May the Fourth be with you.

Learning Target : I can observe organic reactions to better understand what differentiates one reaction from another.

Homework: Bingo packet 1 due Thursday

As you enter... (Write down questions and answers)

BFF Ricci

Reminder: Organic Chemistry Test pushed to Wednesday

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

8th period:

- Lab 22: Organic Chemistry Reactions Pre-lab (15 min)

8th/9th period:

- Lab 22: Organic Chemistry Reactions Lab (75 min)
- Exit Tix (5 min)

Tix out the door (Don't forget your name.)

Identify one key characteristic based on the reaction for each organic reaction:

1. saponification
2. esterification
3. polymerization

Tuesday, Cinco de Mayo

Learning Target : I can summarize the key characteristics of organic reactions.

Homework: Bingo packet 1 due Thursday, all assignments due tomorrow

As you enter... (Write down questions and answers)

1. How do functional groups affect the molecules that they are attached to?

Different molecular structure which produces different properties

2. What are the 7 organic reactions you need to know?

Esterification
Saponification
Fermentation
Polymerization → Addition, Condensation
Combustion
Addition
Substitution

Reminders : Organic Chemistry Test tomorrow
Parent Teacher Conferences tonight from 5-7 pm

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

AGENDA

9th period:

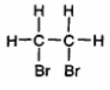
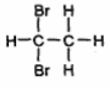
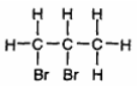
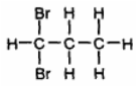
- Finish Lab 22: Organic Reactions Lab (25 min)
- Class Summary of Reaction Types (15 min)
- Exit Tix (5 min)

Tix out the door (Don't forget your name.)

1) The name of an aldehyde has the ending

A) -ol B) -al
C) -oate D) -oic

2) Which structural formula represents 1,1-dibromopropane?

A) 
B) 
C) 
D) 

Organic Reactions Summary

Organic Reaction	Definition/Purpose of Reaction	Characteristics of Reactants	Characteristics of Products
1. Substitution	Replace H with halogen	hydrocarbon + halogen	halide + acid (HA)
2. Addition	Break a double/triple bond to add halogen	unsaturated hydrocarbon + halogen	saturated halide
3. Combustion	Burning to produce heat	hydrocarbon + oxygen	CO_2 + H_2O
4. Fermentation	Produces alcohol	sugar (glucose, $C_6H_{12}O_6$)	alcohol + CO_2
5. Saponification	produce soap	fat / oil + base	soap + alcohol (glycerol)
6. Esterification	produces an ester by dehydration synthesis	organic acid + alcohol	H_2O + ester
7a. Addition Polymerization	Form polymers	unsaturated hydrocarbon	polymer (long chain)
7b. Condensation Polymerization	forms polymer	monomer w/ a functional group	polymer + H_2O

Wednesday, May 6th

Learning Target : I can apply my knowledge and skills on organic chemistry to test questions.

Homework: Bingo packet 1 due tomorrow

As you enter... (Write down questions and answers)

Prepare for your test.

You will need reference tables.

Reminders : Sign up to make up Labs (Tues/Thurs from 3-4 pm)

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

8th/9th period:

- Organic Chemistry Test (60 min)
- Finish all assignments for this unit (30 min)

31 Multiple Choice
9 Constructed Response
80 pts total

Tix out the door (Don't forget your name.)

Reflect...

In 3-4 sentences, describe how prepared you felt to take the test today.

What did you do to prepare? Was it effective? What should you do next time to be better prepared?

Thursday, May 7th

Learning Target : I can recall past topics of chemistry.

Homework: Bingo packet 1 due today

As you enter... (Write down questions and answers)

Take out your bingo packets.

Reminders : Sign up to make up Labs (Tues/Thurs from 3-4 pm)

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

9th period:

- Pictionary/Taboo Regents Review (45 min)

Tix out the door (Don't forget your name.)

n/a

Friday, May 8th

Learning Target : I can understand how the atomic bomb relates to nuclear chemistry.

Homework: Bingo packet 2 due next Thursday

As you enter... (Write down questions and answers)

Review your test and figure out what questions you have.

