Discussion Board Assignments

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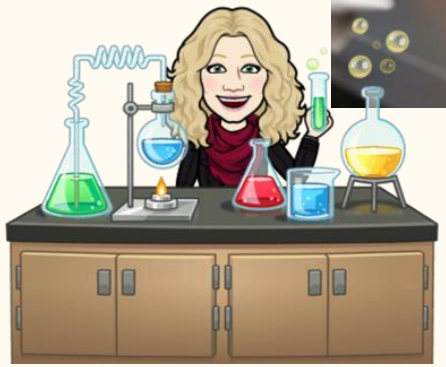

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Overview

- Role of discussions/discussion boards
- What have we done? What are we doing?
  - Intermolecular Forces
  - Scientist Spotlight
  - Types of Energy
  - Virus Infographics
  - Protein Infographics
  - Ask the Expert
- How to convert a conventional assignment to a discussion board
- What are some examples that you've come up with?
- What is an assignment that you would like to create? (some time to work)

Role of a Discussion

- Comprehend
  - Students can help each other understand class material
- Critique
  - Students share ideas and provide constructive feedback to each other
- Construct Knowledge
  - Opportunity for interaction and collaboration; we do not learn in isolation
- Share
  - Create a community of learners, supporting each other and developing a sense of belonging

Intermolecular Forces

Part I: Pick one of the molecules below. Make a post stating which molecule you pick and whether it is polar or nonpolar. *Explain why.* Everyone must choose a different molecule!

Part II: Reply to someone's post and tell them what molecule you chose and what the strongest intermolecular force between your two molecules is. Let's try to identify as many different combinations as possible.

Part III: Read every post and ask questions if you have them. I would encourage you to answer each other's questions, but I will be following along as well.

Molecules:

1. HCl
2. NH_3
3. $CHBr_3$
4. CO
5. CH_3CH_2Cl
6. H_2O
7. HF
8. O_2
9. CO_2
10. HBr
11. CH_3OH
12. CH_3NH_2
13. SO_3
14. C_3H_8
15. CH_3OCH_3
16. NH_2NH_2
17. C_6H_{14}
18. CH_3Br
19. CBr_4
20. CH_2Cl_2

The molecule I chose is CO. CO is polar because oxygen (slightly negative charge) is more electronegative than carbon (slightly positive charge). The oxygen tries to pull the shared electrons toward itself, causing a dipole moment, and resulting in a polar molecule.

Reply

The strongest intermolecular force between SO3 and CO is dipole induced-dipole because there is one polar and one nonpolar molecule.

Reply (1 like)

