Middle School Science Enrichment

1 of 2

Wayne-Westland
COMMUNITY SCHOOLS

SMS - Science Department

Continuity of Learning - Online Resources

Explore What Interests You Most!

General Science Resources (Current Science, etc)				
Science World Click Login SMS Password: *saints78*	Gizmos - Explore Learning Labs SMS Student Login & Password Required	National Geographic for Kids	Newslea Instructional Content Platform FREE ACCESS	BrainPop FREE ACCESS
Phet Interactive Middle School Science Simulation	NeoK12 FREE ACCESS Games, Activities, Tools	How Stuff Works	Steve Spangler YouTube Channel of various science topics	Imagination Station YouTube Channel of various science topics
Worksheet Adventure Tons of printable worksheets on many science topics!	Sick Science! YouTube Channel of various science topics	Science Bob YouTube Channel of various science topics	AsapSCIENCE YouTube Channel of various science topics	CrashCourse Many Science related Videos on many topics!
ScienceShow Many Science Related Videos on many topics!	NBC Learn SCIENCE BEHIND THE NEWS! YouTube Channel, with NSF, of various "current" Science that explores science, technology, engineering, and math found in current events connecting fundamental STEM topics to real-world news.	Science Spot A collection of many printable science lessons and materials on various topics	MAKER CHALLENGES (SEE CREATED GOOGLE DOC LINK) STEM Challenges to help inspire you and get started in a makerspace!	MAKER CHALLENGES #2 Additional STEM Challenges to help inspire you and get started in a makerspace!
ScienceTeachers A resource providing lesson plans, worksheets, and activities for middle school science.	Science Class A collection of resources for teaching science	Science Guys Many Science related Videos on many topics!	PBS Learning Media Collection of Natural Sciences resources	Teach Engineering A FREE digital library composed of hundreds of engineering k-12 educators who make science and math come alive through design thinking.
Smithsonian Tween Tribune				

TED-ED TALKS SCIENCE

TED-ED “How Turtle Shells Evolved?” - (See LINK)
TED-ED “What causes Turbulence?” - (See LINK)
TED-ED “Why can’t some birds Fly?” - (See LINK)
TED-ED “Why don’t poisonous animals poison themselves?” - (See LINK)
TED-ED “How do Viruses jump from animals to humans?” - (See LINK)
TED-ED “Why do knuckles / joints pop? - (See LINK)

MISCELLANEOUS

Smart Concrete (Science of Innovation) - (5:00) -
https://www.youtube.com/watch?v=z4vTMXS5Bd8
Power of Seasalt (ScienceCasts - NASA) - (3:00) -
https://www.youtube.com/watch?v=rLro_IaxZvM

Interested in Life Science (Biology, etc)?				
Science World Click Login Password: *saints78*	Biology with The Amoeba Sisters YouTube Channel of various Biology/Life Science topics	BIOInteractive YouTube Channel of various science topics	PBS Learning Media Collection of Life Science resources	Khan Academy - BIOLOGY
Human Body Video Levels of Organization	KidsHeath Lungs & Respiratory System	NeoK12 Circulatory System	KidsHealth Digestive System	A Kid’s Guide to Life Science: The Human Body Systems
Science Guys Video Naked Egg & Osmosis	Microscopic Organisms Video Creatures in my Water -	Microscopic Organisms Video The Secret Life of Plankton	Video Tour of the Cell	Osmosis Simulation

Interested in Physical Science (Chemistry, Physics, etc)?				
Science World Click Login Password: *saints78*	NBC Learn CHEMISTRY NOW! YouTube Channel of various Chemistry related topics on how Chemistry contributes to everyday life, even with Lesson Plans from NSTA.	Tyler DeWitt Science YouTube Channel of various Chemistry related topics	PBS Learning Media Collection of Physical Science materials	PhysicsGirl! *PBS Digital Studios* YouTube Channel of various physics related topics.
Bozeman Science YouTube Channel of	Minute Physics YouTube Channel of	PeriodicVideos Many Periodic Table	Chemistry 101 YouTube Channel of	ChemiCool Tons of information

various Chemistry, Biology/Life Science, Environmental Science, and Physics topics SUPPLEMENTAL RESOURCES	various Physics topics	related videos!	various Chemistry topics	on the Periodic Table of the Elements and the elements themselves.
Energy Interactive Activities	Catapult	Roller Coaster	Energy Basics Energy Puzzles& Games	Action-Reaction rocket
Watch NBC LEARN - *"The Chemistry of Water"*	Khan Academy - CHEMISTRY	ChemMatters Online Magazine and Science articles	American Chemical Society - Middle School Science	American Association of Chemistry Teachers - Middle School Chemistry Topics

MORE CHEMISTRY

Pure Substances vs. Mixtures, Chem Academy (15:40) - https://www.youtube.com/watch?v=WBWf1T4V7xE
Start, Complete, Check and Collect - **W.S. Physical vs. Chemical PROPERTIES & CHANGES** [50 points; Parts I & II]
Physical and Chemical PROPERTIES, Chem Academy (6:25) - https://www.youtube.com/watch?v=Z5L2NOMEWT0
Physical and Chemical CHANGES, Chem Academy (7:40) - https://www.youtube.com/watch?v=4ZGULLWEy1c
Physical and Chemical PROPERTIES & CHANGES REVIEW, Mr. Causey's World (5:42) - https://www.youtube.com/watch?v=C4pQQQNwy30

PURE SUBSTANCES vs. MIXTURES

Pure Substances vs. Mixtures, Chem Academy (15:40) - https://www.youtube.com/watch?v=WBWf1T4V7xE

PURE SUBSTANCE and HETEROGENEOUS vs. HOMOGENEOUS MIXTURES

Pure Substances vs. Mixtures, Chem Academy (15:40) - https://www.youtube.com/watch?v=WBWf1T4V7xE

PHYSICAL and CHEMICAL PROPERTIES & CHANGES

Physical and Chemical PROPERTIES, Chem Academy (6:25) - https://www.youtube.com/watch?v=Z5L2NOMEWT0
Physical and Chemical CHANGES, Chem Academy (7:40) - https://www.youtube.com/watch?v=4ZGULLWEy1c
Physical and Chemical PROPERTIES & CHANGES REVIEW, Mr. Causey's World (5:42) - https://www.youtube.com/watch?v=C4pQQQNwy30

CRASH-COURSE "The Periodic Table & Dmitri Mendeleev" (11:21) - (See LINK)
CRASH-COURSE "The Nucleus" (10:11) - (See LINK)
BOZEMAN SCIENCE "Tour of the Periodic Table" (9:28) - (See LINK)
TYLER DEWITT "Valence Electrons" (16:52) - (See LINK)

CHEM Videos - IONS & ISOTOPES

What are Isotopes - Tyler DeWitt (7:44)
https://www.youtube.com/watch?v=EboWeWmh5Pg
What are Isotopes - Chem Academy (10:22)

https://www.youtube.com/watch?v=Q2rztYZiDA4
Atoms, Isotopes, Ions - Mr. Causey (8:21)
https://www.youtube.com/watch?v=OaS7iQmzmrE
Ions Explained - Chem Academy (15:41)
https://www.youtube.com/watch?v=ME16VVASTq0

Lewis Structures / e- Dot Diagrams / Octet Rule
Electron Dot Diagrams "how made" and Ions (Cations & Anions) - (4:18) -
https://www.youtube.com/watch?v=y6QZRBIO0-o
Mr. Causey - HOMEWORK HELPER - Octet Rule, Gain or Lose e-'s, Oxidation #'s (charges), Review - (6:00) -
https://www.youtube.com/watch?v=hSNwds-H1_0
The Octet Rule SONG - Octet Rule and much more; show first 3:00-4:00 only (6:00) -
https://www.youtube.com/watch?v=WzWk-mx_14E

Interested in EARTH SCIENCE (Weather, Climate Change, Volcanoes, Earthquakes, etc.)?

Science World Click Login Password: *saints78*	Minute Earth YouTube Channel of various science topics	PBS Learning Media Collection of Earth Science resources	NBC Learn CHANGING PLANET! YouTube Channel NSF collection of various "current" Climate Change related topics and the impact on our planet.	NOVA Teachers Collection of resources for teaching Earth Science
NOAA Resources Education resources are distributed across many websites and program offices at NOAA and partner websites.	Exploring Earth Investigations	Global Footprint Calculator	Farmer's Almanac for Kids	Weather Wiz Kids
How Weather Works?	National Weather Service	Weather Wonders	Meteorology Web-based instructional modules	The Weather Channel - Climate, Data, and Science
10 Strangest Weather Events	Cloud Sorting Game	Environmental Literacy Council		

WEATHER vs. CLIMATE Video Clips

Weather vs. Climate "What is the difference?" (1:32) (See LINK)
CRASH-COURSE for KIDS "Weather vs. Climate" (4:32) - (See LINK)
BOZEMAN SCIENCE "Weather vs. Climate" (7:47) - (See LINK)
SCIENCE KIDS "Weather vs. Climate" (28:45) - (See LINK)
Documentary about the Weather of the World (1:54:21) - (See LINK)
WILD WEATHER "Weather's Devastating Forces" (57:27) - (See LINK)

SUPPLEMENTAL VIDEOS:

1. The Science of Fireworks - Royal Institute - https://www.youtube.com/watch?v=rmtK2BgmGCw (1:09:29) Chris Bishop;
2. Explosive Science - Royal Institute - https://www.youtube.com/watch?v=uFQdcKJUijQ (1:00:51) Chris Bishop;
3. Chemical Curiosities (Demonstrations) - Royal Institute - https://www.youtube.com/watch?v=ti_E2ZKZpC4 (1:09:42);
4. It's Rocket Science - Royal Institute - https://www.youtube.com/watch?v=HESOat2iPzU (58:03) Chris Biship;
5. Chemistry is Awesome (Demonstration real) - https://www.youtube.com/watch?v=afD6eiKBdD4 (3:00)
6. PBS Hunting The Elements (entire show) - (1:53:03) - https://www.youtube.com/watch?v=G04h9kK3ZJs
7. Hunting The Elements - PART I (39:00) - https://www.youtube.com/watch?v=Ewf0p7BbZns
8. Hunting The Elements - PART II (39:00) - https://www.youtube.com/watch?v=6s-kE2N1NJg
9. Hunting The Elements - PART III (39:00) - https://www.youtube.com/watch?v=gDSZ_oGzfSU
10. 13 Most Fascinating Elements Explained (7:53) - https://www.youtube.com/watch?v=qbaJCpigpFE
11. LIQUID METAL YOU CAN TOUCH - Gallium (2:54) - https://www.youtube.com/watch?v=0Hx2DYx4umQ

Other resources:

MYTHBUSTERS

MYTHBUSTERS Main Channel - http://www.dailymotion.com/MythbustersOfficial

The Hindenburg Test (48:00) - http://www.dailymotion.com/video/x2ncm5i

Antacid Jail Break (49:00) - http://www.dailymotion.com/video/x2n8xla_mythbusters-antacid-jail-break-full-episode_tv

Design Squad as built on TV (NASA) - PBS Learning Media - videos, projects and other

http://www-tc.pbskids.org/designsquad/pdf/parentseducators/DS_NASA_04Touchdown_CS.pdf

http://www-tc.pbskids.org/designsquad/pdf/parentseducators/DS_NASA_03LaunchIt_CS.pdf

Air Pressure and Density in the Atmosphere

As you travel further from the Earth's surface, the atmosphere changes. There are different layers of the atmosphere that have various properties such as temperature, density, pressure, etc. Have you ever flown in an airplane? If so, you've probably experienced air pressure shifts when suddenly your ears feel clogged or they "pop"! Air pressure (also known as barometric pressure) is the weight (or force) of the atmosphere pressing down on any given surface of the Earth. The closer to the Earth's surface, the greater the weight (or force) of the atmosphere because air near the surface has ALL air above it pushing down on it. As an airplane travels higher into the atmosphere, air pressure decreases.

