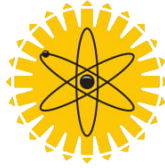


IMH TEP'S

LEGACY ACADEMY



Periodic Table of the Elements

| | | | | | | | | | | | | | | | | | |
|----------------------------------|---------------------------------|-----------------------------------|-------------------------------------|---------------------------------------|----------------------------------|------------------------------------|-----------------------------------|-----------------------------------|------------------------------------|-----------------------------------|-------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|-------------------------------------|
| 1 1IA 11A | | | | | | | | | | | | | | | | | 18 VIII A 8A |
| 1 H Hydrogen 1.0079 | 2 IIA 2A | | | | | | | | | | | 13 IIIA 3A | 14 IVA 4A | 15 VA 5A | 16 VIA 6A | 17 VIIA 7A | 2 He Helium 4.00260 |
| 3 Li Lithium 6.941 | 4 Be Beryllium 9.01218 | | | | | | | | | | | 5 B Boron 10.811 | 6 C Carbon 12.011 | 7 N Nitrogen 14.00674 | 8 O Oxygen 15.9994 | 9 F Fluorine 18.998403 | 10 Ne Neon 20.1797 |
| 11 Na Sodium 22.989768 | 12 Mg Magnesium 24.305 | 3 IIIB 3B | 4 IVB 4B | 5 VB 5B | 6 VIB 6B | 7 VIIB 7B | 8 VIII 8 | 9 VIII 8 | 10 VIII 8 | 11 IB 1B | 12 IIB 2B | 13 Al Aluminum 26.981539 | 14 Si Silicon 28.0855 | 15 P Phosphorus 30.973762 | 16 S Sulfur 32.066 | 17 Cl Chlorine 35.4527 | 18 Ar Argon 39.948 |
| 19 K Potassium 39.0983 | 20 Ca Calcium 40.078 | 21 Sc Scandium 44.95591 | 22 Ti Titanium 47.88 | 23 V Vanadium 50.9415 | 24 Cr Chromium 51.9961 | 25 Mn Manganese 54.938 | 26 Fe Iron 55.847 | 27 Co Cobalt 58.9332 | 28 Ni Nickel 58.6934 | 29 Cu Copper 63.546 | 30 Zn Zinc 65.39 | 31 Ga Gallium 69.732 | 32 Ge Germanium 72.64 | 33 As Arsenic 74.92159 | 34 Se Selenium 78.96 | 35 Br Bromine 79.904 | 36 Kr Krypton 83.80 |
| 37 Rb Rubidium 85.4678 | 38 Sr Strontium 87.62 | 39 Y Yttrium 88.90585 | 40 Zr Zirconium 91.224 | 41 Nb Niobium 92.90638 | 42 Mo Molybdenum 95.94 | 43 Tc Technetium 98.9072 | 44 Ru Ruthenium 101.07 | 45 Rh Rhodium 102.9055 | 46 Pd Palladium 106.42 | 47 Ag Silver 107.8682 | 48 Cd Cadmium 112.411 | 49 In Indium 114.818 | 50 Sn Tin 118.71 | 51 Sb Antimony 121.760 | 52 Te Tellurium 127.6 | 53 I Iodine 126.90447 | 54 Xe Xenon 131.29 |
| 55 Cs Cesium 132.90543 | 56 Ba Barium 137.327 | 57-71 Lanthanide Series | 72 Hf Hafnium 178.49 | 73 Ta Tantalum 180.9479 | 74 W Tungsten 183.85 | 75 Re Rhenium 186.207 | 76 Os Osmium 190.23 | 77 Ir Iridium 192.22 | 78 Pt Platinum 195.08 | 79 Au Gold 196.9665 | 80 Hg Mercury 200.59 | 81 Tl Thallium 204.3833 | 82 Pb Lead 207.2 | 83 Bi Bismuth 208.98037 | 84 Po Polonium [208.9824] | 85 At Astatine 209.9871 | 86 Rn Radon 222.0176 |
| 87 Fr Francium 223.0197 | 88 Ra Radium 226.0254 | 89-103 Actinide Series | 104 Rf Rutherfordium [261] | 105 Db Dubnium [262] | 106 Sg Seaborgium [266] | 107 Bh Bohrium [264] | 108 Hs Hassium [269] | 109 Mt Meitnerium [268] | 110 Ds Darmstadtium [269] | 111 Rg Roentgenium [272] | 112 Cn Copernicium [277] | 113 Uut Ununtrium unknown | 114 Uuq Ununquadium [289] | 115 Uup Ununpentium unknown | 116 Uuh Ununhexium [288] | 117 Uus Ununseptium unknown | 118 Uuo Ununoctium unknown |
| | | 57 La Lanthanum 138.9055 | 58 Ce Cerium 140.115 | 59 Pr Praseodymium 140.90765 | 60 Nd Neodymium 144.24 | 61 Pm Promethium 144.9127 | 62 Sm Samarium 150.36 | 63 Eu Europium 151.9655 | 64 Gd Gadolinium 157.25 | 65 Tb Terbium 158.92534 | 66 Dy Dysprosium 162.50 | 67 Ho Holmium 164.93032 | 68 Er Erbium 167.26 | 69 Tm Thulium 168.93421 | 70 Yb Ytterbium 173.04 | 71 Lu Lutetium 174.967 | |
| | | 89 Ac Actinium 227.0279 | 90 Th Thorium 232.0381 | 91 Pa Protactinium 231.03688 | 92 U Uranium 238.0289 | 93 Np Neptunium 237.0482 | 94 Pu Plutonium 244.0642 | 95 Am Americium 243.0614 | 96 Cm Curium 247.0703 | 97 Bk Berkelium 247.0703 | 98 Cf Californium 251.0796 | 99 Es Einsteinium [254] | 100 Fm Fermium 257.0851 | 101 Md Mendelevium 258.1 | 102 No Nobelium 259.1009 | 103 Lr Lawrencium [262] | |
| | | Alkali Metal | Alkaline Earth | Transition Metal | Basic Metal | Semimetals | Nonmetals | Halogens | Noble Gas | Lanthanides | Actinides | | | | | | |

