CROSSROADS ACADEMY
SCIENTIA VIRTUSQUE

Grade 7
Dr. Faletra
Weeks Sept 26 & October 3

In Class

We continue reviewing the nature of the atom, what atoms are composed of, how atoms are different from element to element, how atoms are ordered on the periodic chart, how the periodic chart can be used as a guide to understanding matter and how atoms bond together to form molecules. We study how the chemistry of food affects our lives and how modern living presents challenges to how we choose to grow and process food. We will rpeform a short experiment on Milk. You will need to write a 2-3 page report single spaced 10-12 font, due Wednesday October 5th by midnight. E-mail the report to peter.faletra@gmail.com

MAKE SURE THE REPORT IS A MS WORD FORMAT!!!!!!

PUT YOUR NAME ON THE TITLE OF THE DOCUMENT

Homework

Review and take notes on the instructional lessons on the school website in the Physical Science section titled:

Organic Molecules Part Two
http://www.crossroadsacademy.org/crossroads/wp-content/uploads/2016//05/Organic-Molecules-Part-Two.pdf

Milk Experiment Instructional lesson in the Instructional Support section
http://www.crossroadsacademy.org/crossroads/wp-content/uploads/2016//05/Milk-Science-Report.pdf

MAKE SURE TO COPY OVER CLASS NOTES ON THE NIGHT OF THE DAY YOU TAKE THE NOTES !!!!

Some concepts/facts

- Atoms are extremely small and the world of atoms is largely understood not by direct observation of individual atoms but by how they behave under a variety of circumstances
- Atoms are the building blocks of matter → if it takes up space, it is made of matter,→ if it is made of matter, it is made of atoms or parts of atoms
- Atoms are made of "subatomic particles" the most important for us are: protons, neutrons and electrons
- Protons and neutrons are typically found in the nucleus of an atom
- Electrons are typically found in a space or cloud around an atom's nucleus
- Atoms of the same number of protons make up a given element…all atoms of the element hydrogen have only 1 proton, all atoms of the element helium have 2 protons
- Atoms are always moving…jiggling
- Atoms are mostly space

- Atoms can combine to form molecules
- Atoms of a molecule are held together by a chemical bond
- The chemical bond is a sharing of electrons between or among atoms
- A covalent bond is a strong bond arising from atoms that share electrons well
- An ionic bond is an imbalanced sharing of electrons between or among atoms that have quite different electron negativities
- The periodic chart orders element based on increasing numbers of protons
- The three major sources of biological molecules in our diet are: proteins, carbohydrates and lipids
- Proteins are made of amino acids
- There are 20 amino acids that we need to make proteins
- There are 10 essential amino acids and we need them in our diet since we cannot make them…the other 10 we can make from the essential amino acids. A deficiency in any one essential amino acids will lead to serious health problems… **Kwashiorkor**
- Most proteins are made of over 50 amino acids
- Carbohydrates (hydrated carbon atoms) are made of simple sugars
- Glucose is the most common sugar on Earth
- Cellulose is a polymer of glucose
- Cellulose is the most common polymer on Earth
- Lipids are long chains of carbons with an acid group at their ends they are typically non-polar
- Fatty acids have a long polar tail and a small polar head

Grade 8
Dr. Faletra
Weeks Sept 26 & October 3

The Atomic Nature of Matter

We continue reviewing the nature of the atom, what atoms are composed of, how atoms are different from element to element, how atoms are ordered on the periodic chart, how the periodic chart can be used as a guide to understanding matter and how atoms bond together to form molecules. We will perform a short activity this week on mixing solutions accurately. For this activity you will need to have read the instructional lesson on Avogadro's number in the Physical Sciences section: http://www.crossroadsacademy.org/crossroads/wp-content/uploads/2016//05/Avagadros-Number.pdf

Homework

Review and take notes on the instructional lessons on the school website in the Physical Sciences section titled:

Organic Molecules Part Two Nuclear Stability
http://www.crossroadsacademy.org/crossroads/wp-content/uploads/2016//05/Organic-Molecules-Part-Two.pdf

