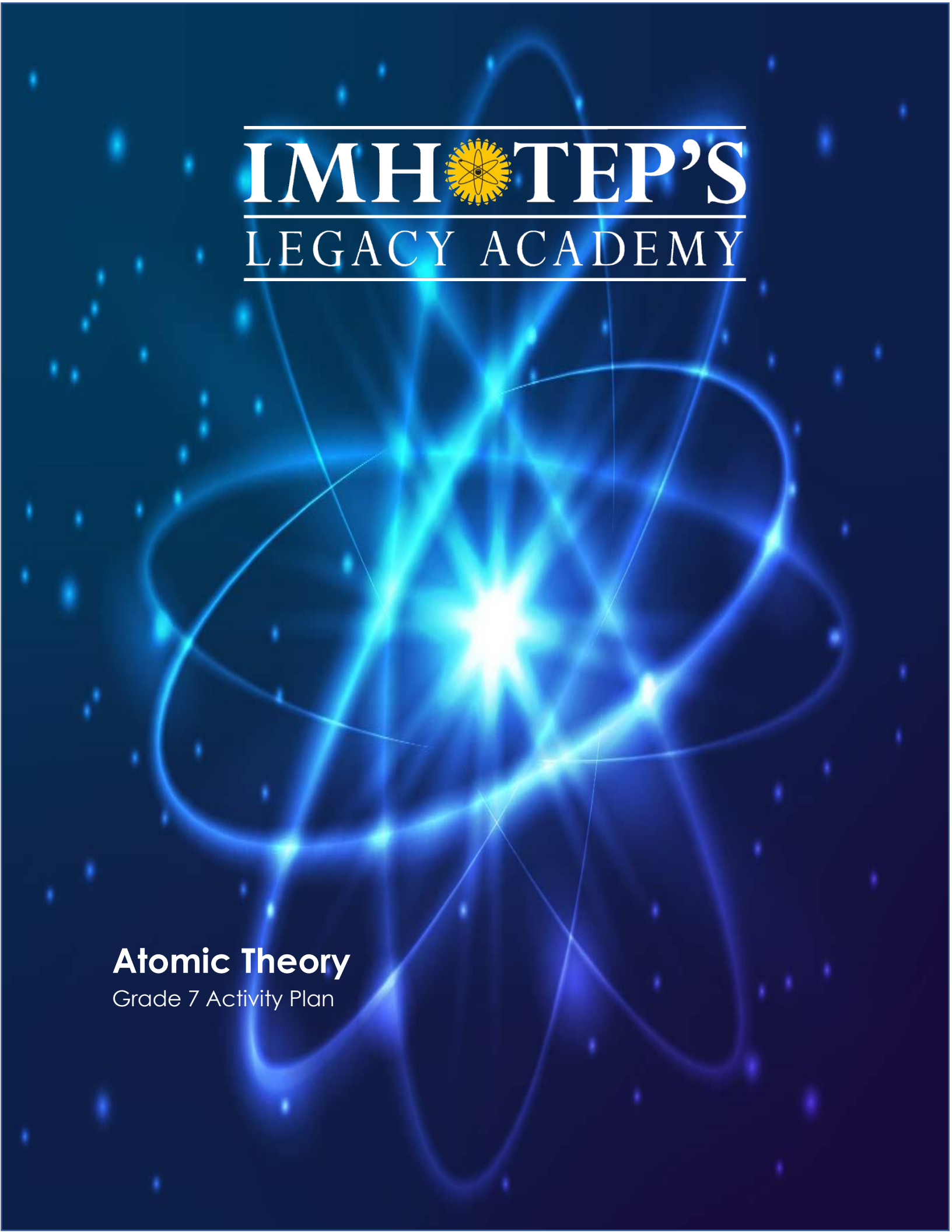


Atomic Theory

Grade 7 Activity Plan

Reviews and Updates

Activity	Revision	Author	Date
Activity Plan Created		Jeffrey Lyn	May 22h, 2019

Atomic Theory

Objectives:

1. To learn about subatomic the particles: protons, neutrons and electrons
2. To learn about the history of atomic theory.
3. To understand the structure of molecules.

Keywords/concepts: Electrons, Protons, Neutrons, Isotopes

Take-home product: Element Molecule, Atomic Balloon

Curriculum Outcomes:

Grade Seven: (307-14, 208-7)

Segment	Details
African Proverb Cultural Icon (10 min.)	A flea can trouble a lion more than a lion can trouble a flea. **George Carruthers**
Pre-test (5 min.)	Explain to students that everything is made up of molecules. Explain how these molecules are composed of atoms and even these atoms are composed of subatomic particles known as protons, neutrons and electrons.
Activity One (10 min)	Electron Orbit.
Activity Two (35 min.)	Atomic Structure
Activity Three (35min.)	Isotopes
Activity Four (25 min.)	Atomic Theory Advancement
Post-test (5 min.)	Atomic word search
Take-home Project	Ping Pong Ball Molecule

Suggested Interpretation of the proverb

Never underestimate issues regardless of how small they are.