I'm in my Element

Grade 9.10 Activity Plan

Reviews and Updates

| REVIEWER | ACTIONS/COMMENTS | DATE |
|-----------------|-------------------------|-------------|
| Esther Bonitto | First draft of activity | 09/08/19 |

I'm in my Element

Objectives:

1. To understand the difference between chemical and physical changes
2. To introduce the concept of acids and bases
3. To understand densities of liquids, while discussing chemical properties

Keywords/concepts: acids, bases, chemical, density, electrons, neutrons, physical, protons, properties, reaction

Take-home product: "Secret message/drawing" on paper

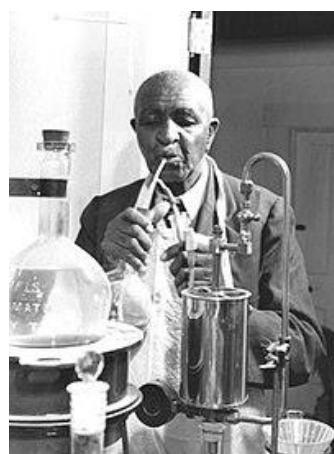
Curriculum Outcomes:

Grade 7: (307-4)

Grade 9: (307-12, 307-13)

| Segment | Details |
|--|---|
| African Proverb & Cultural Relevance (5 min) | “A good name is better than a good perfume.” ~Ethiopian Proverb |
| Activity 1: Operation Frog (30 min) | Introduce students to the anatomy of a frog, while comparing its organs to that of the human body. Briefly explain how chemistry takes place in digestion. |
| Activity 2: Self-pouring Liquid (20 min) | Amaze students by showing them the strange properties of polyethylene glycol, while explaining basic molecular-level chemistry. |
| Activity 3: Secret Acid-Base Message (20 min) | Allow students to write out a secret message on a piece of paper using baking soda, then watch the message jump to life when it's coated with grape juice. |
| Post-test (10 min) | Aid students in the completion of a Crossword Puzzle, encouraging them to finish it quickly, as the first student to finish will get to pick out a prize from the *Chemist Chest* |

Suggested Interpretation of the Proverb: It is better to have a good reputation than to be the prettiest girl or most handsome guy, or to wear the best perfume or cologne. Perfumes can be created artificially, as they are a mixture of chemicals, but their scent is only temporary and will soon be forgotten. However, doing kind deeds for people and having a friendly personality will always be remembered by all you meet, so always remember to make the best impression possible!



Cultural Relevance:

George Washington Carver (1860s-1943) was an African American scientist and inventor, who chemically experimented with and manipulated peanuts, sweet potatoes, and soybeans to create cool, useful products such as shaving cream, insulation, and skin lotion! His heart was set on sharing his agricultural discoveries with poor farmers so that they could improve their crop yields, and their quality of life.

https://en.wikipedia.org/wiki/George_Washington_Carver#Legacy
<https://www.livescience.com/41780-george-washington-carver.html>

Background Information

Chemistry: The branch of science that focuses on the matter of which all substances are composed, how these substances interact with one another, and how new substances can be made by combining existing substances.

Molecules: A group of atoms that are bound together and form the smallest unit possible of a compound that can be used in a chemical reaction.

Atoms: The smallest particle of matter possible, containing neutrons, protons, and electrons.