Nuclear Stability
mailto:http://www.crossroadsacademy.org/crossroads/wp-content/uploads/2016//05/Nuclear-Stability.pdf

Some concepts/facts

- Atoms are extremely small and the world of atoms is largely understood not by direct observation of individual atoms but by how they behave under a variety of circumstances
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- Atoms can combine to form molecules
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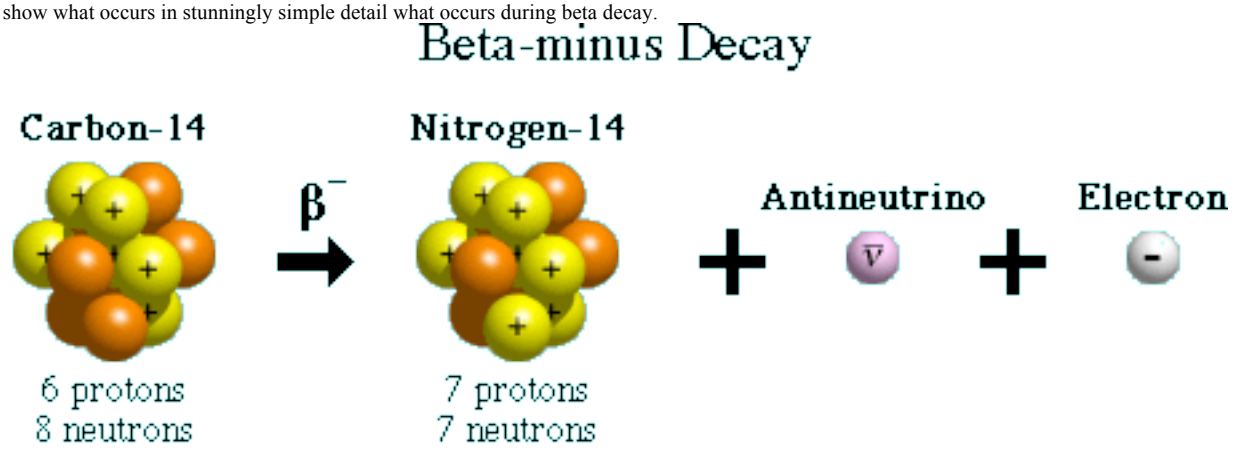
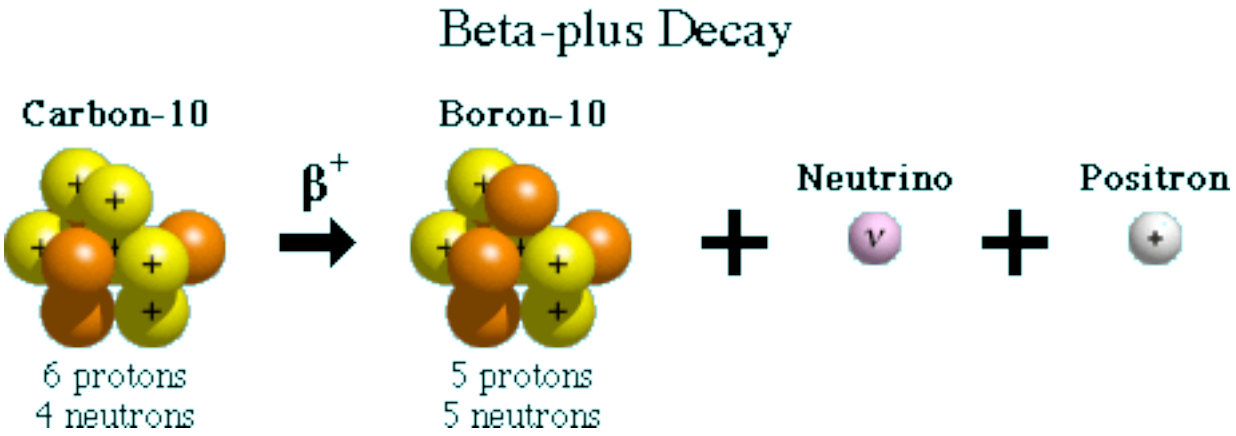
- The periodic chart orders element based on increasing numbers of protons
- The three major sources of biological molecules in our diet are: proteins, carbohydrates and lipids
- Proteins are made of amino acids
- There are 20 amino acids that we need to make proteins
- There are 10 essential amino acids and we need them in our diet since we cannot make them…the other 10 we can make from the essential amino acids. A deficiency in any one essential amino acids will lead to serious health problems… **Kwashiorkor**
- Most proteins are made of over 50 amino acids
- Carbohydrates (hydrated carbon atoms) are made of simple sugars
- Glucose is the most common sugar on Earth
- Cellulose is a polymer of glucose
- Cellulose is the most common polymer on Earth