The higher an airplane goes, the less dense the atmosphere becomes. Density is how compact the molecules are in a solid, liquid, or gas. Our atmosphere is made of millions of tiny gas molecules. Gasses in our atmosphere include nitrogen, oxygen, argon, and carbon dioxide. These gas molecules are free to move about and shift around. The more compact (or close) those molecules are to each other, the more dense the atmosphere. As you travel away from the Earth's surface, the atmosphere expands the further you go. That expansion (more space) allows gas molecules to spread out resulting in the atmosphere becoming less dense.

Air pressure and density work and change together as you enter different layers of the atmosphere. As the atmosphere expands the further you get from the Earth's surface, it becomes less dense and air pressure decreases. As you increase altitude (distance from Earth's surface) in an airplane, air pressure changes. When that change occurs, the air that is trapped inside your inner ear presses on your ear drum causing a feeling of hearing loss. As you ascend, that pressure causes your ear drum to push outward which causes your ears to "pop".

On Earth's surface, air pressure changes also tell you when a change in the weather is on the way. Generally, if air pressure is falling a storm is on its way. When air pressure rises, fair weather is coming. If air pressure remains steady, the weather you are currently having remains the same. Differences in air pressure also result in wind. Air moves from areas of high pressure to areas of low pressure and the greater difference in air pressure, the faster the wind blows.

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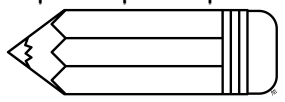
Instructions: Cut out and glue down the 'Air Pressure and Density in the Atmosphere' flip flaps. On the front of the first two flaps, draw a picture representing each term. Underneath each flap, explain what it is and what you learned about each term from the reading passage. Under the third flap, explain the relationship between air pressure and density in the atmosphere. Next, compete the 'Cause and Effect' chart using information from the passage. Finally, answer the writing prompt and add any other information your teacher instructs.

Air Pressure and Density in the Atmosphere

Air Pressure	Density	The relationship between air pressure and density as you travel through the atmosphere

Cause	Effect
You travel further from the surface of the Earth through the atmosphere.	
Air moving from areas of high pressure to low pressure at Earth's surface.	
	Your ears "pop" while traveling in an airplane.
	Gas molecules in the atmosphere spread out becoming less dense.

Explain how air pressure changes as you travel away from Earth's surface. Use information from the passage to support your answer.



Atoms

The word atom comes from the Greek word *atomos*, which means "indivisible." An atom is the smallest particle into which an element can be divided and still maintain the properties of that element. All matter is made up of atoms. Think about all the types of matter around us – solids, liquids, and gases! Different kinds of atoms make up different types of matter and those different kinds of atoms are called elements. Examples of elements are gold, hydrogen, oxygen, carbon, aluminum, sodium, and lead. You can cut a piece of gold in half over and over again until it is too small to cut it once more. Once you reach the point where the element cannot be cut anymore, that is an atom.

An atom itself is made of smaller particles called protons, neutrons, and electrons. These tiny particles work together to help the atom function. Protons and neutrons stick together to form the atom's nucleus, or the center of the atom. Electrons move around the nucleus in what is called the electron cloud. Protons in the nucleus are positively charged particles The number of protons in an atom determines what type of atom/element it is. For example, an atom with 6 protons is carbon and an atom with 12 protons is magnesium. All atoms of the same element have the same number of protons. Neutrons in the nucleus of an atom have no electric charge at all and they are all the same. Sometimes, unlike protons, atoms of the same element can have different numbers of neutrons. Atoms of the same element that have a different number of neutrons are called isotopes.

Surrounding the nucleus of each atom are a number of electrons that move around the protons and neutrons. Electrons are negatively charged particles and are all identical. The number and arrangement/paths of electrons determine the chemical properties of each atom. The path electrons take around the nucleus of an atom are random, but the electrons stays within the electron cloud space. Electrons have a negative charge and protons have a positive charge, so they attract to each other. This force is what holds the electrons to the nucleus of each atom.

Atoms are so very tiny. Think about how thick one strand of hair is. An atom is more than ONE MILLION times smaller than the thickness of that hair. And the protons, neutrons, and electrons are even smaller! Although they are tiny, they still have mass (recall that mass is the amount of matter in an object). Most of the mass of an atom is found in the nucleus (the protons and neutrons).

Throughout time, the ideas and theories of atoms and how they work has changed and evolved. In the 1800s, chemist John Dalton determined that matter was made up of small, dense particles that could not be destroyed. Closer to the 1900s, British scientist J.J. Thompson proposed that atoms are made of smaller particles that have positive and negative charges. Since then, Danish scientist Niels Bohr created the model of the atom that we're familiar with today where electrons revolve around the nucleus in various paths like the earth revolves around the sun. This was a huge development in the atomic theory. Today's model, called the electron cloud model, proposes that electrons travel in regions of various thicknesses around the nucleus of an atom instead of specific orbital paths. Scientists will continue to study and learn about atoms for many years to come.

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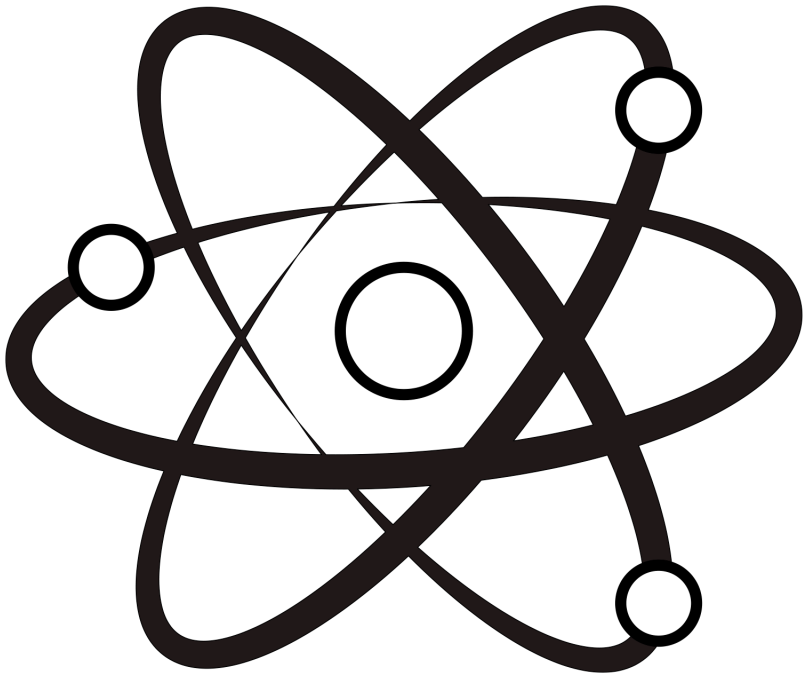
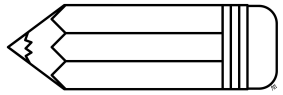
Instructions:: First, cut out the 'WHAT MAKES UP AN ATOM" foldable. On the front, draw an atom and label each part. Under each flap, describe each part using information from the reading passage. Next, cut out and glue down the graphic of the atom. Label each part of the atom and add at least 3 facts that you learned from the reading passage around the atom. Be sure to draw in protons and neutrons in the nucleus. Finally, respond to the writing prompt and add any other information your teacher instructs.

What Makes Up an Atom?

PROTON	NEUTRON	ELECTRON



Describe the evolution of the atomic theory over time.



Atoms and Matter Reading Comprehension Name: _____

Directions: Please read the following text and answer the multiple choice and free-response questions.

Atoms and Their Structure

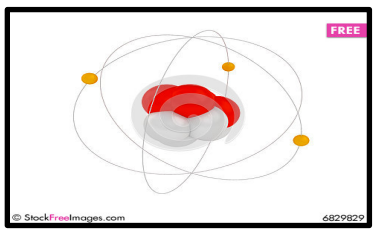
Atoms make up everything in the world. Look around you. The tables, chairs, and even the people around are made of atoms! When scientists looked at atoms and studied them, they found that atoms were made up of 3 distinct particles. The particles are called protons, neutrons, and electrons.

Protons are known as the particles that have a positive charge. When scientists first found a proton, they thought it was the smallest thing in the world. The scientists were wrong. In 1968, particle quarks, tiny particles, were found inside of a proton. Protons make the nucleus of the atom, also known as the center, alongside neutrons.

Neutrons are the particles that do not carry any charge. These particles join with protons to create the nucleus which is the heart, or the center, of the atom. They might not have a positive or negative charge like protons and electrons, but neutrons are just as important. Neutrons play a major role in the radioactive properties of atoms and mass.

Electrons are considered to be the particles with negative charge and travel around the nucleus. These particles are the smallest of all the particles and very light. Electrons can be considered to be the most interesting because scientists can take the electrons by stripping them off and using them to create energy and power in devices such as televisions and radios. Scientists also use electrons to measure the inside of atoms by bouncing them off of the atom. Scientists look to see how the atoms react when they are being hit by an electron.

These amazing particles are pieces of matter, and this amazing chemistry makes molecules.



Multiple Choice

1. Protons and neutrons join together to create the _____.

a. nucleus
b. atoms
c. neutrons
d. protons

2. What is the electrical charge of a neutron?

a. no energy
b. neutral
c. negative
d. positive

3. Particle quarks _____.

a. do not exist
b. are inside the electron
c. are inside the proton
d. are interesting

4. Which of these is a major role played by the neutron?

a. circle the nucleus
b. neutral charge
c. radioactive properties
d. low density

5. This article suggests that_____.
6. Scientists make mistakes.

a. Neutrons are not important.
b. Electrons are useless.
c. Protons are the most important.

6. Which of these is false information about electrons?

a. They are stripped to get energy.
b. They are radioactive.
c. They travel around the nucleus.
d. They can be bounced off of the nucleus.

_____
6

Free-Response

7. Compare and contrast the three particles. Write 2 pieces of contrasting information about each particle. (2 points)

_____

_____

_____

_____

_____

_____

8. If electrons and protons were people, what would they say to one another?(2 points)

_____

_____

_____

_____

_____

_____

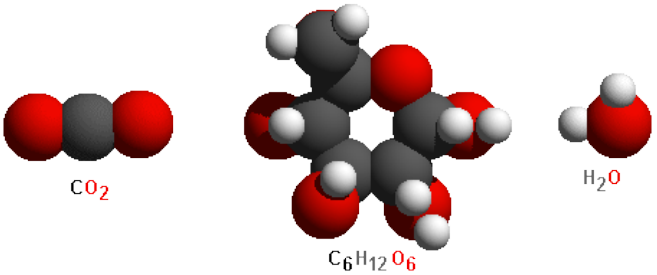
_____

Atoms and Matter Reading Comprehension Name: _____

Directions: Please read the following text and answer the multiple choice and free-response questions.

Molecules and Their Changes

Atoms are composed of three particles: protons, neutrons, and electrons. Atoms are the smallest unit of substance. Molecules are very small, and the human eye cannot detect them; although, scientists have created instruments that can create images of atoms and molecules. When two or more of those atoms get together, they are called molecules. Every molecule looks different depending on how the atoms are placed together. The picture below shows that concept.



These atoms are joined together with chemical bonds. Scientists write these compounds, and they are called chemical formulas. An example of a molecule compound is water. Water's chemical formula, how the atoms are put together, looks like H2O. H2O means that the molecule is composed of two hydrogen atoms and one oxygen atom.

Molecules can change the way they are put together with chemical change. Chemical change occurs at a molecular level when two or more molecules interact with on another. During these interactions, the atomic bonds, what gets the atoms to stick together, are broken or created new. An example of this molecular chemical change is when you burn a log in the fireplace, and the molecules of the log change into ash.

Another type of change occurs physically. Physical changes occur and effect the molecules by the way they look, act, or feel, but the molecules don't change what they are. That means that their molecular formula stays the same. For example, water can freeze to become an ice cube which is a solid. It can then melt to become liquid. The change is reversible and it is still water!

Did you know that plastics are molecules created by scientists? They are hydro-carbon molecules, and this is just one example of a million molecules people can create!

Multiple Choice

1. What particles make up an atom?
   a. molecules
   b. protons and neutrons
   c. neutrons and chemicals
   d. protons, neutrons, and electrons

2. Which shows a physical change?
   a. rusting of iron
   b. burning wood
   c. cooking of an egg
   d. breaking a glass

3. A chemical formula_____.
   a. shows how dense a molecule is
   b. is a compound that shows what a molecule is composed of
   c. is when you mix chemicals together
   d. shows the physical change in a molecule

4. How have scientists helped the molecular science move forward?
   a. They created chemical change.
   b. They created physical change.
   c. They went against the periodic table.
   d. They have created more molecules.