Elements: Different substances (atoms) that cannot be broken further down into smaller particles of matter, but are chemically different from one another in their reactive properties and are distinguished according to the number of protons they contain.

Nucleus: The center of an atom, which contains the protons and neutrons.

Subatomic: Something that is smaller than an atom and is usually contained therein.

Protons: A stable subatomic particle that constitutes a positive charge and is found in the nuclei of all elements.

Electrons: A stable subatomic particle that constitutes a negative charge and surrounds the nuclei of all elements.

Neutrons: A stable subatomic particle that carries no charge and is found in the nuclei of all elements.

Periodic Table of Elements: A "table" that organizes all the known elements into rows and columns, based on their chemical properties and the number of protons which they contain.

Acid: A compound that gives away protons.

Base: A compound that accepts protons.

Activity 1: Operation Frog

Source:

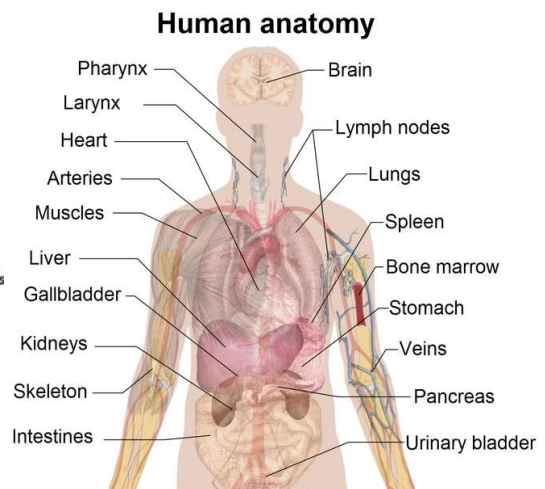
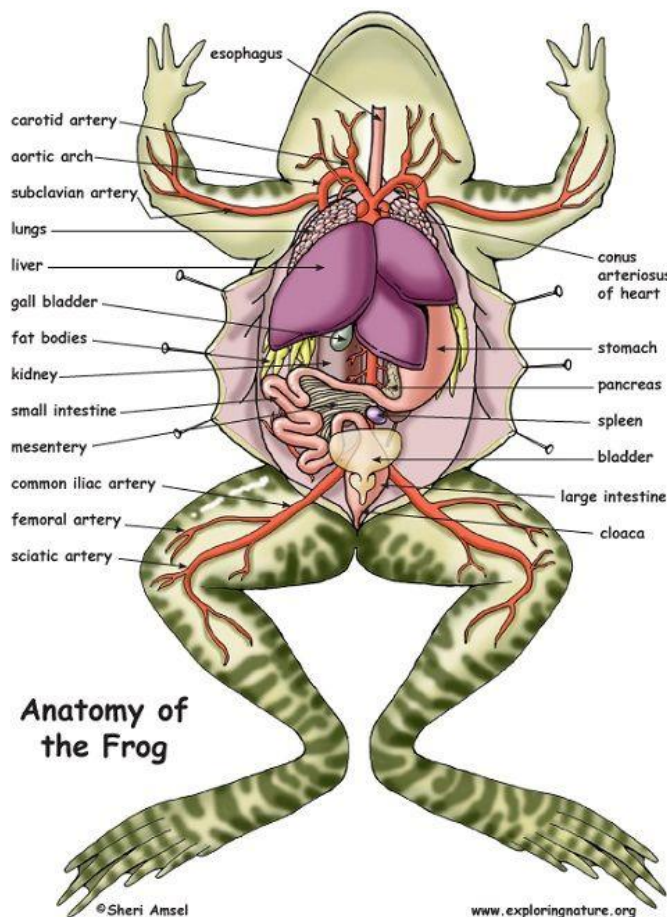
- <https://www.youtube.com/watch?v=Og5xAdC8EU>

Purpose: to learn about the anatomy of a frog

| Item | Quantity (10 students) |
|---------------|------------------------|
| 3D frog model | 5 |

Procedure:

1. Allow students to explore the frog model by “dissecting” its organs.
2. Identify each of the individual organs with the students, and compare their visual appearance and function to those found in the human body.
3. Briefly explain the chemistry that takes place in the human digestion process.
Watch the short video in the link above!