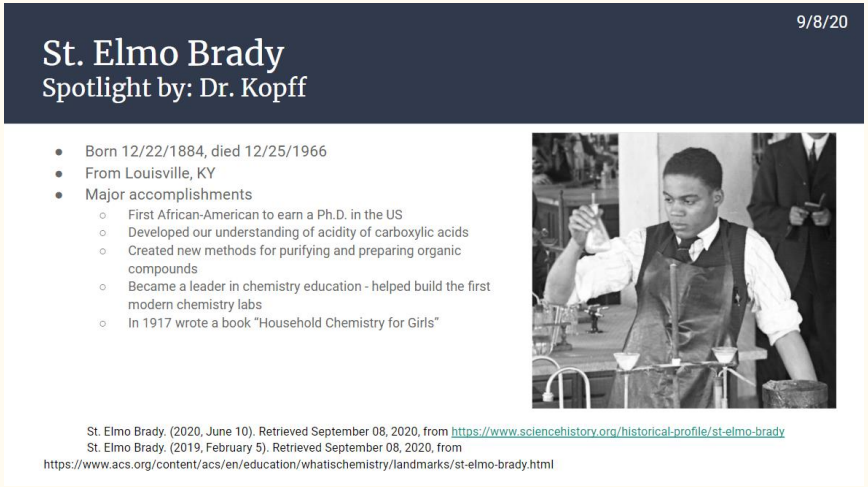
Scientist Spotlight

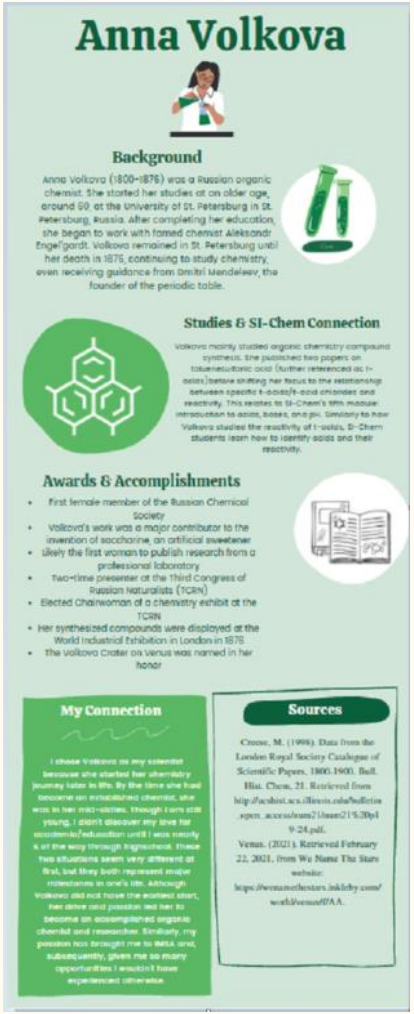
Focus on Diversity in Science and personal connections

Must include
- Basic biographical info
- Their scientific work and how it relates to our learning objectives
- Accomplishments/awards
- A personal connection
- Sources

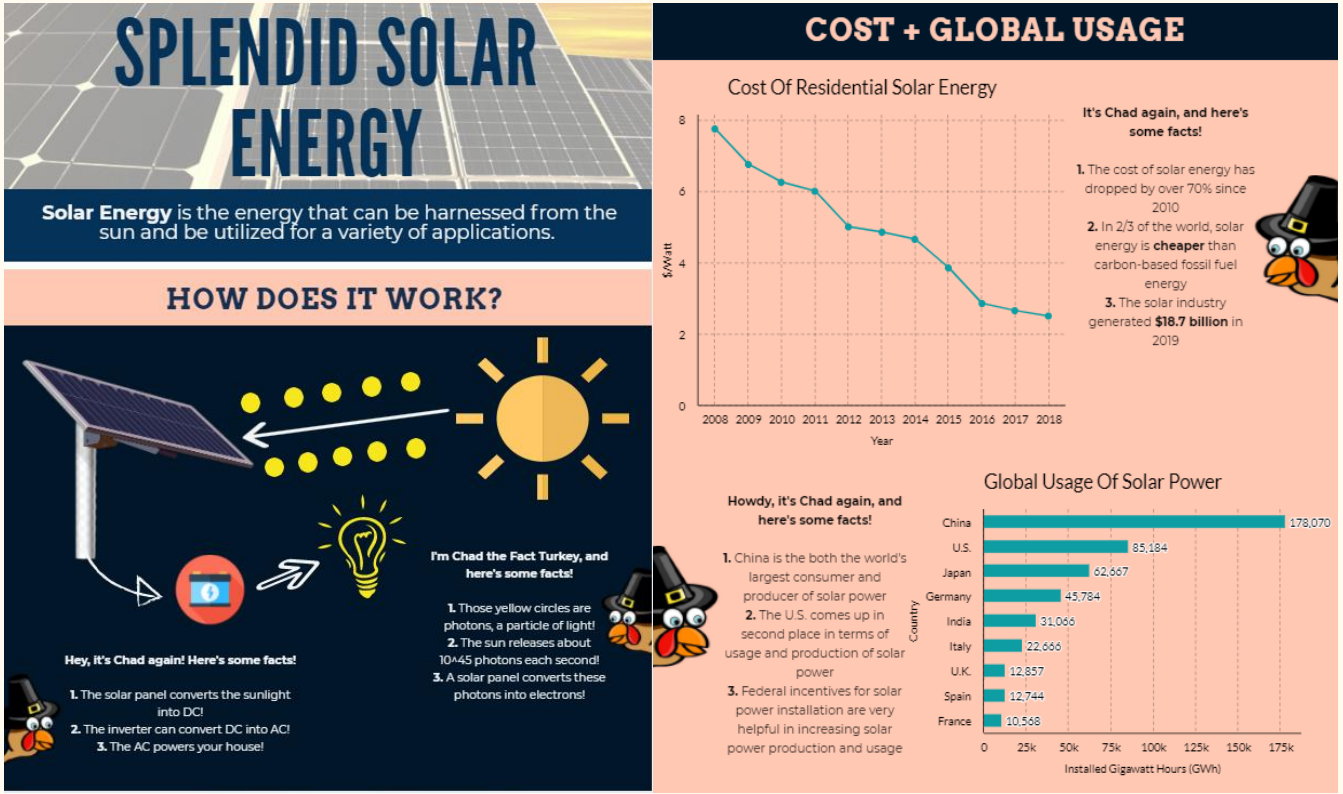
Need to ask questions to other students about their scientists

Need to respond to questions from other students - might require more research!