5. This article suggests that_____.
   a. Plastics are bad.
   b. Scientists pollute.
   c. Chemical and physical change is inevitable.
   d. All H20 molecules look the same.

6. What does H20 mean?
   a. It shows how radioactive water is.
   b. It shows the chemical change of water.
   c. It is the molecular formula of water.
   d. It shows the physical change of water.

Free-Response

7. How are chemical and physical changes different? How are they similar? (2 points)

_____

_____

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8. How have scientists played an important role in molecular findings? (2 points)

_____

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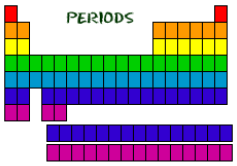
Atoms and Matter Reading Comprehension Name: _____

Directions: Please read the following text and answer the multiple choice and free-response questions.

Elements in the World

An element is a substance that cannot be broken down into any other substances. These are considered to be the building blocks of the world. There are over 120 elements, and each one has a specific number assigned to it. This is called the atomic number. Hydrogen, for example, is the first element, and it has the number 1. Number 1 stands for the one proton that the hydrogen element has. Some other examples of elements are oxygen, chlorine, sodium, and carbon.

Scientists have found that there are about 120 different natural and created elements in this world, and there may be even more to discover and create! When the new elements were discovered, scientists needed a way to organize the list. This table is organized like a grid, and each element is put in its own place depending on what its atomic structure. The table is broken down into rows and columns, and even though there are some spaces in between, the rows read left to right. These are called periods. Periods show that every element in the same period (row) has the same number of atomic orbitals. For example, every element in the 3rd row has the same number or electrons in the orbital.



Periodic tables are also broken up into groups, and these are the columns within the table. These vertical columns group the elements by how many electrons are in the outer orbital.

Even though elements are made up of atoms, they can still turn into different forms. They can be melted or even turned into a gas. When elements join to make compounds, they lose their original properties and take on new ones.

Atoms and Matter Reading Comprehension Name: _____

Multiple Choice

1. The periodic table shows_____.
   a. the atoms in the world
   b. elements that have been found or created.
   c. the scientists who have found the elements.
   d. protons, neutrons, and electrons

2. The atomic number is _____.
   a. how many number of protons that element has
   b. how many atoms the element has
   c. which protons like that element
   d. when it was discovered

3. What is true of elements?
   a. There are about 50 elements.
   b. They can be broken down into smaller pieces.
   c. They are categorized in a table.
   d. Elements do not change into other forms.

4. What does the main number of the atom mean?
   a. how many number of atoms the element has
   b. number of protons
   c. how heavy the element is
   d. how rare the element is

5. This article suggests _____.
   a. Elements are rare.
   b. No more elements will be found.
   c. Elements can be created.
   d. The elements on this planet are the same as on Jupiter.

6. Which of these is false information of the periodic table?
   a. The rows read left to right?
   b. There is a maximum of 8 orbitals.
   c. There are some spaces in between.
   d. All the elements in a period have different number of atomic orbitals.

_____
6

Free-Response

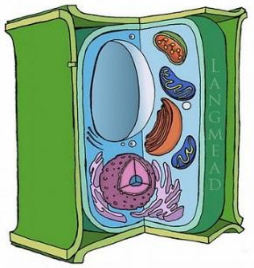
7. What is the periodic table, and how are the elements categorized in it?(2 points)

8. How are elements, atoms, and molecules connected with one another? (2 points)

4

Cells

Name: _____



Life on planet Earth is incredibly varied. There are thousands of different types of creatures and thousands of different types of plants **inhabiting** the planet. For all of this variety, however, all living things share at least one common characteristic. All living things are made of cells.

The cell is often considered to be the "building block of life". In other words, most organisms, whether large or small, are built of millions of individual cells. These cells all work together to allow one single animal or plant to survive.

Most living things are **multi**-cellular. This means that they have a great many cells all working together. Some living things, though, are comprised of just one single cell. In either case, without cells, nothing would be alive.

In humans and other animals, cells are specialized depending upon where they are located. Skin cells, for example, have special characteristics that allow them to perform the function of skin. Nerve cells, located in the brain and throughout the body, perform a different function, receiving, transporting and interpreting signals from **stimuli**. And the cells that make up the internal organs of animals each have their own special features that allow them to perform their own special functions.

Like humans and animals, plants have cells too. Plant cells are very similar to animal cells in many ways but, because plants function differently than animals, their cells have many features that animal cells **lack**.

The illustrations above show an animal cell (left) and a plant cell (right). Within each of these cells lie small bodies called organelles. Organelles function in a way that is similar to the organs of an animal. Every single cell in every single living thing has its own organelles. Organelles allow cells to breath, take in and **excrete** waste, reproduce, and even think.

The complexity of cells allow animal and plant life to function and are the key to the survival of life on Earth. By understanding cells and how they work, humans can gain a deeper understanding of themselves and can work to ensure that they can live a rich and full life.

1. How many cells do most organisms have?

- **a.** One
- **b.** Hundreds
- **c.** Thousands
- **d.** Millions

2. Multi-cellular means:

- **a.** Many cells
- **b.** One cell
- **c.** No cells
- **d.** Plant cells

3. What is a reason why cells in an organism are different?

- **a.** They are located in different areas of the organism
- **b.** They perform different functions
- **c.** All cells are the same
- **d.** Both a and b

4. Why are plant cells and animal cells different?

- **a.** Because plants don't eat
- **b.** Plant cells and animal cells are the same
- **c.** Because plants and animals function differently
- **d.** Because animals eat plants

5. Describe some of the functions of organelles:

_____
_____
_____
_____
_____
_____

Cells

Name: _____

6

There are thousands of different types of creatures and thousands of different types of plants **inhabiting** the planet.

- **a.** dying on
- **b.** eating on
- **c.** living on
- **d.** moving to

7

Most living things are **multi**-cellular.

- **a.** one
- **b.** millions
- **c.** more than one
- **d.** ten

8

Nerve cells, located in the brain and throughout the body, perform a different function, receiving, transporting and interpreting signals from **stimuli**.

- **a** sounds
- **b** touches
- **c.** smells
- **d.** all of the above

9

Plant cells are very similar to animal cells in many ways but, because plants function differently than animals, their cells have many features that animal cells **lack**.

- **a.** have
- **b.** don't have
- **c.** keep
- **d.** give away

10

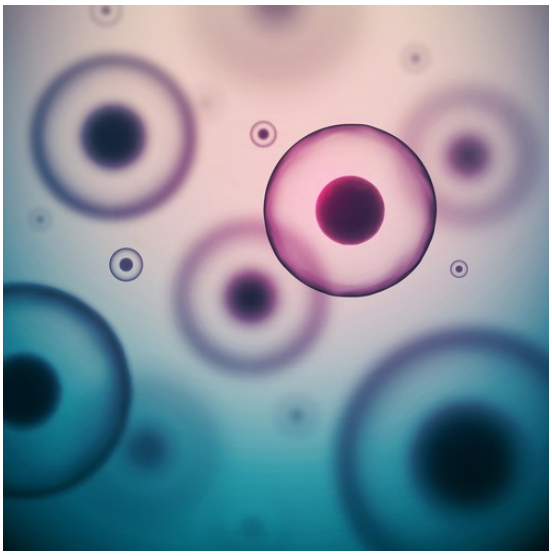
Organelles allow cells to breath, take in and **excrete** waste, reproduce, and even think.

- **a.** take in
- **b.** give off
- **c.** produce
- **d.** consume

Name: _____

Cells: Building Blocks of Living Things

by Cindy Sherwood



To build a tower of blocks, you put one block on top of another until it creates a tall structure. With living things, there is a type of building block that does the same thing, creating the structure of who we are. This building block of all living things is called a cell.

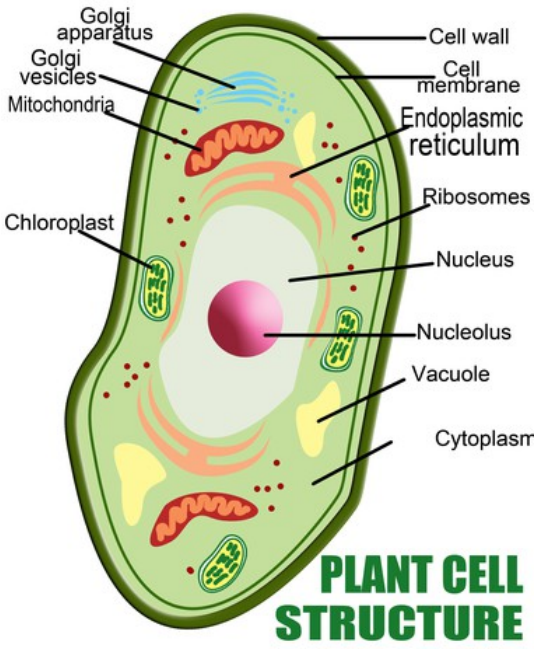
A cell that is cut in half will not survive. That makes a cell very special. It is considered the smallest part of an organism that can survive on its own, so it is the most basic unit of life.

Trillions of cells join together to form a human being. But a single cell can also be alive. There are many very simple single-celled organisms, such as bacteria. They are the earliest and most primitive forms of life on earth.

Cells are extremely tiny. Even if you have perfect eyesight, you cannot see one, except with a microscope. So what does a cell look like? Imagine a kind of sack holding a watery, jelly-like material. The sack is held together by a membrane, the outer lining of the cell. This membrane separates one cell from others and protects it from its outside environment. The membrane also allows some materials to enter and leave the cell.

There are many different types of cells, which serve different purposes in how plants and animals function. There are cells that take in nutrients from food and other cells that turn those nutrients into energy. Some cells provide structure to an organism. Other cells can make copies of themselves. Certain types of cells contain organelles. Just like the name sounds, organelles are similar to small organs of the human body and perform specific tasks necessary for an organism to survive.

A human being may live to be a hundred years or older. But that does not mean all of our cells live that long. In fact, depending on the type of cell, some only live for a few days while others may live as long as a year. In fact, every single minute, about 300 million cells die in your body. But there is no need to worry you will run out of cells because so many die all the time. About 300 billion new cells are produced every day in the human body!

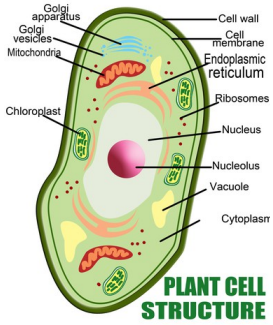


Another amazing aspect of cells is that they contain all the genetic material that helps determine who you are when you are born, such as your hair, eye, and skin color and whether you will grow up to be tall or short. Human cells contain 23 pairs of chromosomes with this genetic information. One pair of these chromosomes, which are known as the X and Y chromosomes, even determine if you are born as a boy or girl. Who could imagine that something as tiny as a cell could be so important to all of life!

Name: _____

Cells: Building Blocks of Living Things

by Cindy Sherwood



1. What would you find inside a human cell if you could inspect it closely?

a. smaller living organisms **b.** genetic material

c. bacteria **d.** smaller cells

2. According to the information in the article, will a human being have the same set of cells that he or she is born with when he or she is old? Why or why not?

_____

_____

3. Read the following statement.

Cells cannot survive without the support of other cells.

On the lines below, indicate whether this statement is true or false. Then explain why the statement is true, or why it is false.

_____

_____

4. In your own words, describe what some of the earliest life forms were like.

_____

5. According to the information in the article, what does the membrane of a cell do?

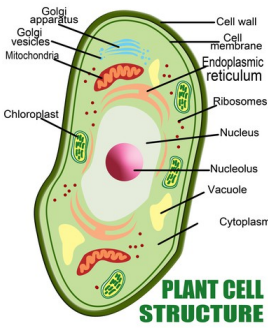
_____

_____

Name: _____

Cells: Building Blocks of Living Things

by Cindy Sherwood



The following terms are vocabulary words from the article. Match the vocabulary word with its correct definition by writing the corresponding letter on the line.