Average = 47% :(

Reminders : Sign up to make up Labs (Tues/Thurs from 3-4 pm)

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

8th period:

- Last Unit!! Nuclear Chemistry (45 min)

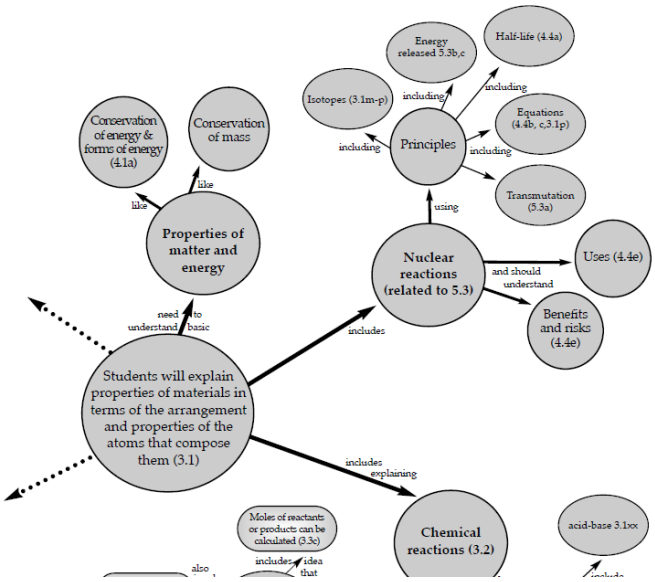
9th period:

- ~~Pictionary/Taboo~~ Kahoot Regents Review (45 min)

Tix out the door (Don't forget your name.)

n/a

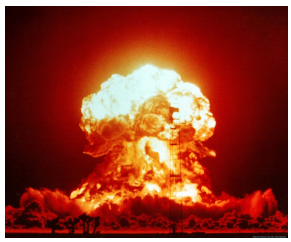
Nuclear Chemistry: **subfield of chemistry dealing with radioactivity, nuclear processes, such as nuclear transmutation, and nuclear properties.**



Let's start by thinking about the atomic bomb.

What do you know about the atomic bomb?

Manhatten Project
WWII
made from scraps



How do you think the atomic bomb was created?

Do you remember how small an atom really is? We are talking about HUUUUUUGE differences in size here.

Something as small as an atom was able to affect... DEMOLISH... something as large as the island of Japan!!!

But, how!?!?!

Nuclear Weapons

A nuclear weapon is commonly defined as a device, which uses a nuclear reaction for destructive means.

Table of Contents

Introduction

The first nuclear weapon was successfully detonated on July, 16,1945. The nuclear weapon, code named " Trinity", yielded an explosion equivalent to 20 kilotons of Trinitrotoluene (TNT), and an unexpected shock wave, that could have been felt 100 miles away. Before we can fully understand the chemical complexity and appreciate the engineering elegance of a nuclear weapon, we must first grasp basic nuclear chemistry concepts.

Basic Nuclear Chemistry Definitions and Concepts

Nuclear Fission- A nuclear reaction caused by nuclear decay of an unstable atom. As a result of the instability of the atom, the nucleus splits into 2 fission fragments also yielding free neutrons and exorbitant amounts of energy (both in the form of electromagnetic radiation and kinetic energy).

Example of Fission Reaction

$^{235}U \rightarrow$ fission fragments (many different combinations of fragments can form) + Neutrons + 3.20* 10-11 Joules

Nuclear Fusion- Almost completely complimentary to fission. The nuclear reaction where two nuclei collide, at high velocity, and each of their respective nuclei squeeze together to form the nucleus of a different, heavier nucleus. Often times, the elements used in fusion processes today are the isotopes of hydrogen, deuterium and tritium. The reaction also yields free neutrons and exorbitant amounts of energy from binding energy.

diff # neutrons

Example of Fission Reaction

$^{2}D+^{3}T \rightarrow {}^{4}He+{}^{1}N+ 17.6\ MeV$

Fissile / Fissionable – An atom is fissionable if it is capable of undergoing a fission reaction. If an atom is fissile it is not only able to undergo fission, but it is also capable of sustaining a nuclear chain reaction.

Nuclear Chain Reaction- As stated earlier in the text, a nuclear fission reaction yields free neutrons. In a nuclear chain reactions, the free neutrons from a nuclear fission reaction bombard near by fissile isotopes resulting in multiple fission reactions. These reactions result in colossal amounts of kinetic energy and gamma radiation.

Critical Mass- The amount of fissile isotope required to successfully start and sustain a nuclear chain reaction. If the fissile material is at a subcritical mass it cannot sustain a nuclear chain reaction. On the other hand, at the fissile material is at a supercritical mass, it will undergo a chain reaction at a faster rate.

Nuclear Winter- A nuclear winter is a theorized outcome of a nuclear war. It is when enough nuclear detonations have taken place to scorch enough of the earth to release sufficient soot and ash into the earth's stratosphere to significantly diminish sunlight and create excessively cool weather for up to years afterwards. Researchers estimate that the detonation of 100 Hiroshima type explosions in the subtropics would eject enough soot into the atmosphere to create a global climate change and a nuclear winter for most of Eurasia and North America for up to ten years, which would have catastrophic effects. Although the effects of a nuclear winter would have other vast consequences, like depletion of the Ozone layer, the immediate consequences previously discussed are what are characteristic of a nuclear winter.