Types of Energy



Choose a type of energy from this list:

- Oil
- Coal
- Natural gas
- Solar
- Biomass
- Wind
- Geothermal
- Hydroelectric
- Fuel cells
- Nuclear

Infographic must include:

- How does it work?
- Pros and cons
- What three countries are the biggest consumers of your energy choice?

Other requirements:

- Title
- Section headings
- Minimum of three colors
- Minimum of one chart or graph
- Minimum of four graphics
- Minimum of ten facts
- Citations

Types of Energy

PROS & CONS

PRO		CON
AFFORDABLE + REDUCES ELECTRIC BILL Solar energy has become cheaper than ever and has been proven to reduce electric bills!	cost	**HIGH UNFRONT COST** The upfront costs of solar panels can be quite expensive, sometimes even $20.000
ENERGY INDEPENDENCE With solar panels, the US can become self-reliant in their energy production, not needing to depend on other countries for oil imports.	energy	**INTERMITTENT SOURCE** Fluctuate in their energy return due to a failure to work in certain conditions like night-time when there is minimal sunlight.
ENVIRONMENTALLY FRIENDLY Solar panels are beneficial to the environment as they prevent the release of CO2 and other toxic chemicals	environmental	**LEECHES TOXIC WASTE** Solar panels are often not disposed of correctly, and as a result chemicals like lead are released into the enviorment

FUN FACTS

Hey it's Chad again, and here's my favorite section: fun facts!

Solar energy is the **most** abundant energy source in the world (173,000 terawatts of solar energy hit Earth every second)!

Over two million solar systems have been installed in the U.S. alone!

Solar energy was invented way back in 1954, when three individuals at Bell Lab discovered photovoltaic techonology.

Homeowners can achieve a breakeven point with solar energy in just **three years!**

One **hour** of sunlight = One **year's** worth of energy for Earth!

Solar energy can work even **without** direct sunlight!

California is the U.S.'s largest solar power producer!

CITATIONS/SOURCES

1. https://www.energy.gov/eere/solar/how-does-solar-work
2. http://sitn.hms.harvard.edu/flash/2019/future-solar-bright/
3. http://lsa.colorado.edu/essence/texts/solar.html
4. https://www.eia.gov/energyexplained/solar/
5. https://energy.mit.edu/research/future-solar-energy/
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8. https://climatechange.ucdavis.edu/climate-change-definitions/how-is-solar-power-generated/
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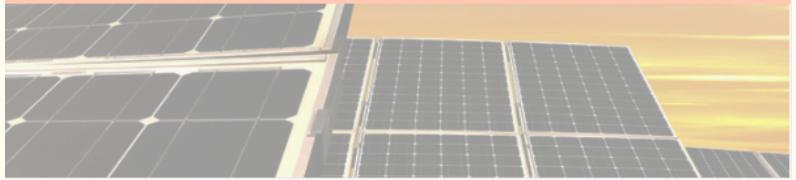
10. https://www.consumeraffairs.com/solar-energy/solar-energy-pros-and-cons.html
11. https://ag.tennessee.edu/solar/Pages/What%20Is%20Solar%20Energy/default.aspx
12. http://www.bu.edu/articles/2016/solar-energy-advantages/



Virus Infographics

https://create.piktochart.com/output/46467250-ers-cov

- What family does the virus belong to?
- Picture of the virus
- What is the genetic material inside? Double stranded DNA, Single stranded DNA, RNA, etc.
- How many proteins does it encode, and how do these proteins get processed? For example, does one polypeptide chain get lysed into different proteins with a viral protease, or does it happen differently?
- Compare and contrast your information from above with the SARS-CoV-2 virus. (See my SARS-CoV-2 infographic on Moodle). For example, how are they the same, and how are they different?
- References

MERS-CoV

Viral Structure

MERS-CoV is the coronavirus responsible for the Middle East Respiratory Syndrome (MERS). MERS-CoV belongs to the family Coronaviridae and the genus Betacoronavirus. A key structural component of the viral membrane, the MERS-CoV spike protein forms large protruding surface spikes that distinguish the MERS-CoV virus from other viruses.