1. _____ genetic

2. _____ primitive

3. _____ organelles

4. _____ chromosomes

5. _____ nutrients

6. _____ microscope

7. _____ organism

8. _____ bacteria

9. _____ survive

10. _____ energy

a. threadlike structures inside cells that carry genetic materials

b. an instrument that allows you to look closely at objects that are invisible to the human eye, including cells

c. remain alive

d. relating to genes; hereditary information that is passed from parent to child

e. single-celled organisms that can cause some diseases

f. any specialized structures inside a cell that perform specific tasks; similar to organs

g. the strength a living thing gains from absorbing nutrients

h. ancient; prehistoric

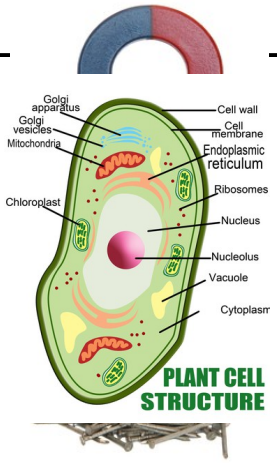
i. substances that provide the nourishment living things need to survive and grow

j. an animal, plant, or single-celled living thing

Name: _____

Cells: Building Blocks of Living Things

by Cindy Sherwood

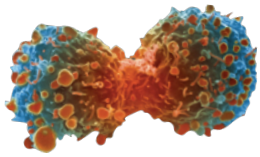


In the article, "Cells: Building Blocks of Living Things," you learned that a cell is the most basic unit of life. Trillions of cells make up the human body, and each one has a special function that helps the body run smoothly.

Using the information in the article, and your science textbook, describe **three different types of cells** in the human body. Make sure you share the name of the cell, describe its function in the body, and provide any other interesting facts you find about that type of cell.

Name: _____ Date:_____

A CLOSER LOOK AT CANCER



PART I: KWL

Start this activity off by completing the "K" (What do you know about cancer) and the "W" (what do you want to know about cancer) portion of the table below. *The last section, the "L", should be saved for last.*

KWL		
What do you Know about cancer?	What do you Want to know about cancer?	What have you Learned about cancer?

PART II: HISTORY OF CANCER

Cancer is a very serious and complex disease. Though we are making new discoveries every day, cancer is not a new disease; it has been around since mankind. It is hard to say if the incidences of cancer are higher today than they were hundreds of years ago, because then the disease was not well understood and often not diagnosed.

The oldest known description of cancer was found on an Egyptian papyri written between 3000-2000 BC. The writings referred to tumors of the breast. Also, in mummified remains of both Peruvian Incas and Egyptians dating back to 1600 BC contained lesions (abnormal growth) of bones, which suggests cancer.

Cancer is not contagious because it does not involve the transmission of pathogens. Cancer is actually caused by a faulty gene in your own cells. A tumor is simply a cluster of cells that were not part of the body's original plan, which can vary in size. Tumors can be malignant, which means the cells are spreading to other parts of the body (cancer), or benign, which means that the cells are contained in one area- they cannot spread or grow in other parts of the body (noncancerous).

The ancient Greek philosopher Hippocrates is known to be the first man to recognize the difference between benign and malignant tumors. He wrote manuscripts of cancer found in many regions of the body. Hippocrates noticed that blood vessels swell around malignant tumors. The swollen blood vessels reminded him of crab claws- so he called the disease karkinos (Greek for "crab"). In English, this term translates to carcinos- or carcinoma, which is the medical term for cancer.

1. What evidence do we have that cancer is not a disease of modern civilization?

_____

_____.

2. What is a tumor? _____

_____.

3. Name and describe the two types of tumors. _____

_____

_____.

4. Who was Hippocrates and why did he essentially name the disease after a crab?

_____

_____

_____.

Making Connections

5. Based on the reading, why do you think we refer to the disease as "cancer"?

_____

_____.

PART III: WHAT IS CANCER?

Recall that your body is made of billions of cells. Cells are constantly dividing to make more of themselves- how else would you have transformed from a baby to an (almost) adult? Cells divide for several reasons, including: growth, repair, and to replace.

Cells need to repair themselves from injury. Humans do have some small capabilities of regeneration. If you break a bone, new bone cells will grow to heal. If you scrape your knee, new skin cells will grow to heal. Cells also need to replace old cells. Did you know that cells have programmed cell death? Your old cells will need to be replaced by new ones. Typically, cells can only make a certain amount of copies of themselves. Some cells, such as red blood cells, do not make copies of themselves at all.

Cancer results from damage to genes. Recall that genes are segments of DNA, which have specific instructions. In healthy cells, these genes limit the ability for a cell to divide. In cancerous cells, the genes are damaged and are not able to control the cell's division as effectively.

What can cause this damage? It appears as though certain environmental factors may be linked to some types of cancer. For example, the cancer rates among the U.S. are not evenly distributed across the nation. Usually there is a higher rate of cancer in cities, suggesting that pollution and pesticide runoff may contribute to cancer. There is a clear link between pollutants and radiation to cancer. Most cancer causing agents are powerful mutagens- substances that can damage DNA. When DNA is damaged, we call it "mutated".

How many mutations does it take for cancer to occur? Research indicates that it only takes a few gene mutations to transform a healthy cell into a cancerous cell. The cancer- causing genes involved are responsible for regulating how fast a cell grows and divides. Scientists have discovered two types of genes that control cell division: **oncogenes** and **tumor- suppressor genes.**

Imagine driving a car. To get things going, you step on the gas. Your cells have genes that act like the accelerator of a car to start the process of cell division; these are called oncogenes. Just like you can use your brakes if you need to slow down or stop a car, a cell has genes that can slow down and stop cell division, too. These are called tumor- suppressor genes. If these genes are damaged, cell growth might not slow down, and this leads to cancer.

6. What are three reasons that cells need to divide? _____
_____.

7. Cancer results from damage to _____, which are segments of DNA, that have
_____ _____.

8. Describe what a mutagen is and name two mentioned in the reading: _____
_____
_____.

9. What is an oncogene? _____
_____
_____.

10. What is a tumor-suppressor gene? _____
_____.

Graphing Exercise

Cancer can affect many different organs- some of which, such as skin, can be affected by several different types of cancer. Some types of cancer are more treatable than others.

Using the information on the following page, create a bar graph to depict the cancer rates of different types of cancer in the United States. Use one color for the type of cancer, and another color for how many deaths that particular disease caused.

Be sure to label your graph! There will be TWO bars for each type of cancer- one for the number of cases, and one for the number of estimated deaths. Use two different colors in your bar graph (one for estimated cases and one for estimated deaths).

Type of Cancer	Estimated Cases	Estimated Deaths
Breast cancer	180,000	40,000
Lung cancer	160,000	140,000
Prostate cancer	320,000	40,000
Skin (basal and squamous cell)	800,000	10,000
Skin (melanoma)	30,000	20,000
Colon	100,000	40,000

INTERPRETING YOUR GRAPH

Use complete sentences, please!

1. Which cancer type is most common? Least common?

2. Which cancer type seems to be least treatable? Most treatable?

3. Provide a possible explanation as to why the incidence of basal and squamous skin cancer is so high.

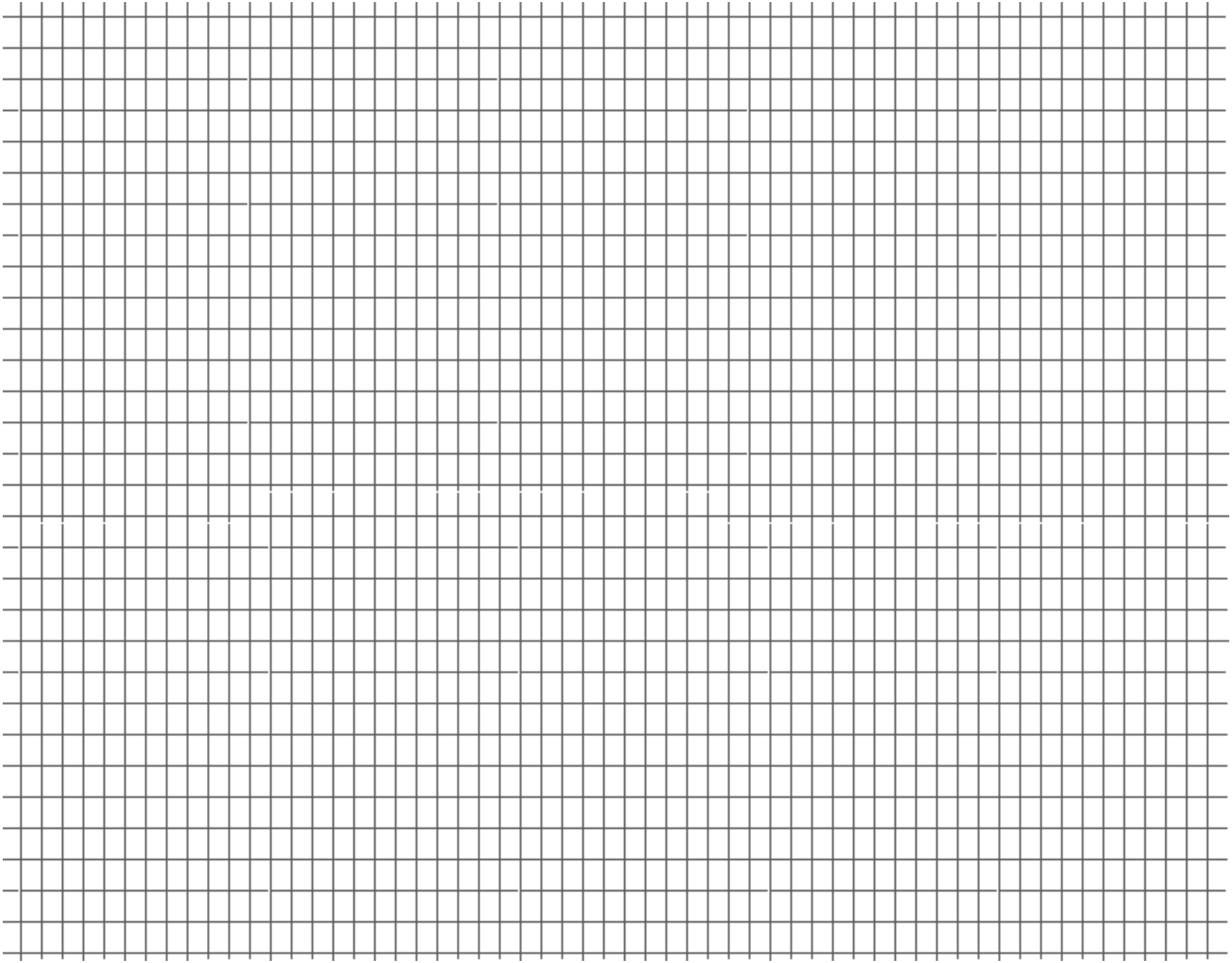
4. Using breast cancer as an example, calculate the percentage of survival for this cancer type (hint: calculate the # of survivors, divide it by the # of estimated cases, and multiply this # by 100%).

DO NOT FORGET TO COMPLETE THE "L" PART OF YOUR KWL IN PART I.

Tips on how to set up your graph:

The y axis can be labeled number of thousands of estimated cases and deaths, which means that you would only need to go from 0-800 on the y axis. Just be sure to come up with a good method for measuring what each line on your graph is worth first? (For example: should going up one line be an increase of 10? 50? Decide this before you proceed). The x axis should be the type of cancer (two bars for each type of two different colors).

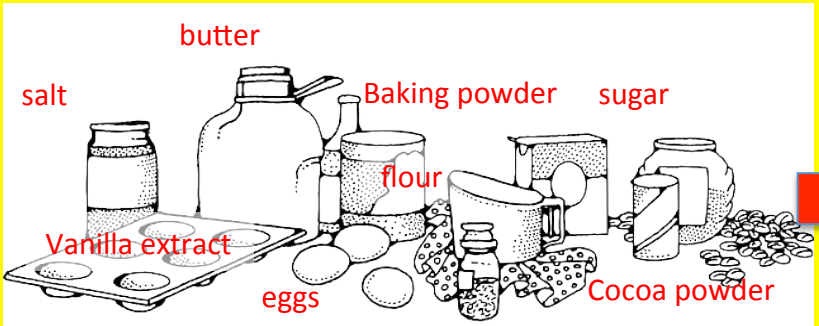
GRAPH TITLE: _____



L1: WHAT ARE CHEMICAL REACTIONS?