George Carruthers

George Robert Carruthers (born October 1, 1939) is an award-winning African American inventor, physicist, and space scientist. Carruthers invented the ultraviolet camera/spectrograph for NASA to use when it launched Apollo 16 in 1972. His work also demonstrated that molecular hydrogen exists in the interstellar medium. In 2003, Carruthers was inducted into the National Inventor's Hall of Fame. He received an honorary doctorate for Engineering from Michigan Technological University.

Background Information

Electrons

An electron is a negatively charged subatomic particle. It can be either free (not attached to any atom) or bound to the nucleus of an atom. Electrons in atoms exist in spherical shells of various radii, representing energy levels. The larger the spherical shell, the higher the energy contained in the electron.

Neutrons

A neutron is a subatomic particle found in the nucleus of every atom except that of simple hydrogen. The particle derives its name from the fact that it has no electrical charge; it is neutral.

Protons

A proton is a subatomic particle found in the nucleus of every atom. The particle has a positive electrical charge, equal and opposite to that of the electron.

Isotopes and Isomers

Isotopes are two atoms with the same number of protons, but a different number of neutrons. Because they have the same number of protons, they are atoms of the same element, but with different masses. For example, most carbon is C-12 (with 6 protons and 6 neutrons); the radioactive isotope used for carbon dating is C-14 (with 6 protons and 8 neutrons).

Isomers are two molecules with the same atoms joined together in a different shape. For example, butane is C4H10, with the four carbon atoms joined in a straight chain; methylpropane is also C4H10, but with the carbon atoms joined in a T shape.

Bohr Model

The Bohr Model has an atom consisting of a small, positively charged nucleus orbited by negatively charged electrons.

Activity One: Electron Orbit

Items	**Quantity (10 students)**
AA battery	10
Foil	1 roll
Disk Magnets	60 quarter sized 60 dimes sized
Markers	10

Procedure:

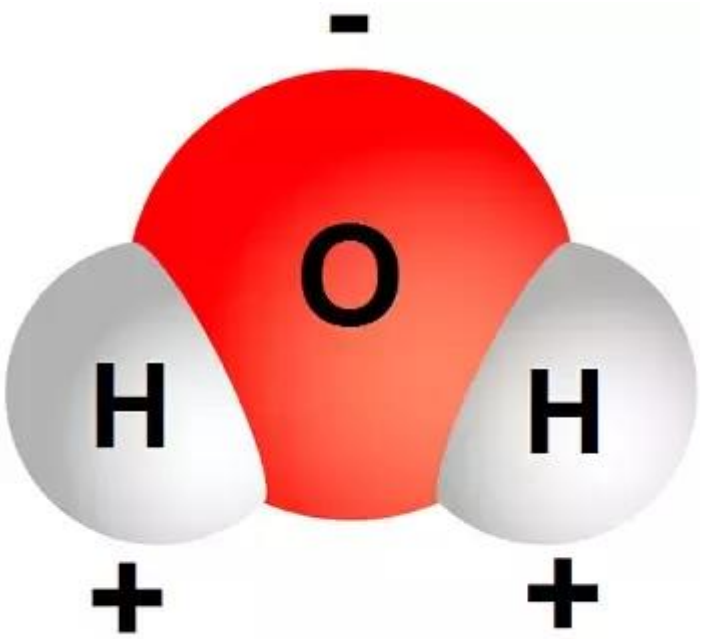
1) Tear a 4 sheets of foil paper of dimension 12'' long x 12'' wide. Arrange the sheets to form a large square.

2) Draw the nucleus of the element Lithium in the center of the foil sheet. Mark 3 distances of A, B, C from the center of the nucleus at intervals of approximately 6 inches.

3) Put a large magnet (approximately the size of a quarter) at the negative terminal of the battery and a small magnet (approximately the size of a dime) at the positive terminal of the magnet. Place each magnet and battery object at one of the previously marked distances and allow them to revolve around the nucleus.

4) This orbiting is known as the Bhor model of atomic theory. This structure illustrates how this model believes that electrons revolve around the nucleus.

Activity Two: Molecular Structure



Item	**Quantity (10 students)**
Ping Pong Balls (White/clear)	30
LEDS	30 LEDS; 20-Blue, 10-Red
Hot glue	5 sticks
Hot glue gun	5
Electrical tape	1 roll
Scissors/ saw/ box cutter	10
Markers	10
Play dough	I tub
9v battery	10
Alligator wires	20
Sandpaper	10 sheets

Procedure:

1. Cut 3 ping pong balls in half and use the sandpaper to ensure that each half is smooth and mostly free of jagged edges. Cut 8, 2-inch pieces of copper wire.

2. Bend the LEDs so that they from a straight line. Tape/ solder the copper wire to each lead of the all the LEDS.

3. Bend the shorter lead of each LED so that it forms a small hoop at the end of the lead.

4. Hot glue each LED on one half a ping pong ball so that it spans the full circumference of the ball but also has approximately 4 cm of excess lead. Repeat this process for the remaining 2 LEDS.