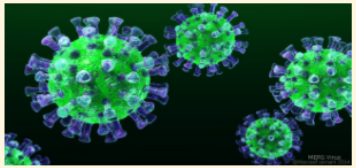


Figure 1: MERS-CoV illustration

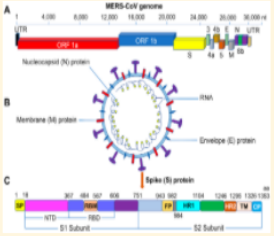


Figure 2: MERS-CoV genome

MERS-CoV is a single-stranded, enveloped, positive-sense RNA virus. Around 30.1 kilobase pairs long, its genome contains 10 open reading frames (ORF) and encodes 10 proteins: 2 replicase polyproteins (ORF 1a and ORF 1b), 4 structural proteins (envelope protein, membrane protein, nucleocapsid protein, and surface spike glycoprotein), and 4 nonstructural proteins (ORF 3, ORF 4a, ORF 4b, and ORF 5). The main route of entry for MERS-CoV is dipeptidyl peptidase 4 (DPP4) on the host cell surface. MERS-CoV can infect a variety of human cell types and tissues in culture, including macrophages, fibroblasts, and endothelial cells. The S1 subunit consists of the N-terminal domain (NTD), the receptor-binding domain (RBD), and the receptor-binding motif (RBM). The S2 domain consists of a fusion peptide (FP), the heptad repeat region 1 (HR1), heptad repeat region 2 (HR2), transmembrane region (TM), and cytoplasmic tail (CP). The binding of the S1 subunit to the cellular receptor DPP4 triggers conformational changes in the S2 subunit that cause the insertion of the fusion peptide into the target cell membrane and the formation of a six-helix bundle fusion core between HR1 and HR2. This key membrane fusion structure causes the viral membrane and the cell membrane to come into close proximity to fuse the membranes.

https://www.cdc.gov/coronavirus/mers/about/index.html
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3807317
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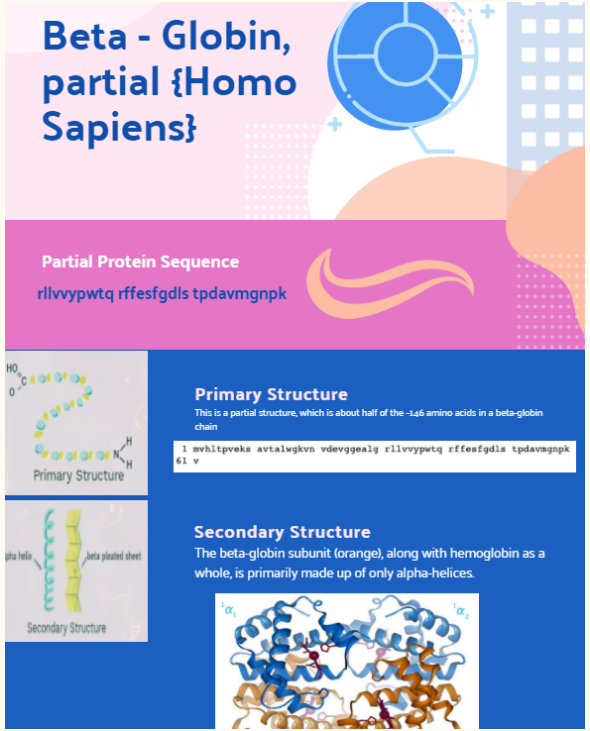
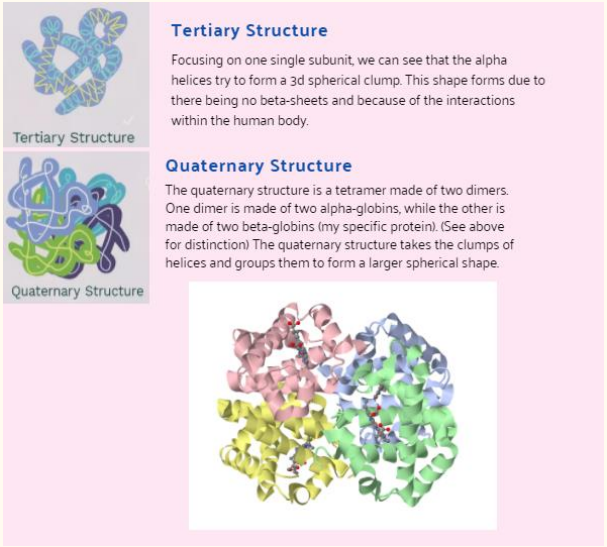
https://www.mdpi.com/1999-4915/11/1/60/htm
https://reprokine.com/product-category/viral-antigens/mers-antigens/