Have you ever wondered how an Oreo cookie started out? It was not always this delicious, it had to go through a chemical reaction in order to taste this good.

A chemical reaction is a process by which one or more substances (reactants) change to make one or more new substances that are chemically joined (products). The chemical and physical properties of the new substance are different to the original substance.



Reactants

Product

HOW DO YOU KNOW A CHEMICAL REACTION HAS OCCURRED?

There are many ways to tell that a chemical reaction has taken place. The more signs that you see the more evidence there is that a chemical reaction has happened.

Production of gas | **Solid formation (Precipitate)** | **Temperature Change** | Light emission | Color Change

In the making of an Oreo cookie, we know that a chemical reaction has occurred, because a gas is produced, when the sodium bicarbonate (baking powder) breaks down into carbon dioxide, sodium carbonate and water. This occurs at a temperature between 50-200 ^{0}C. This type of reaction is called "Thermal decomposition" (The chemical breakdown of a substance due to heat). There is also a color change as the heat causes the ingredients to darken.

$2NaHCO_3$	→	Na_2CO_3	+	H_2O	+	CO_2
Sodium Bicarbonate		Sodium carbonate	+	water	+	Carbon Dioxide

L1: WHAT ARE CHEMICAL REACTIONS? ACTIVITY

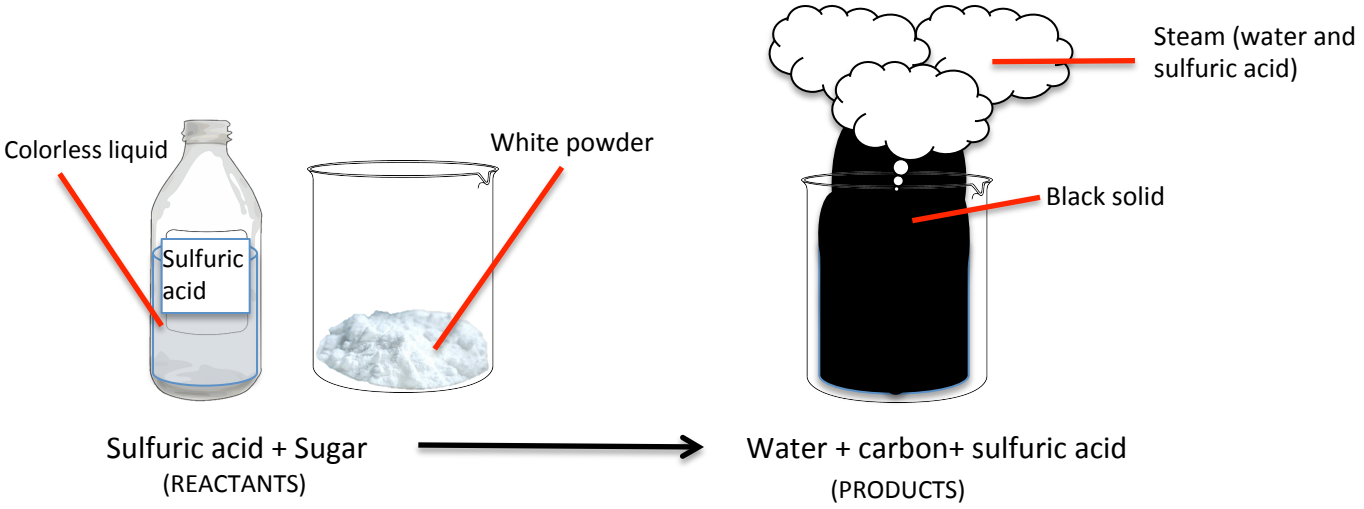
1. What is the definition of a chemical reaction?_____

_____

2. What are 5 ways to tell that a chemical reaction has taken place?

_____, _____, _____, _____, _____

3. When substances go through a chemical reaction they produce a new substance that has different physical and chemical properties to the reactants. Look at the picture of the reaction below and answer the questions.



a) What are the physical properties of sulfuric acid? _____

b) What are the physical properties of sugar?_____

c) What are the physical properties of the products that are produced when sugar reacts with

Sulfuric acid?_____

4. Explain using evidence why the production of Oreo cookies is an example of a chemical reaction. Use 2 different pieces of evidence to support your answer.

_____

_____

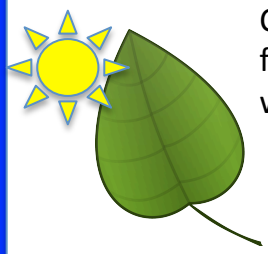
_____

_____

_____

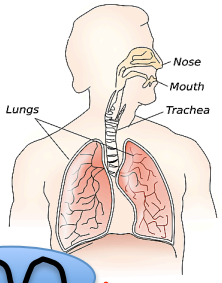
_____

L2: Examples of chemical reactions?



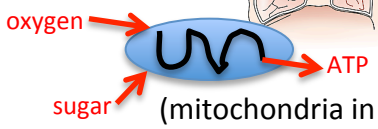
Chemical reactions are happening all around us. Plants for example make their own food through a process called photosynthesis, where they react carbon dioxide with water, in the presence of sunlight to produce oxygen and sugar.

$$6\,CO_2 + 6\,H_2O \xrightarrow{\text{LIGHT}} C_6H_{12}O_6 + 6\,O_2$$



Humans release energy into their cells through a reaction called Aerobic Respiration. This is the reverse reaction of photosynthesis, oxygen, that we breathe in reacts with sugar to produce carbon dioxide, water and energy in the form of ATP.

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy (36 ATPs)}$$



(mitochondria in a cell)

When we go outside to cook a burger on the grill we burn propane gas, this is a combustion reaction. The gas ignites to produce water, carbon dioxide and heat energy. Allowing us to cook our burger.

$$C_3H_8 + 5O_2 \rightarrow 4H_2O + 3CO_2 + \text{energy}$$

Have you ever left your bike out in the rain? Well after time your bike will become rusty; just like the picture of the rust car on the right. This is because the iron reacts with oxygen and water. This type of reaction is called an oxidation reaction.

$$4\,Fe + 6\,H_2O + 3\,O_2 \rightarrow 4\,Fe(OH)_3$$

When you eat cookies, a chemical reaction happens in your mouth. Amylase, a digestive enzyme in your mouth breaks the sugar down into smaller substances that the body can absorb. Hydrochloric acid, in your stomach also reacts with food to break it down. This sometimes results in the production of methane gas, causing you to pass gas!

It is important to remember that substances react chemically in characteristic ways, for example they may produce gas, change temperature, color, emit light and even produce a precipitate.

In a chemical process, the atoms that make up the original substances (reactants) are regrouped into different molecules, to form the new substances (products). The products have different properties from those of the reactants. The total number of each type of atom is conserved, and thus the mass does not change.

L2: Examples of chemical reactions? ACTIVITY

If you look at the reaction that occurs during photosynthesis, you can see that the total number of reactants are equal to the total number of products. The total number of atoms that you start with are still there at the end of the reaction. The atoms are conserved in the reaction.

$$6\,CO_2 + 6\,H_2O + light \rightarrow C_6H_{12}O_6 + \mathbf{6\,O_2}$$

Carbon oxygen hydrogen

The key atoms that are involved in this reaction are Carbon, Hydrogen and Oxygen.

REACTANTS:

6 molecules of carbon dioxide ($6\,CO_2$) :
6 carbon atoms, 12 Oxygen atoms.

6 molecules of water ($6\,H_2O$):
12 Hydrogen atoms and **6 Oxygen atoms**

PRODUCTS

1 sugar molecule: ($C_6H_{12}O_6$)
6 carbon atoms, 12 hydrogen atoms, 6 Oxygen atoms

6 Oxygen molecules: ($6O_2$)
12 oxygen atoms.

1. How many carbon atoms are in 6 molecules of carbon dioxide? _____

2. How many oxygen atoms are there in 6 molecules of carbon dioxide? _____

3. How many molecules of water can you make from 12 hydrogen atoms and 6 oxygen atoms? _____.

4. What is the total number of oxygen atoms that are present on the reactant side? _____

5. What are the total number of oxygen atoms that are present on the product side of the reaction? _____

6. Explain using evidence why the mass of the reactants in a reaction will always equal the mass of the products.

_____

_____

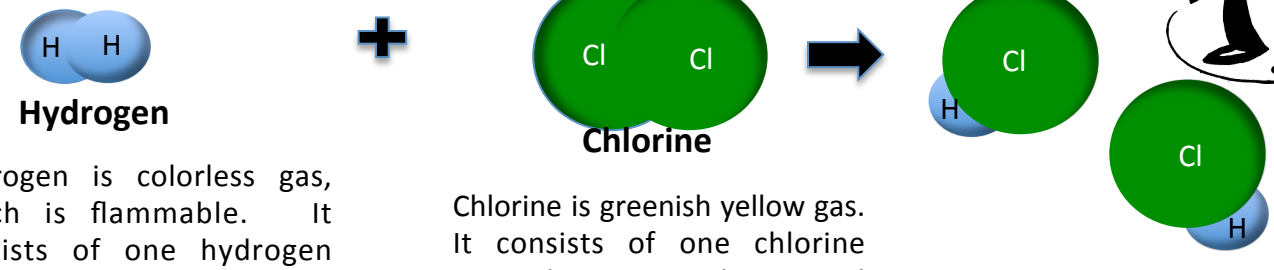
_____

L3: Reacting atoms and molecules

You may have seen a magician pull a rabbit out of his hat, is this pure magic or an illusion?

In terms of chemical reactions there is no magic taking place, the substances produced are formed by the interactions of the atoms that are found within each substance.

For example if you take 2 chemical substances chlorine and hydrogen. By observing their atoms we can see how they react to form hydrogen chloride.



Hydrogen

Hydrogen is colorless gas, which is flammable. It consists of one hydrogen atom, however under normal conditions it usually forms a hydrogen molecule that consists of 2 hydrogen atoms.

Chlorine

Chlorine is greenish yellow gas. It consists of one chlorine atom, however under normal conditions it usually forms a chlorine molecule that consists of 2 chlorine atoms.

Hydrogen chloride

The structures of chlorine and hydrogen are referred to as a diatomic molecules. Diatomic molecules are two atoms bonded together. In order for these two molecules to react the bonds that hold these atoms together in must break before they can react. During the reaction the atoms from each different substance join to form a new substance, called hydrogen chloride. Hydrogen chloride is a diatomic compound, that consists of 2 different atoms which are chemically joined. Hydrogen chloride is a non flammable, colorless gas, its properties differ to the properties of its reactants, chlorine and hydrogen.

Simple combustion reactions

Combustion reactions are chemical reactions which involve a substance burning in the presence of oxygen. There are many examples of combustion reactions, some of which you may be fortunate enough to try out in the classroom.

some substances contain carbon, hydrogen and oxygen, they are called organic compounds. When they burn in oxygen they always produce carbon dioxide and water.

$2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O$

Propane + oxygen → carbon dioxide + water

Some metals however, which do not contain carbon, hydrogen and oxygen form metal oxides. Zinc, magnesium, copper and iron burn with oxygen to produce metal oxides.

$2\,Zn + O_2 \rightarrow 2\,ZnO$

Zinc + Oxygen → Zinc oxide

$3\,Fe + 2\,O_2 \rightarrow Fe_3O_4$

Iron + Oxygen → Iron oxide

$2Mg + O_2 \rightarrow 2\,MgO$

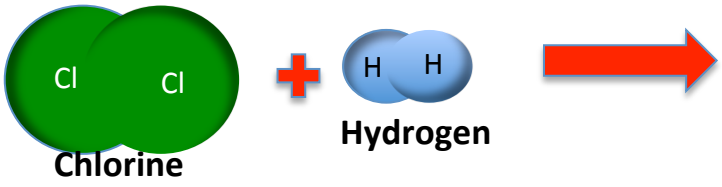
Magnesium + Oxygen → Zinc oxide

L3: REACTING ATOMS AND MOLECULES: ACTIVITY

1. What are diatomic molecules? Give an example.

_____

2.Explain what happens when hydrogen reacts with chlorine. What new substance is formed and how does its properties compare to the original reactants?