5. Hot glue the other half of each ball so that it becomes a whole ball again with the leads sticking out.

6. Make small ball of playdough approximately the size of a quarter and stick the long lead of a ball with a blue LED into it. Place the long lead of the red led to the hoop of the red LED.

7. Place the long lead of the last LED into the hoop of the red LED.

8. Attach one of the alligator clips to the final copper wire and with the same wire clip it to the positive terminal of the 9-V battery. Attach the other alligator clip to the only exposed lead left.

9. Stick the coper wire attached to the positive terminal into the playdough and observe what occurs.

10. Write “H” on both blue LEDS and “O” on the red LED. The result is a water molecule.

Activity Three: Isotopes

Item	Quantity (10 students)
Liquid A	1L
Liquid B	1L
Liquid C	1L
Hot Gun	1
Elastic Sheet	1
Bucket	20
Pipet	10
Ping Pong Balls	35
Ruler	10
Nail	5

Procedure:

1. Make a single hole in the ping pong ball so that it is the only point of entry. Repeat this for the remaining two balls.

2. Use the pipet to fill each ball with a different liquid until full. Seal each of the balls with hot glue.

3. Stretch the elastic fabric across two level surfaces so that it is tight but can stretch if a force is applied. Drop one of the balls into the center.

4. Measure the distance the ball drops from the top. Repeat this process for the remaining two balls.

5. Observe that despite being filled with the same amount of liquid some drop further. This will demonstrate that despite being the same element some clearly weights more which is the exact principle as an isotope.

Activity Four: Advancement of Atomic Theory

Items	Quantity (10 students)
Large Balloons	11
Scissors	5
Popcorn Kernels	1 box
White printer paper	12 sheets
Markers/pencils	10
Clear tape	I roll
Flashlight	5
Black Light	1

Procedure:

1. Cut out eight circles of white paper approximately the size of a quarter and eight the size of a dime. Randomly and lightly draw a positive or minus sign on each of the quarter sized ones and only negative signs on the dime sized circles.

2. Hot glue popcorn kernels in the center of one of the circles. Blow up the balloon to near maximum capacity for best performance and divide it in half vertically with a marker.

3. Tape the circle with the kernels to the center of one half of the balloon. Tape the remaining quarter sized circles around this circle on the same half of the balloon. Tape the dime sized circles in a circle around the center.

4. Splatter lightly tonic water on the balloon on the drawn line separating the two halves of the balloon and the previously cut out circles.

5. The balloon can now demonstrate the entire history of atomic theory.

1. Dalton: If viewed from the side with no circles it can represent Daltons theory of all things are made up of a uniform element.

2. Thompson: If held up to the light with the cut-out circles facing the light one can see the cut-out circles and their charges. This illustrates Thompsons belief that all elements are composed of just positive and negative charges.

3. Rutherford: If a flashlight is shone on the center of the circle with the kernels one will be able to view the kernels in the enter with the smaller dime sized circles around it. This demonstrates Rutherford's theory of having a nucleus that is exclusively positively charged represented by the kernels and the outside electrons being negatively charged.

4. Electron Cloud: Expose the balloon to a blacklight. One should view a dense "cloud" of droplets around the half boundary and the center of the balloon. Electrons are no longer depicted as particles moving around a central nucleus in a fixed orbit. Instead, Schrodinger proposed a model whereby scientists could only make educated guesses as to the positions of electrons. Hence, their locations could only be described as being part of a 'cloud' around the nucleus where the electrons are likely to be found

Post Work: Atomic Word Search

Print off the Word search worksheet on the following page.

Y	C	Y	P	u	B	N	M	G	V	L	T	E	A	L
u	J	B	P	B	G	M	B	N	S	Y	A	P	A	A
N	T	N	E	M	E	C	A	L	P	S	I	D	T	Z
F	u	E	X	A	H	V	D	A	D	D	P	Q	R	P
N	K	B	Q	J	K	X	C	Z	I	W	M	u	I	Y
G	O	F	K	W	D	E	L	W	M	C	N	B	A	V
H	L	W	L	S	L	D	R	A	E	X	L	X	N	F
L	I	F	W	u	J	Y	L	E	N	X	Y	G	G	J
R	u	F	H	K	Y	u	S	R	S	Q	Y	R	L	A
B	J	u	K	D	M	P	X	A	I	V	A	A	E	Z
V	P	S	F	R	H	L	P	O	O	E	P	Q	Z	Z
W	R	X	O	E	F	L	R	L	N	R	J	L	M	I
O	S	F	R	D	B	C	u	B	E	G	u	M	A	P
Z	Y	E	C	H	J	M	J	I	u	C	L	Q	T	Q
Y	Q	G	Y	V	E	R	L	N	R	R	O	O	W	V

AREA
VOLUME
CUBE
SPHERE
FORMULA
DISPLACEMENT
PIZZA
TRIANGLE
BEAKER
DIMENSION

Materials List:

Below is a list of materials that are not common and required special purchase:

1. Elastic Cloth: $20CAD for 5ft

https://fabricville.com/en/organic-cotton-lycra-solid-knit-brown.html