Protein Infographics

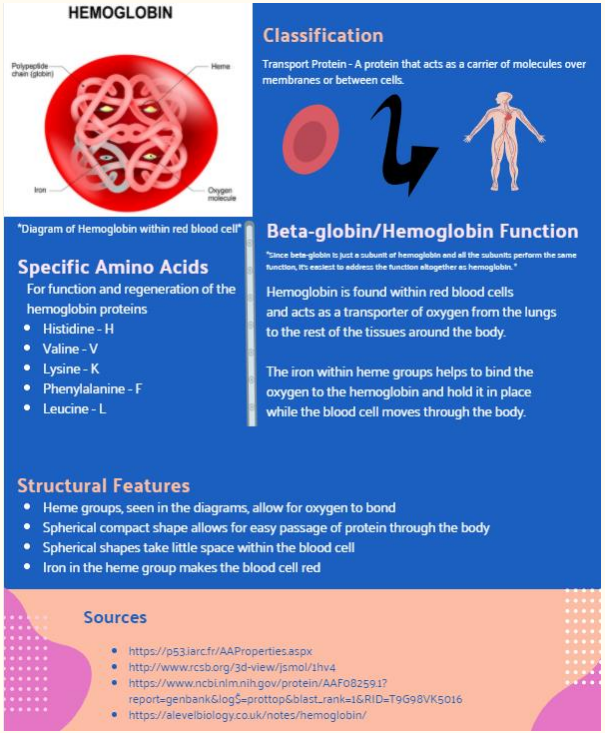




Infographic must include:

- The name of the protein
- The function of the protein.
- What class of protein does this one belong to out of the eight you read about?
- The primary, secondary, tertiary, and quaternary structure of the protein.
- What specific amino acids are important for the function of this protein (if any)?
- What other structural features of the protein are important for its function (if any)?

Protein Infographics



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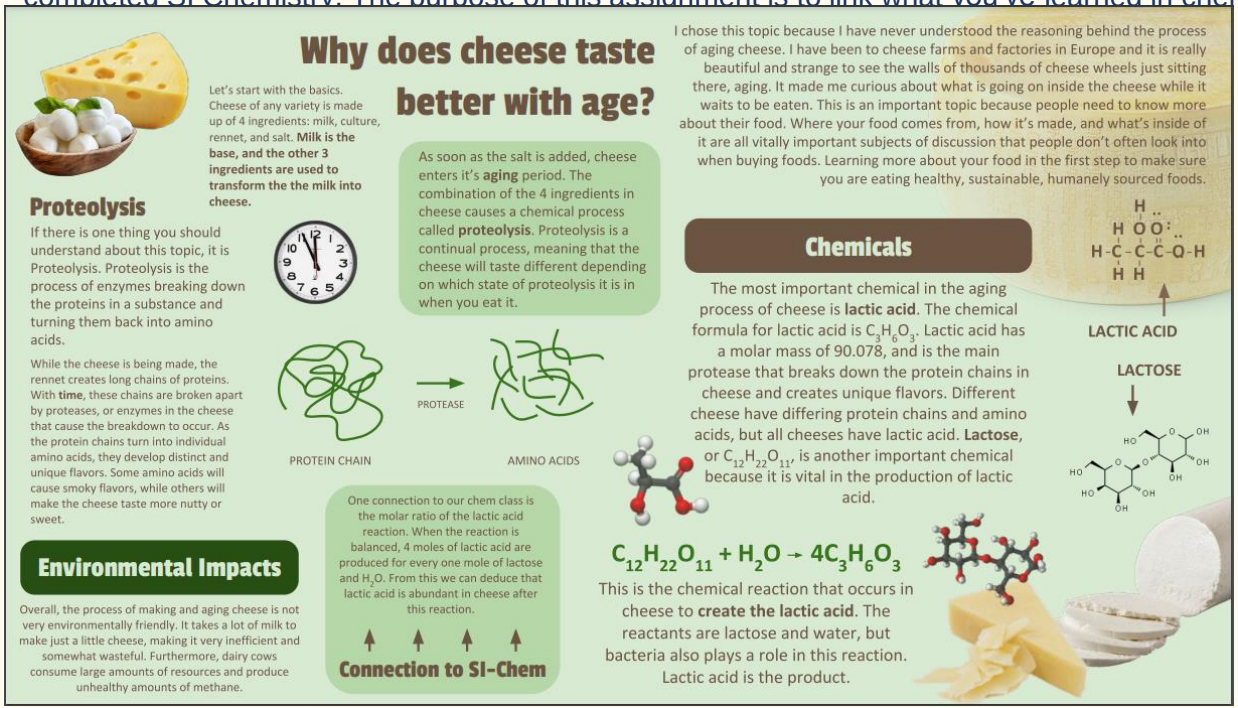
Ask the Expert - Final Project