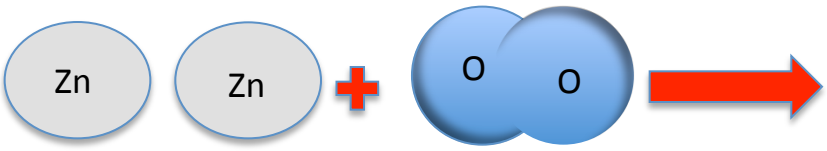


_____

_____

_____

3. Zinc combusts in oxygen to produce Zinc oxide. The equation for the reaction is **$2\ Zn + O_2 \rightarrow 2\ ZnO$** complete the diagrams below to show what happens to the atoms during this reaction.



a) What are the reactants of this reaction?_____

b) What are the products of this reaction?_____

c) What type of molecule is oxygen? _____

d) What is the total number of atoms in the reactants? _____

e) What is the total number of atoms in the products?_____

4. If the total mass of the reactants measured 160 grams, what would be the total mass of the products? Explain your answer.

_____

_____

L4: CHEMICAL REACTIONS AND ENERGY

Have you ever injured yourself and then placed a cold pack over your injury to help relieve the pain and swelling? Some packs do not need to come straight out of the freezer, all you need to do is bend them and then they become cold. This is an example of an endothermic reaction.

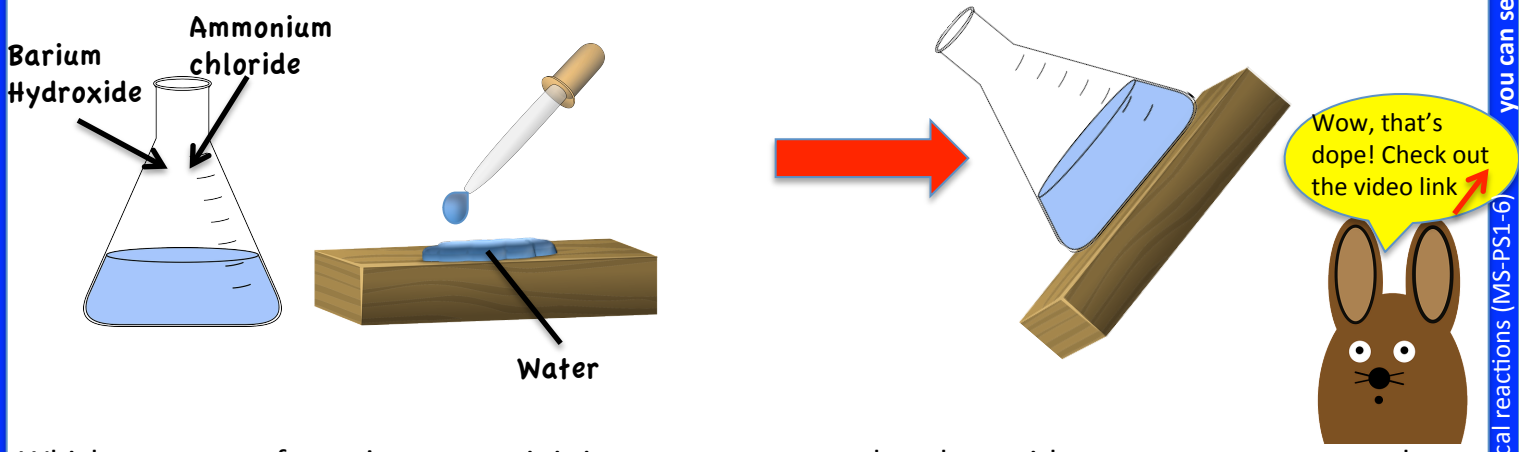
The cold pack contains chemicals which absorb the surrounding heat making your skin feel cold.

Some chemical reactions release energy and some absorb energy.

A chemical reaction in which energy is released is called an **exothermic reaction**. These types of reactions, release energy in the form of **light**, **electrical energy** and **heat energy**. When you burn propane, the reaction of oxygen and propane produces a lot of heat, this heat is exothermic and can be used to cook your food. If you add active yeast to hydrogen peroxide it will also cause an exothermic reaction.

Endothermic reactions are reactions in which energy is absorbed by the reactants. An example of this can be seen in the cold pack above, it also occurs during photosynthesis. Plants use the sun's light energy to react carbon dioxide with water to produce glucose and oxygen.

If you place 32 grams of Barium Hydroxide, in a Erlenmeyer flask, and then add 11 grams of Ammonium chloride, and shake the two together, an endothermic reaction will occur. The reaction is so endothermic that if you place the reacting flask onto a block of wood, that has a drop of water on it. The bottom of the flask will freeze the water, and stick to the block of wood.



Which ever type of reaction occurs, it is important to remember that neither mass nor energy can be created or destroyed during a chemical reaction. The **law of conversation of energy** states that energy cannot be created or destroyed, however it can be transferred from one object to another.

Where does the energy come from in a reaction?

In an exothermic reaction, energy is stored in the bonds of the reactants. When these substances react this energy is released and transferred to its surroundings, making them feel hot.

During endothermic reactions the energy is taken in from the surroundings and is transferred to the products., making the surroundings feel cold.

L4: CHEMICAL REACTIONS AND ENERGY: ACTIVITY

1. Explain the difference between an endothermic reaction and exothermic reaction.

_____

_____

_____

2. For each of the following reactions explain whether they are endothermic or exothermic. There is also a video link so you can see the reaction.

a) Magnesium burns in oxygen to produce heat and a bright light. _____
(Video link: https://www.youtube.com/watch?v=8aqr1BO14Lw)

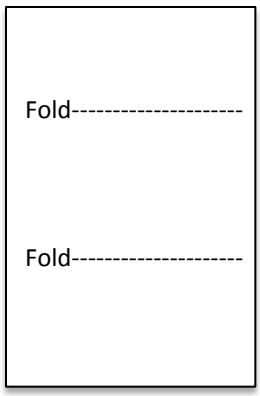
b) Cooking an egg, in a frying pan. The heat from the stove turns the runny egg into a hard egg.

_____

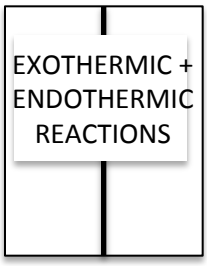
c) Alkali metals (Lithium, sodium, potassium, Rubidium and Cesium) reacting with water. To produce hydrogen gas, and in the case of potassium flames.
(video Link https://www.youtube.com/watch?v=uixxJtJPVXk)

_____

3. Produce a foldable to describe and explain endothermic and exothermic reactions. You may decide to do your own research to find your own examples of these types of reactions. There might be some that you could create using household substances, such as sodium bicarbonate.



Regular 8" X 10" paper



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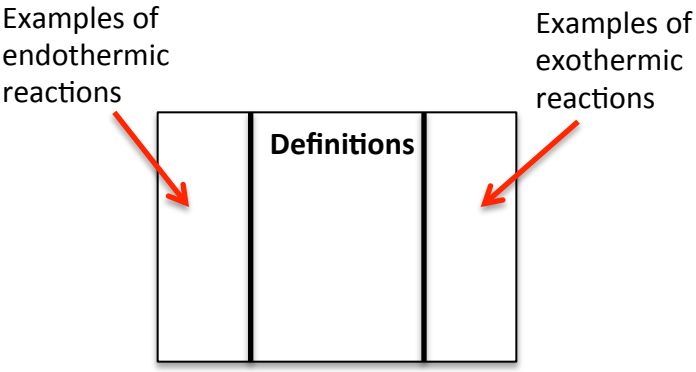


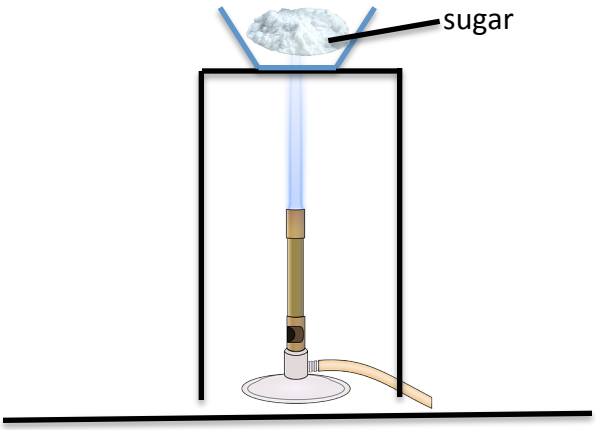
INSIDE

ASSESSMENT #1: MS-PS1-2

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
[Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]

SCENARIO: you are a finalist of the hit show "Who Wants To Be a Science Millionaire". Your final challenge is to determine whether reactions have occurred in varying substances.

1. Using the apparatus below. The game show host, burned sugar, iron wool, magnesium, and zinc over a Bunsen flame. All of the substances caught fire. Use the table to determine whether a reaction took place or not.



Substance	Starting mass (g)	Appearance before burning	Appearance during burning	Appearance after burning	Mass after burning (g)
sugar	736 g	Fine white powder	Sets alight, orange flame, sugar turns black, produces gas.	Sticky black liquid/syrup	120g
Iron wool	220 g	Grey material, solid wire like fibers.	Glows orange, sets alight,	Dark grey brittle fibers	316 g
magnesium	48 g	Silver metal, solid, bends easily	Sets alight creates white light	White greyish powder	80 g
Zinc	130 g	Silver metal, solid, bends easy	Sets alight creates blue/ green flame	White/greyish powder	162 g

ASSESSMENT #1: MS-PS1-2

QUESTIONS:

1. Use the information from the table to answer the following questions:

a) What happened to the mass of the substances as they burned? _____

b) When sugar burned it produced carbon dioxide and water. When it was weighed after burning its mass measured 120 g. Why did its mass decrease?

_____

c) What are the difference in properties of magnesium and magnesium oxide?

_____

d)Based on the evidence explain which substances reacted with oxygen during combustion. Explain your answer and support your argument with evidence.

_____
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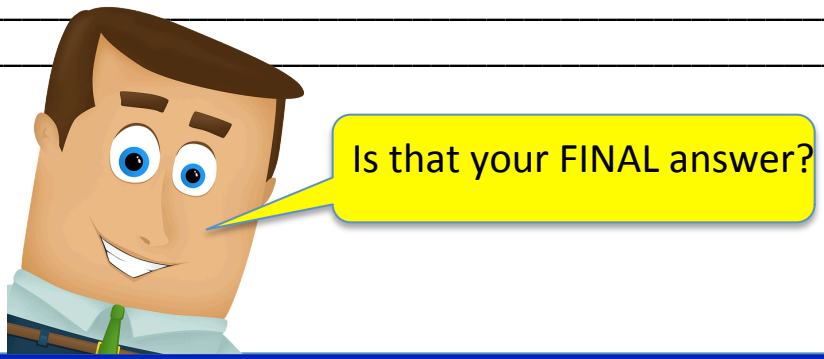


ASSESSMENT #1.1: MS-PS1-2

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

SCENARIO: The table below shows the interactions of metals with oxygen and cold water. The table shows the melting points and density of each metal before and after its interaction. Density is the mass of an object relative to its volume.

Based on this information you need to find a metal that is least reactive, so that it can be used to create a statue of The President of The United States.