Fallout Condition- Fallout refers to the radioactive material that "falls out" of the atmosphere after a nuclear explosion. It consists of dus and radioactive particles that can contaminate an area with radioactivity and pose a huge health hazard to biological organisms. It car contaminate the animal food chain which can have drastic effects on the affected region. Weather has a huge impact on fallout, winc currents can spread radioactive fallout either over a large area, such as in the case of *Castle Bravo*, or not.

A nuclear weapon can either undergo a nuclear fission reaction (atomic bomb) or a nuclear fusion reaction (H bomb or thermonuclear bomb) The first nuclear weapons built underwent pure nuclear fission. Uranium-235 and Plutonium-239 were the most common fissile isotopes used. (Since Uranium 235 is practically absent in nature, it requires human methods of artificial enrichment to become a fissile isotope) There are 2 basic nuclear fission weapon designs:

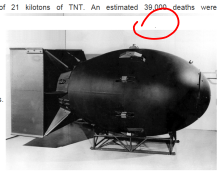
- **Gun assembly-** An uranium-235 bullet is fired through a barrel at a fissile Uranium-235 target. The collision of the two isotopes causes the uranium samples to squash together to form a critical mass, at which time the mass initiates a chain reaction. The gun design can only work with the uranium-235 isotope.
- **Implosion-** A critical mass of a fissile material (U-235 or Pu-239) is surrounded by highly explosive material. When detonated, the explosives, usually TNT, compress the fissile material causing it to assume a state of supercritical mass. The supercritical mass then instantaneously takes part in a fission chain reaction.

The first nuclear fusion weapons (also known as thermonuclear weapons) were designed to initiate a fission-based chain reaction. The fusion reaction between the hydrogen isotopes used, ^{3}-tritium and ^{2}-deuterium, would result in the free neutrons necessary to bombard a fissile isotope and start a nuclear chain reaction. The first thermonuclear weapon was detonated during the early 1950's. Similar to the nuclear implosion design, thermonuclear weapons use the heat and radiation from a fission reaction to make the fissile material assume a state of supercritical mass. The supercritical mass then instantaneously undergoes a fusion chain reaction yielding exponentially more energy then a fission chain reaction.

Nuclear Bombs

Fission Bomb- In a fission bomb, neutrons given off from the radioactive decay of an element, usually uranium or plutonium, are used to cleave adjacent atomic nuclei in the respective radioactive isotope. The neutron does this through force, like a bullet being shot at a piece of limestone, when the neutron hits the atomic nuclei, the large radioactive nucleus is split into two smaller nucleus' of different elements, depending on which radioactive element was used as the fissile reactant. The reaction of splitting the atom gives off an immense amount of energy, that was originally used to hold the nucleus together, and extra neutrons. The fission reaction in an atomic bomb begins when a given amount of TNT is detonated around a radioactive isotope such as plutonium. The explosion from the TNT compresses the plutonium to a super dense mass. Eventually the plutonium sample reaches its critical mass and the neutrons that are given off by the decaying nucleus' of the plutonium atoms cannot escape without bumping into an adjacent plutonium atom. When this happens, the hit atom is split which, in turn, gives off more neutrons which do the same thing. This fission reaction is the process used in the atomic bombs used against Japan during World War II.

- **Little boy-** "Little Boy" was the codename for the first atomic fission bomb used as a weapon. The bomb was dropped by the United States on Hiroshima on August 6, 1945 by a B-29 Superfortress named *Enola Gay* during World War II. It used a 600 milligram Uranium-235 core as the radioactive isotope and exploded with a force equivalent to approximately 13-18 kilotons of TNT. An estimated 140,000 died instantly with thousands more in the months that followed from injuries and radiation poisoning.
- **Fat Man-** "Fat Man" was the codename of the second atomic bomb used in World War II. The bomb was detonated over Nagasaki, Japan just three days after "Little Boy," on August 9, 1945. It used a Plutonium core similar to the Trinity bomb tested a month earlier in New Mexico, which was the first man made nuclear reaction. It was detonated 1,800 feet above Nagasaki and yielded an explosive force of 21 kilotons of TNT. An estimated 39,000 deaths were sustained immediatly, with thousands more later from injuries.



Fusion Bomb- A fusion bomb, is a weapon that uses a fusion reaction instead of a fission reaction to derive its destructive force. It is much more powerful than a fission based bomb, but is triggered in a similar way. The fusion reaction is initiated by an initial explosion. However due to the extreme quantities of heat and energy needed to start the fusion process, TNT is an inadequate source of energy. Instead, smal atomic bombs are placed strategically around a core containing hydrogen isotopes, deuterium and tritium. Once the atomic fission bombs detonate, they create enough heat and compression for the two hydrogen isotopes to fuse together to create a normal helium nucleus, ar extra neutron, and a tremendous amount of energy. Because fusion occurs at extremely high temperatures, equal to that of the sun weapons that utilize this process are also known as Thermonuclear weapons ,such as hydrogen bombs.