For your final project YOU are the expert on your topic (your choice). You will need to come up with a question you've been wondering about that relates to chemistry in some way, then you will research that question and become an expert. As the expert you need to respond to a series of questions about your topic - your responses should be aimed at the level of a student who is currently taking, or just completed SI Chemistry. The purpose of this assignment is to link what you've learned in chemistry with a real-world question.



Required Questions

1. What topic did you choose to research?
2. Why did you choose that particular topic?
3. Would you say this is a topic that everyone should know something about? Explain your answer.
4. What are the most important chemicals that are related to your topic? (Show the chemical formulas and structures with key groups identified.)
5. What are some of the relevant physical or chemical properties of these chemicals?
6. What key reactions are involved with your topic? (Write out these reactions if possible)
7. Provide examples of how your topic is related to what was studied in SI Chemistry and how you could use your classroom experience to help explain this subject to a friend or family member.
8. What are some key environmental or societal impacts related to the chemicals involved with your topic?
9. If there was one thing that everyone should understand about your topic, what do you think is the most important thing for them to understand? Explain why you feel this way.

THE CHEMISTRY OF SUNSCREEN

THE IMPORTANCE

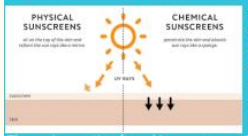
I chose this topic because it's interesting to me how a thin layer of cream over your skin can protect it from the powerful rays of the sun. Knowing how sunscreen works is not something that everyone needs to know, though I do believe that everyone needs to understand that it's important in order to protect their skin and health. The most important thing to know is that sunscreen is crucial to protect your skin from potential harm or diseases cause by the sun's powerful rays.

THE CHEMISTRY ASPECT

There are two main parts to sunscreen which are the emulsion, which is the lotion, oil, or substance that spreads over your skin, and the active ingredient contained in the emulsion which provides protection from the sun.

Zinc oxide (top) or titanium dioxide (bottom) are mainly used to deflect the sun's rays (physical blockers) but some sunscreens use molecules that absorb and filter the amount of rays that can reach the skin. The main chemical filter that is used is avobenzone (middle).

Zinc oxide and titanium dioxide have the ability to block the rays of the sun as a physical property while avobenzone and other molecules like it absorb the photons in these rays.



They then enter into an excited state and then release that energy in an alternative pathway mainly through a low-grade heat that many people can't feel.

The main reaction found in sunscreens is the absorption of UV rays through these molecules.

CONNECTION TO SI - CHEMISTRY

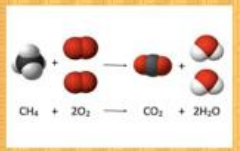
One way this topic relates to what was learned in SI - Chemistry is the idea that once the UV rays are absorbed, they need to be released somehow. Another is the idea that though the physical blockers don't react with the UV rays, they prevent the rays from reacting with our skin. These were all observed through different reactions we talked about in SI - Chemistry and make it easier to explain how they work to someone.

Combustion: Cause and Effect

Combustion is a very valid and important topic because of its relevance in modern society, from its usefulness in products such as cars to its effect on the environment.

Because of its applicability in life and its potential usefulness in many ways, it is important that people know about it, not only to use it but also to use it correctly.

Combustion always takes place when hydrocarbons come into contact with oxgyen, creating water and carbon dioxide. These are the main chemicals involved, although there can technically be others.