Metal	Density (g/cm^3)	Melting point ^0C	Substance it interacts with	Density after interacting (g/cm^3)	Melting point after interacting (^0C)
Iron	7.874	1538	oxygen	5.24	1566
Magnesium	1.738	650	oxygen	3.58	2852
Zinc	7.14	419.53	Cold water	7.14	419.53
gold	19.3	1064.18	oxygen	19.3	1064.18
zinc	7.14	419.53	oxygen	5.61	1975
potassium	0.856	63.38	oxygen	2.35	740
Copper	8.92	1084.62	oxygen	6.31	1326
aluminum	2.7	660.32	Oxygen	3.95	2072

1. Which metal is least reactive and most suitable to build a statue? Explain your answer using evidence from the table?

_____

_____

_____

2. What other substances should you interact your chosen metal with before building your statue of The President?

_____

_____

_____

ASSESSMENT #3 : MS-PS1-5

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
[Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]

SCENARIO: A candle is burning. You and your friend are arguing as to what happens to the wax as it burns. Your friend argues that they wax is simply used up and disappears. You however are sure that this is not the case as things do not simply disappear. You briefly remember your teacher talking about "The Law of Conservation". You cant remember the details, but you know that it has something to do with this law. You are tired of listening to your friends un-supported arguments. You decide to set the record straight and explain to your friend what happens when things burn and how the law of conservations applies to chemical reactions.

The chemical and word equation for burning a candle can be seen below.

$$2\ C_{30}H_{62} + 91O_2 \rightarrow 60CO_2 + 62\ H_2O$$

Candle + Oxygen → Carbon dioxide + Water

You also found the following equations for when things burn:

Burning Magnesium: $MgO + O_2 \rightarrow 2MgO$

Burning Propane: $C_3H_8 + O_2 \rightarrow 3CO_2 + 4H_2O$

1.Produce a visual poster or PowerPoint Presentation to explain to your friend the law of conservation, and how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

RUBRIC: **SCORE**

1. I have produced a visual model of the law of conversation, in the form of a poster or PowerPoint ___/5
2. I have explained the law of conservation. ___/5
3. I have used drawings and diagrams to show how atoms are conserved in chemical reactions. ___/5
4. I have annotated my diagrams and offered written explanations. ___/5
5. My work is well presented, demonstrating time and effort. ___/5

GRADE: A= 22-25 B = 20-21 C = 17-19 D = 15-16

Vocabulary

CHEMICAL REACTION: The process in which 2 or more substances interact to form one or more new substances that have physical properties that are different to the original substance.

REACTANTS: substances that will interact in a chemical reaction to form a new substance

PRODUCT: a new substance that is formed when 2 or more substances undergo a chemical reaction

THERMAL DECOMPOSITION: the breakdown of a substance due to heat

PHYSICAL PROPERTIES: the characteristics of a substance, for example the way it looks, its mass, melting point and density

ATOM: the basic unit of a chemical element

MOLECULE: a structure that contains 2 or more atoms which are chemically bonded.

DIATOMIC MOLECULE: molecule that consists of 2 atoms that are chemically bonded.

ELEMENT: a substance in its purest form, which contains only one type of atom.

COMBUSTION REACTION: chemical reaction in which a substance burns in the presence of oxygen.

LAW OF CONSERVATION: states that energy cannot be created or destroyed, however it can be transferred from one object to another.

EXOTHERMIC REACTION: type of reaction where energy, which is stored in chemical bonds is released during the process of breaking bonds to create a new substance. (heat is released)

ENDOTHERMIC REACTION: type of reaction where energy is absorbed during the process of breaking and forming chemical bonds in a new substance. (heat is absorbed)

1. Produce a personal dictionary to help you learn the key vocabulary terms.

WORD	DEFINITION	SENTENCE	PICTURE

CHEMICAL REACTIONS QUIZ

NAME_____ SCORE_____

1. What is the name of the process in which 2 or more substances interact with each other to form one or more new substances.

A. COMPOUND FORMATION B. CHEMICAL REACTION C. PHOTOSYNTHESIS D. CHEMICAL PRODUCTION

2. In a reaction magnesium burns in the presence of oxygen to produce magnesium oxide. What type of reaction is this?

A. NON REACTIVE B. MIXING REACTION C. THERMAL DECOMPOSITION D. COMBUSTION REACTION

3. The chemical equation for formation of magnesium oxide is: Magnesium + oxygen → Magnesium Oxide What is the product of this reaction?

A. MAGNESIUM B. OXYGEN C. MAGNESIUM OXIDE D. MAGNESIUM AND OXYGEN

4. The chemical equation for formation of magnesium oxide is: Magnesium + oxygen → Magnesium Oxide What is the REACTANTS of this reaction?

A. MAGNESIUM B. OXYGEN C. MAGNESIUM OXIDE D. MAGNESIUM AND OXYGEN

5. Chlorine forms a stable molecule that consists of 2 atoms. What type of molecule is this more commonly known as?

A. DIATOMIC MOLECULE B.DUOATOMIC MOLECULE C. DIAMOLECULE D. BIATOMIC MOLECULE

6. In a reaction 2 substances with a combined mass of 120 g will react to produce 1 or more new substances. What will the total mass of these new substances?

A. 60g B. 120g C.240 g D. 320g

7. What is the correct term used to describe a substance that contains just one type of atom.

A. MONATOMIC MOLECULE B. COMPUND C. ELEMENT D. MOLECULE

8.What is the the name given to a structure that contains 2 or more atoms which are chemically bonded?

A. MONATOMIC MOLECULE B. COMPUND C. ELEMENT D. MOLECULE

9. Two chemicals react to form a new chemical substance. During the reaction energy is released in the form of heat and light. What type of reaction is this?

A. ENDOTHERMIC REACTION B. EXOTHERMIC REACTION

10. What are 5 ways in which you know a chemical reaction has occurred?

_____, _____, _____, _____ ,_____

Name: _____ Date: _____ Period: _____

Circulatory System

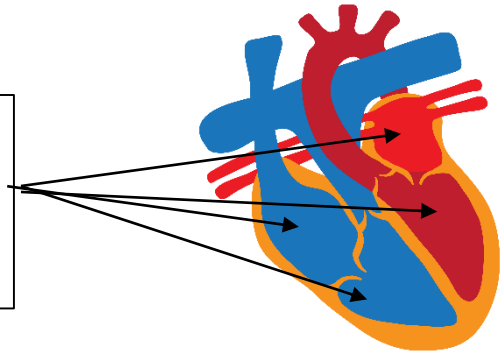
Key Words:
Cell- Smallest unit of life
Tissue- Collection of similar cells working together to perform a function
Organ- A group of similar tissues working together to perform a function.
Organ/Body System- A collection of different organs, tissues, and cells working together.

1. When you are outside running, playing sports, or are in your P.E. class, your heart is beating faster than it normally would. When you are exercising, you also have to breathe heavier than you normally would. Your **circulatory system** and your **respiratory system** work together to make sure your body gets what it needs in order to keep you moving.

2. Your **circulatory system** is a body system that includes the **heart** as the primary **organ** along with other **tissues** such as veins, arteries, and capillaries. The primary job of the circulatory system is to move blood which will then deliver nutrients and remove waste from the cells.

3. The circulatory system is made up of different organs. An **organ** is a collection of similar tissues to perform a particular job. The function of the heart is to pump the blood cells to the different parts of the body. The blood cells carry nutrients to the other parts of the body and will take waste out of the body to keep the other cells healthy.

The primary organ in the circulatory system is the heart. Shown are four chambers in the heart that pumps the blood.



As you read…

Contrast: What is the difference between an organ and a tissue?

_____

_____

_____

_____

In the Text: What organs and tissues are found in the circulatory system?

_____

_____

_____

_____

In the text: What is the function of the circulatory system?

_____

_____

_____

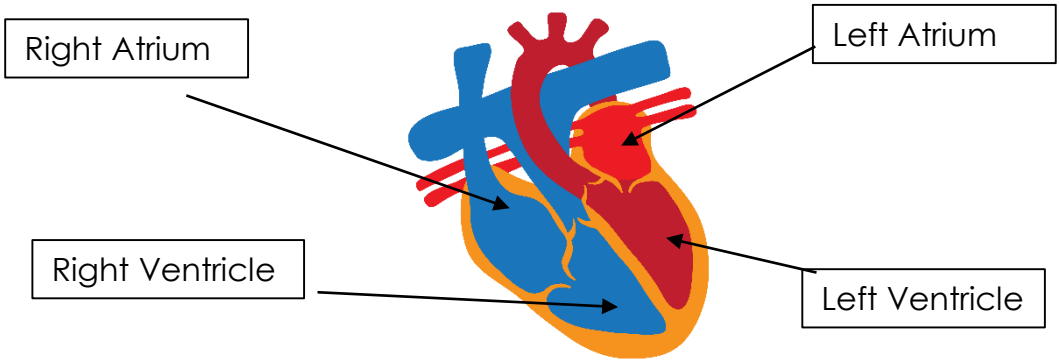
Name: _____ Date: _____ Period: _____

Circulatory System

Key Words:

Heart- Primary organ in the circulatory system. Used to pump blood to the body.
Atrium- The upper chambers in the heart that collect blood from the rest of the body.
Ventricle- The chambers in the heart that send blood out to the rest of the body.
Arteries- Blood vessels that carry oxygen rich blood to the rest of the body.

4. The heart has multiple chambers in order to deliver the blood to the different parts of the body. There are four chambers in the heart with each set of chambers having a specific name. The two upper chambers are called the **atriums**. The atriums collect the blood from the rest of the body. The bottom chambers are called **ventricles** and they will send the blood out of the heart. With the left atrium collecting oxygen rich blood from the lungs to be transported to the rest of the body by the left ventricle. The right atrium collects the deoxygenated blood from the body that will then be sent back to the lungs through the right ventricle.



5. Once the blood has left the heart through the left ventricle, it will make its way into the blood vessel known as an artery. You can easily think of the blood vessels as streets and the blood cells being like mail carriers who need to drop off important packages. The houses would represent cells who are receiving packages and sending packages back out.

As you read…

Contrast: What is the difference between a ventricle and an atrium?

_____

_____

_____

_____

Compare: What do all atriums do inside of the heart?

_____

_____

_____

_____

In the text: What type of tissue does the blood go into once it leaves the heart?

_____

_____

Name: _____ Date: _____ Period: _____

Circulatory System

Key Words:

Veins-Blood vessels that carry deoxygenated blood back to the heart.

Capillaries- Very narrow blood vessel that allows gas exchange at the cellular level.

Lungs- A pair of organs in the respiratory system that allows the organism to exchange carbon dioxide for oxygen by breathing.

6. So just as there are some streets in your neighborhood that are very narrow where only one car can move through, or there may be even larger streets with multiple lanes, and high ways are even larger. When blood leaves the heart, it leaves through a very large artery. The **arterie**s are like the highways for blood cells that carry oxygen. The blood cells that carry oxygen will move through the arteries until they begin to branch off into thinner tissues called capillaries. If the arteries are like high ways, then the capillaries are going to be like narrow neighborhood streets.

7. **Capillaries** are very small narrow blood vessels that only allow the passage of one blood cell to move through at a time. This is where the blood cell exchanges the oxygen is carrying to the body cell and will then pick up any carbon dioxide.

8. Once the carbon dioxide has been picked up, the blood cell will begin its journey back to the heart. The "streets" it moves on is no longer called an artery but a vein. **Veins** are the blood vessels that carry deoxygenated blood back to the heart where it will then be sent back to the **lungs**.

Illustration of a single blood cell moving through a capillary.

As you read…

Think About It! Why would you compare blood vessels to roads?

_____

_____

_____

_____

Contrast: What is the difference between veins and arteries?

_____

_____

_____

_____

In the text: After the oxygen is dropped off at the cell, where do the blood cells go next?

_____

_____

Name: _____ **Date:** _____ **Period:** _____

Circulatory System
Guided Practice

Directions: Match the following terms with the correct definition

1. Red Blood Cell
2. Vein
3. Artery
4. Capillary
5. Heart
6. Circulatory System
7. Atrium
8. Ventricle

A. Blood vessel carries oxygen to the rest of the body from the heart

B. Primary organ in the circulatory system that pumps blood

C. Part of the heart that collects the blood from the rest of the body.

D. Blood vessel that carries deoxygenated blood away from the body and back to the heart.

E. Part of the circulatory system that carries the oxygen or carbon dioxide

F. Body system that delivers oxygen and nutrients to the body.

G. Part of heart that sends blood out.

H. Narrow blood vessel where gas exchange occurs.

9. Knowing the way the circulatory system works, describe why your heart needs to beat faster when you exercise? _____

_____

10. What complications might there be if something is wrong with part of your circulatory system? _____

_____

Name: _____ **Date:** _____ **Period:** _____

Circulatory System
Guided Practice

Directions: Write the letter of the appropriate definition in the blanks below.