- Lipids are long chains of carbons with an acid group at their ends they are typically non-polar
- Fatty acids have a long polar tail and a small polar head
- There is a "line of stability" that atoms follow to remain stable. The illustration on this line in the instructional lesson on Nuclear Stability indicates that as elements progress in size on the periodic chart they a larger neutron to proton ratio to remain stable. If they have too many protons they undergo a beta positive decay where the proton decays into a neutron bring the atom closer to the line of stability.
- A Feynman diagram is an illustration that cleverly illustrates how forces of nature operate within atomic particles over time. They can show what occurs in stunningly simple detail what occurs during beta decay.





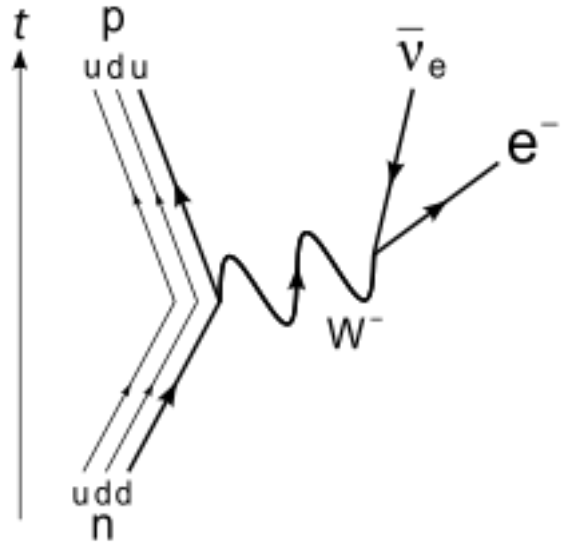
- Beta decay is one process that unstable atoms can use to become more stable. There are two types of beta decay, beta-minus and beta-plus.

- During beta-minus decay, a neutron in an atom's nucleus turns into a proton, an electron and an antineutrino. The electron and antineutrino fly away from the nucleus, which now has one more proton than it started with. Since an atom gains a proton during beta-minus decay, it changes from one element to another. For example, after undergoing beta-minus decay, an atom of carbon (with 6 protons) becomes an atom of nitrogen (with 7 protons).

- During beta-plus decay, a proton in an atom's nucleus turns into a neutron, a positron and a neutrino. The positron and

neutrino fly away from the nucleus, which now has one less proton than it started with. Since an atom loses a proton during beta-plus decay, it changes from one element to another. For example, after undergoing beta-plus decay, an atom of carbon (with 6 protons) becomes an atom of boron (with 5 protons).

Although the numbers of protons and neutrons in an atom's nucleus change during beta decay, the total number of particles (protons + neutrons) in the system remains the same.



The Feynman diagram for β^- decay of a neutron into a proton, electron, and electron antineutrino via an intermediate W^- boson. The W^- boson, is the carrier particle that "mediates" or carries out the weak force. The weak force is one of the 4 basic forces of the universe and is responsible for radioactive decay. The other 3 are: Gravity, Electromagnetism, and the strong force that hold the nucleus of an atom.

HOMEWORK

- Copy Notes
- Review and take notes on the instructional Watch instructional lessons titled:
- *Nuclear Stability*
- Feynman diagram and beta decay