Although hydrocarbons can vary widely in molecular geometry, we know that H_2O is bent while CO_2 and O_2 are linear. In regards to polarity, CO_2, O_2, and virtually all hydrocarbon variants are nonpolar while H_2O is polar. This reaction is irreversible.

Combustion, quite simply, is a reaction that causes things such as fire and explosion to occur. It can be observed and explained easily to a family member by simply striking a match and seeing the match catch flame.

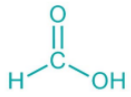
We learned in class how to tell if a reaction was combustion simply by looking at a chemical equation. I have done that here, as well as explaining its real life affect.

Combustion has allowed our society to progress greatly. It is used to make many things in factories, like metals and alloys, as well as start engines on vehicles. It is even what takes place when a rocket launches into space. However, its use in things like engines has lead to a deterioration of Earth's ozone layer, which some people claim contributes to things like global warming. Combustion can also destroy things, such as forests and homes.

People should know that, although many of the combustion examples I listed are carried out through humans, it does happen in nature as well. Combustion is likely involved when stars are born and die, and even during the Big Bang. It is also in action when a volcano erupts.

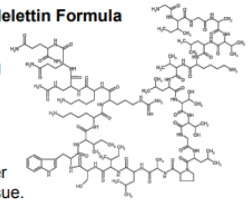
Chemical Composition of Bee Stings

Chemicals in bee stings:
The percentage in a bee sting is 88% water and 12% venom. The main component is melettin followed by enzymes phospholipase A and hyaluronidase. It also contains formic acid. These components make the pH of the bee venom 5-5.5 causing it to be acidic.



Formic acid

Melettin Formula



Properties of the Venom:
Melettin is a compound that destructs cells in the cell membrane allowing the other components to enter the tissue. *Phospholipase A* breaks down the blood cells and releases the pain inducing agents. *Formic Acid* is an important intermediate formed during chemical synthesis. Counting the hydrogens in the molecular formula of Formic Acid show that the formic acid is acidic making the entirety of bee venom acidic.

Key reactions:
1. Melettin reacts red blood cells causing them to burst
2. Phospholipase follows and destroys cell membrane causing inflammation and pain
3. $HCOOH_{(aq)} + NaOH_{(aq)} \rightarrow HCOONa_{(aq)} + H_2O_l$

Describes the reaction of formic acid and melettin when the bee stings a human

Societal/Environmental Impacts:
In many occasion bees have been used for their ability to make honey and pollination methods. By creating the hybrid Africanized Bee, bees have tend to be more aggressive with their stings causing them to use their bee venom more often.

What you should know:
Everyone should know that bee stings are common and there are ways to treat the bee venom. By preventing the hysteria that comes with knowing there's venom injected in your body, you can remain calm and find treatment for the sting.

About the Chemist:
My name is and I am a chemist specialised in the chemical composition of insect venom. I have researched the topic of venom of bee stings. Always having an interest in insects from a young age, I was inspired to discover the secrets of the bee.

Why do you need to know..
It never hurts to know something about the creatures that surround you. Knowing the chemical composition of a bee venoms can help you treat a future sting and identify what insect has stung you.

Relation to SI Chemistry:
The acidity and pH scale learned in SI Chemistry can help identify the venom and acidity of bee stings. By using the method of counting the Hydrogen atoms in a component, we can understand whether the venom is acidic or basic. After determining its pH, the bee venom can be compared to other acids and bases who have similar or different pH's.

How to convert an assignment to a discussion board

- How do you want your students to engage?
  - Want students to learn from each other, not from me
  - Students each have a different task or topic
  - Pick things you care about reading!
- How will you measure engagement?
  - Students original post
  - Responding to other students work through questions
  - Relating their post to other students' posts
- How do you grade engagement?
  - Model behaviors for students (example posts, previous students' work)
  - Set precise guidelines (X number of questions asked; X number of responses)
  - Be clear and specific in your instructions

Other Considerations

- Splitting large classes into multiple “discussion groups”
  - Allows for deeper discussions
- Types of student responses
  - Create a video or slideshow response
- Options for Infographics
  - Piktochart.com
  - Google/Powerpoint slide
  - Canva.com
  - visme.co

What are some examples that you've done?

What are some topics/assignments that you would be interested in converting?

Contact Us!

Copies of assignments are available on IMSA Digital Commons

Email us with any questions!

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