1. Red Blood Cell _____
2. Vein _____
3. Artery _____
4. Capillary _____
5. Heart _____
6. Circulatory System _____
7. Atrium _____
8. Ventricle _____

A. Blood vessel carries oxygen to the rest of the body from the heart

B. Primary organ in the circulatory system that pumps blood

C. Part of the heart that collects the blood from the rest of the body.

D. Blood vessel that carries deoxygenated blood away from the body and back to the heart.

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F. Body system that delivers oxygen and nutrients to the body.

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9. Knowing the way the circulatory system works, describe why your heart needs to beat faster when you exercise? _____

_____

10. What complications might there be if something is wrong with part of your circulatory system? _____

_____

Name: _____ Date: _____ Period: _____

Blood

Key Words:

Blood Cell- The red blood cell provides an important role in gas exchange by carrying oxygen and carbon dioxide to and from the cell and delivering nutrients.
Blood Vessel- Tube shaped tunnel that acts as a road way for blood cells.
Plasma-Non living fluid inside of blood vessels where blood cells can flow through.
White Blood Cell- Part of the immune system, provides protection against bacteria.

1. Blood provides a very important role in our body. The **red blood cell** carries gasses to and from our heart and lungs and carries other nutrients to all of the cells in our body. Red blood cells are very interesting because they do not have a nucleus. The reason why the red blood cells do not contain a nucleus is that by removing even that small amount of mass, the blood cell can carry more oxygen. Not having a nucleus is also why blood cells look like donuts with the middle being thinner than the outside.

Fun Fact! A single drop of blood can contain as many as 5 million red blood cells!

2. Red blood cells move in a fluid known as **plasma**. This reduces friction and allows the blood to flow like a liquid. The plasma and all other cells flow through a tube like structure called a **blood vessel**. This can include veins, arteries and capillaries.

3. Other types of particles in blood vessels include platelets and white blood cells. **Platelets** are small structures that help patch up any cuts when you are bleeding. They are what form scabs. **White blood cells** are also in blood vessels and are used to fight bacteria and other infections.

As you read…

In the text: What is the function of the red blood cell? _____

_____

_____

_____

In the text: What is the function of plasma in the blood? _____

_____

_____

_____

_____

Contrast: How are red blood cells and white blood cells different?

_____

_____

_____

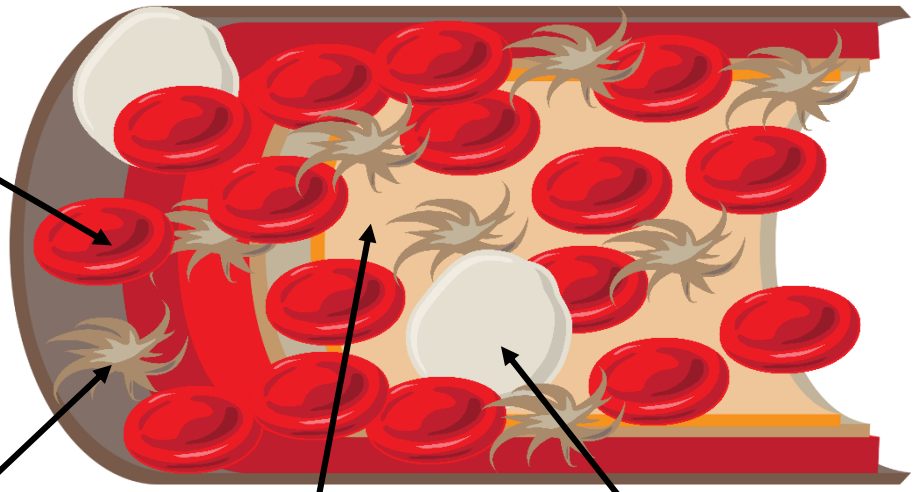
Name: _____ Date: _____ Period: _____

Blood

Guided Practice

Directions: Look at the picture of the blood vessel below. For each object with an arrow, give the name and the function.

1.



2.

3.

4.

5. If there were high numbers of white blood cells what do you think that would mean for the individual? _____

_____

6. What would happen to humans if we did not have platelets? _____

_____

7. Why does there need to be more red blood cells than white blood cells?

_____

Climate Change

What is climate?

When we talk about **climate**, the first thing that usually comes to mind is the temperature in an area. Africa typically has a high temperature and therefore, we think of it as having a hot climate. Antarctica is usually cold so it has a cold climate. Climate is BIGGER though. Climate is an area's "average weather", including temperature, precipitation (rain, snow, etc.), humidity, wind and even seasons (What is climate change?, n.d.). The Earth has been around a long time and its climate has changed a lot. During the time of the dinosaurs, Earth was a much warmer place and just about 10,000 years ago, we finished an ice age. The problem we face now is human-made climate change. What we do is changing our climate much faster than Nature intended and that's what's causing the problems.

Happy Thought!

It's not too late! By making small changes to our lifestyles, we can lower our carbon dioxide emissions and reduce pollution. If everyone does his or her part, we can stop this.

What's the big deal?

NASA has reported a global average temperature increase of 1.4° Fahrenheit since the 1880s, and stated that nine out of the ten warmest years have happened since the year 2000. These records date back 134-years (Global Climate Change, n.d.).

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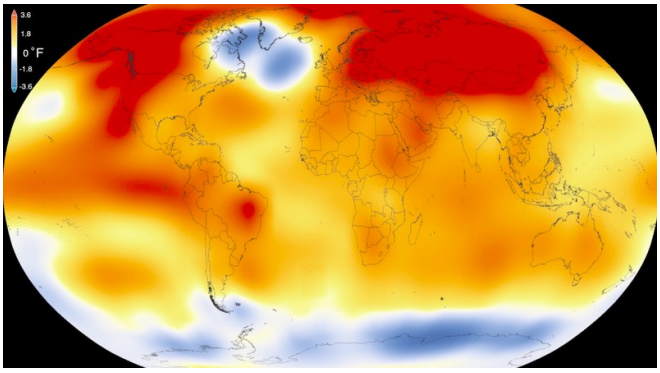
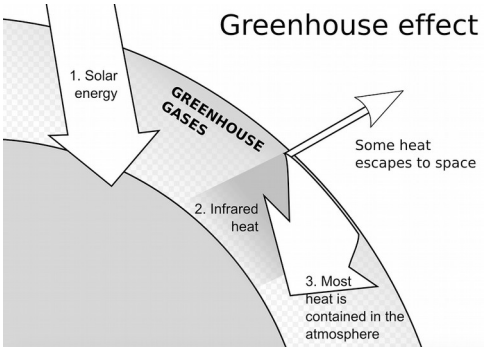


This picture shows temperature changes compared to 1951-1980. Red means hotter, blue is colder – Credit NASA

The Greenhouse Effect

One of the most significant ways we affects we have on our environment is the large amount of greenhouse gases we emit, mainly carbon dioxide (CO_2). How does this create global warming and climate change? It all comes down to the greenhouse effect. The greenhouse effect is when the layer of gases in the **atmosphere** absorbs heat from the Earth to keep it warm like a blanket or sweater keeps you warm. The gases that do this (including carbon dioxide) are called **greenhouse gases**. They are very important, without them, most places on Earth would be too cold to live in. But when there's too many of them, it can cause the surface temperature of the Earth to rise.



What's causing all this carbon dioxide?

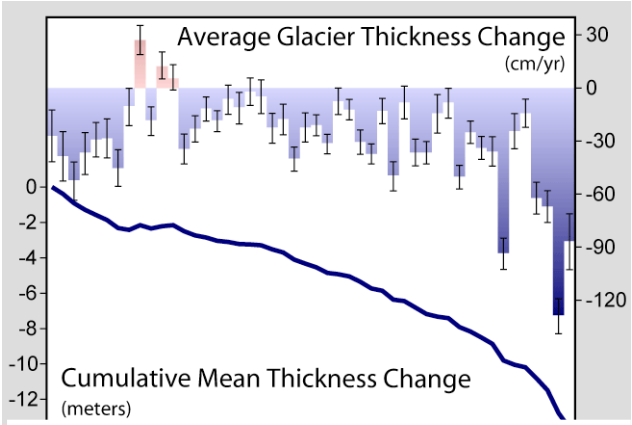
The biggest way we create carbon dioxide is by burning **fossil fuels** to make energy to run our cars, light our homes, charge our phones, etc. The level of CO_2 is measured in parts per million (ppm), or how many CO_2 molecules there are in a sample of one million molecules of air. Looking back 400,000 years, the levels never went above 300 ppm. Today they are at 403.28 ppm (Global Climate Change, n.d.).

Fossil Fuel Electricity Generation plant

Fossil fuels – fossil fuels are things like coal, oil, and natural gas that are formed from long-dead plants, animals and other organisms over millions of years.
Atmosphere – the layer of gases surrounding the planet.
Greenhouse gases – gases in the atmosphere that absorb heat from the Earth, keeping it warm.

Why are we so concerned about 1.4°F?

As we increase the temperature on Earth, we start to melt the ice at the poles (poor Santa). There is so much water trapped there, that when the ice melts, it causes sea levels to rise and extreme weather events like hurricanes and tornadoes (Shaftel, 2016) to occur. Also, when the ice melts, many animals lose their homes and can die.



This graph shows how the polar ice has been melting since 1960. Photo Credit - Robert A. Rohde

What can we do to help?

Some of the things we can do to help include:

- Using energy-efficient light bulbs.
- Carpooling and using public transportation or walking.
- Turning down our air conditioner in the summer and furnace in the winter.
- Using green energy sources like wind and solar power to create electricity.

As Jimmy Kimmel put it, “You know how you know that climate change is real? When the hottest year on record is whatever year it currently is.”

Reading Comprehension Questions

1. What is climate?
2. What is the greenhouse effect? Why is it important? How are we changing it?
3. What are some of the things that could happen due to global warming?

Watch the following video to answer questions 4-6. The video can be found by accessing the following URL or QR code:

https://goo.gl/HfjFYl

4. If the world's temperature increased by 1 degree, what would happen to the amount of fresh water?
5. How much sea ice has disappeared in the last 30 years?
6. By 2100, how high could sea levels rise and what TWO main consequences could that have?

Extension Questions

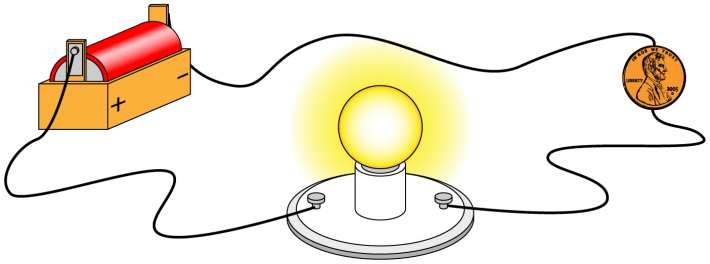
7. What do you think will happen if we do nothing about our climate change?
8. What part of your daily routine can be changed to help the climate change crisis? Provide at least 5 things YOU can do to help.
9. Create a short (1-2 minute) video about the severity of climate change to be shown to a grade 1 class. Your language and presentation must be at a level your audience can understand. Your video should provide information on what is happening as well as ways everyone can help.

Name: _____

Conductors and Insulators

A **conductor** is a material that allows electricity to flow through it.
An **insulator** is a material that electricity cannot flow through.

To determine whether an object is a conductor or insulator, you can build a simple circuit with a battery, light bulb, and three pieces of wire.



Touch the free ends of the wire to the object you are testing. If the light bulb lights up, the object is made from a conductor. if it does not, the object is made from an insulator.

Complete the table. Predict whether each item is made from a material that is a conductor or insulator. Then test each item to determine if it is made from a conductor or insulator.

Object	Prediction: Conductor or Insulator?	Result: Conductor or Insulator?
rubber band		
penny		
nickel		
toothpick		
key		
paper clip		
brass paper fastener		
glass microscope slide		
(your choice)		
(your choice)		