- **Hydrogen Bomb-** A Hydrogen bomb is a thermonuclear weapon first tested by the United States in 1952 in Bikini Atoll. It was codenamed *Castle Bravo*, it yielded much more fallout and energy than expected, it had energy equal to 1000 Hiroshima atomic bombs.
- **Tsar Bomba-** The largest, most powerful bomb ever created by humanity. Roughly translated, it means "The King of Bombs." The Russian made bomb code named *Ivan*, was a type of hydrogen bomb that had an explosive yield of >50 megatons of TNT. It was a three stage thermonuclear weapon in that it went through a process identical to that of a normal hydrogen bomb, however after the fusion process was complete, the extra neutron given off by each helium nucleus formed, was used to create a small additional fission reaction with a small amount of uranium. So, in essence, it was three bombs put together, an atomic explosion to start the fission reaction and a tiny additional atomic explosion after the fusion reaction. The resulting explosion created a shock wave so powerful that it could be measured on its third trip around the world. Although the entire process lasted only about 39 nanoseconds, it yielded about 1.4% of the entire output of the sun during that time.

Cobalt Bomb- A cobalt bomb in theory could be the most deadly bomb to ever be conceived. It is in a class of bombs known as "Salted Bombs." It is similar to other fission-fusion-fission type bomb designs however instead of purely fissionable material being placed around the fusion fuel, to start the fusion process, much of the fissionable material is replaced with non-fissionable material such as cobalt. The idea behind this is that the non-fissionable material will absorb much of the released neutrons and become extremely radioactive. Although the explosion is not as large as that of other related thermonuclear devices, it is still large and it leaves the targeted area so radioactive that it becomes uninhabitable to all living things, with the fallout half life being about 5.25 years. It is its ability to kill all life with fallout that this type of bomb has become known as a type of doomsday device. However, there are a few problems with this concept as a doomsday weapon. The first problem is the cost and size of such the. Although there is no limit to the size of a thermonuclear weapon, the amount of cobalt needed to fatally contaminate earths surface is 0.002 lbs of radioactive ^{59}Co, or 1 gram, for every square kilometer. This translates into roughly 1,142,400 lbs of cobalt needed to be transmuted into ^{60}Co and then scattered over earths surface. The size, cost to make, and practicality of such a weapon are, alone, enough of a problem to deter anyone from ever building such doomsday device. Another problem is that ^{60}Co might not be equally scattered over each square kilometer equally, due to wind and other natural factors, which would cause some areas of earth to not be lethally contaminated. One more problem with such an idea, is that if not everyone is killed within a short time from the radiation, humans being the intelligent beings tha we are, would learn to take shelter and shield ourselves from the radiation and/or clear up the contamination. So far, it is public knowledge that no cobalt bomb has ever been built. If one has, then it is a highly classified secret o some nation's government.

Neutron Bomb- A type of thermonuclear weapon, made in the united States in 1958, that is intended to release its deadly force in the form of deadly radiation instead of blast or heat energy. However, since it is a thermonuclear weapon it still has considerable blast and hea properties that far exceed the potential of conventional bombs, it is only about a tenth as strong as a fission type atomic bomb. It is known as an Enhanced Radiation Weapon (ERW). It undergoes a process of fission-fusion however, its casing is typically made of Nickel or Chromium to allow all the neutrons to escape, instead of being captured. It was originally developed during the Cold War as an anti-tank weapon since tank personnel would be protected from considerable heat and blast damage. It releases about 80 Gy of radiation, which is over 13 times the lethal dose of radiation for a human. It also has the ability to make the armor on a tank become radioactive which would contribute to the effectiveness of its purpose. Incapacitating radiation poisoning occurs within the first few minutes of exposure to its radiation up to 690-1350 meters away from ground zero, depending on the protection of individual soldiers, with death occurring within the hour. Because of the slow sadistic method of death brought on by this weapon, it was originally opposed by President John F. Kennedy.

Dirty Bomb- A dirty bomb is not a nuclear style bomb. It is rather a conventional bomb with radioactive material attached to it. It is t largest danger from terrorist or any insidious person that gets there hands on radioactive material or waste. Most of the damage from a di bomb occurs from the conventional bomb and not the radioactive material. The main danger from a dirty bomb is simply the scattering radioactive material which, although said to be unlikely based on incidents like Chernobyl, can cause sickness and death from the extend radiation.

Testing

Bikini Atoll- Aside from inspiring the name of the two piece swim suit, Bikini Atoll is a ring of Islets in the Pacific that are part of Micrones It has been the testing ground of many nuclear bombs since the 1950's, with probably the most famous case being that of the test of t Hydrogen bomb, *Castle Bravo*. In the testing of *Castle Bravo* a whole island was, for the most part, destroyed with much of two neighbori islands suffering the same consequence.