive maturation model

(Greene et al 2010)

- Dualism
- Dogmatism
- Skepticism
- Rationalism



Engagement!



Don't eat the lawn food y'all



Eat this!



Calcium Dihydrogen Phosphate
aka triple super phosphate
aka baking powder



Chemical Properties

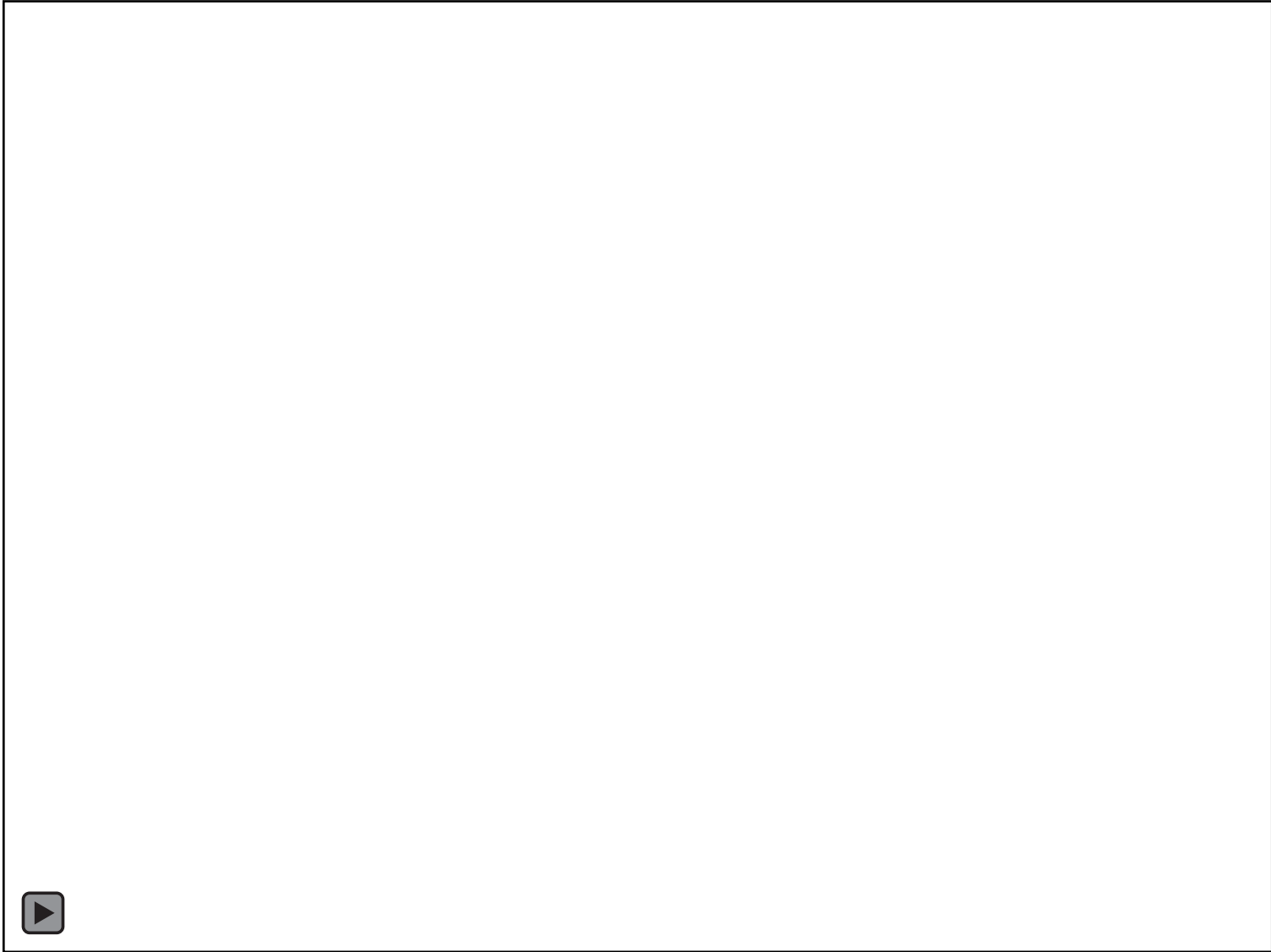
Chemical formula:	$\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$
Fertilizer analysis:	45% P_2O_5 (0-45-0) 15% Ca
Water-soluble P:	Generally >90%
Solution pH	1 to 3



What is the cheapest dietary source of potassium for people?
Find out at the Potassium Potluck!



“Nitrogen, you are my favorite N” –Mike 2015





4:16

+ QUEUE

DOWNLOAD

EMBED

TRANSCRIPT

PRODUCERS

Here's How To End Iowa's Great Nitrate Fight

February 2, 2015 · 5:02 AM ET

Heard on [Morning Edition](#)



DAN CHARLES



Outcome Assessment

- 2017 – 28 of 32 students formulated reasonable potential solutions to Iowa's "great nitrate fight" on the final exam.
- 2017 SFBS Capstone Students (2015/2016 AGSC 356 students) provided a nuanced and technically competent fertilizer recommendation for a proposed food forest adjacent to a P-impaired waterway.