Activity 2: Self-pouring Liquid

Source:

- <https://www.youtube.com/watch?v=59Tax6GFriA>

Purpose: *to understand that not all liquids or substances have the same, "standard" properties*

| Item | Quantity (10 students) |
|-------------------------------|------------------------|
| Large measuring cup (500 mL) | 1 |
| Water | 1 L |
| Polyethylene glycol (Clearax) | 1 bottle |
| Spoon | 1 |
| Large bowl | 1 |
| Drill (optional) | 1 |
| Straw (optional) | 1 |
| Syringe (optional) | 1 |

Procedure:

1. Pour 500 mL of water into the large measuring cup. Barely tilt the measuring cup to allow the liquid to start pouring. Make sure that the students notice that the water will stop pouring at this tilted angle, unless you tilt it further. Tilt it forward more, and pull it back to an upright position. Continue to demonstrate this until all the water is poured out of the cup.
2. Pour 400 mL of water into the large measuring cup. Add 1 full bottle of polyethylene glycol and stir it in.
3. Carefully lift the measuring cup and hold it over the bowl. Barely tilt the measuring cup to allow the liquid to start pouring. Tilt it a bit further if nothing extraordinary seems to be happening. You should notice that the liquid continues to pour up and over the cup, all by itself!
4. This happens because polyethylene glycol is a molecule that is made up of very large, long chains of molecules that are all linked together. When a few molecules slide over the cup, the others follow since they are mostly all connected. Water on the other hand is made up of very small molecules which do not link together, therefore they do not pull each other out of the cup.
5. Try playing around with the polyethylene glycol. If you spin a straw in it quickly, the liquid will climb the straw. You can also place a syringe into the liquid, and continuing drawing the liquid up into the syringe even after it has been removed from the liquid. Wow! By mixing the water with the polyethylene glycol, did we perform a physical or chemical change?

Activity 3: Secret Acid-Base Message

Source:

- <https://www.youtube.com/watch?v=4MHn9Q5NtdY>

Purpose: *to understand how simple acid-base reactions work*

| Item | Quantity (10 students) |
|---------------|------------------------|
| Baking soda | 1 box |
| Water | 2 L |
| Grape juice | 2 L |
| Cotton swabs | 10 |
| Small bowls | 20 |
| Printer paper | 10 sheets |
| Spoon | 1 |

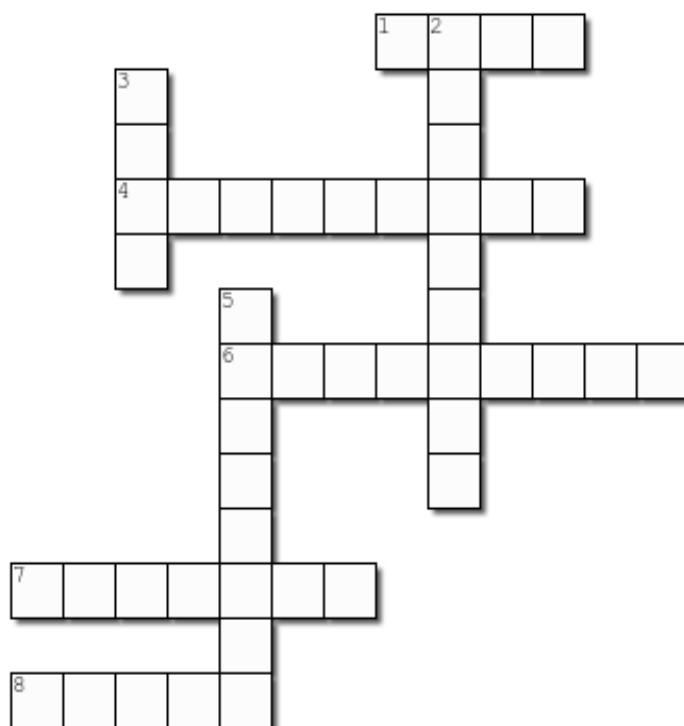
Procedure:

1. Pour 79 mL of baking soda into each student's bowl, and add 79 mL of water. Stir to mix. (This can be prepared beforehand).
2. Allow each student to write a secret message or draw a picture on their paper using the baking soda as the "ink" and cotton swab as the "pencil".
3. Allow the ink to partially dry so that it smudges less once the grape juice is added.
4. Take a paint brush, and dip it into a bowl of grape juice. Paint the grape juice over your secret message and watch it be revealed! This happens because the grape juice is acidic, and the baking soda is basic. Essentially, the grape juice is giving hydrogen molecules to the baking soda, therefore both the grape juice and baking soda are taking on new chemical structures. Is this a chemical or physical change?

Name: _____

I'm in my Element

Complete the crossword puzzle below! Whoever finishes first will get to pick out a prize from the *Chemist Chest* :)



Created using the Crossword Maker on TheTeachersCorner.net

Across

1. A compound that gives away protons
4. Something that is smaller than an atom and is usually contained therein
6. A stable subatomic particle that constitutes a negative charge
7. A stable particle that constitutes a positive charge
8. The smallest particle of matter possible, containing neutrons, protons, and electrons

Down

2. A branch of science that focuses on how molecules react together
3. A compound that accepts protons
5. A stable subatomic particle that carries no charge