Chemistry AR+ Activity - Student Handout

Exploring The Atom

Is this activity you will use the iOS app Chemistry AR+ to learn about atomic structure. You can download the app from App Store at the following link: click here. Or search for Chemistry AR+ if you are using the App Store app on your mobile device.

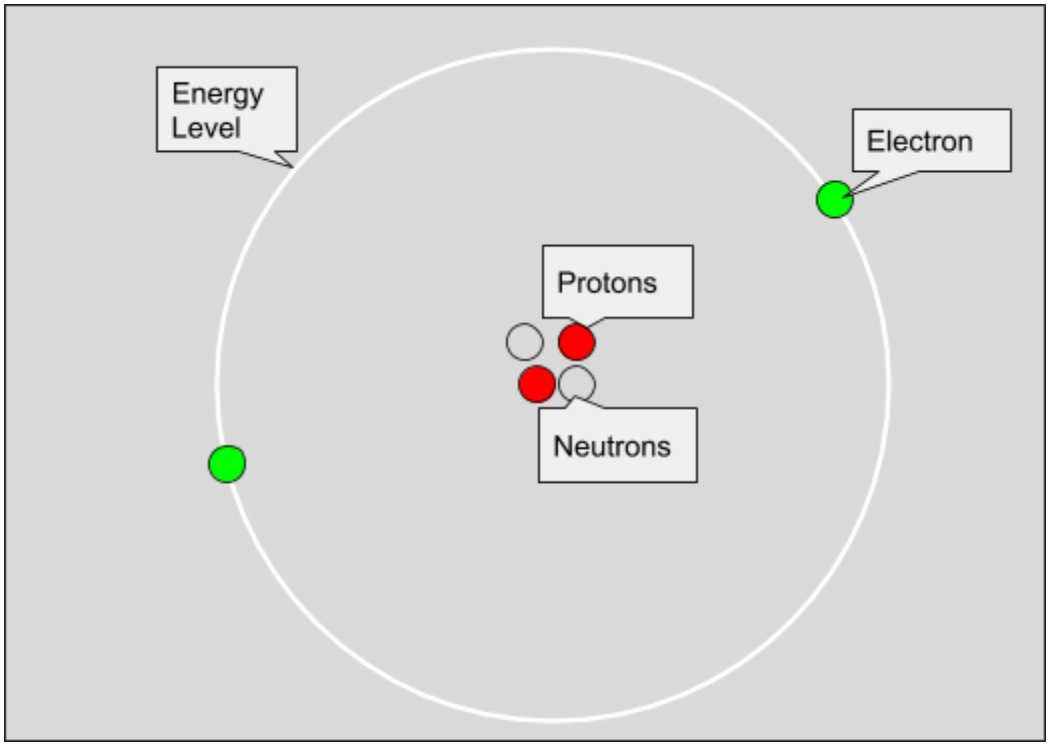
Important things to know while using the app and viewing the models of the atom:

Once a model loads in the app, you have the option to walk around it if you do not touch the screen.

Please be aware of your surroundings if you use the app in this manner. It is easy to lose track of where you are if you are not careful.

You can use your fingers and pinch motions to manipulate the model around. If you touch the screen and move the model around you can no longer walk around it.

Information On Atomic Models In The App



Periodic Table of the Elements

1 H Hydrogen 1.008																1 H Hydrogen 1.008	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Berylium 9.012											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
11 Na Sodium 22.99	12 Mg Magnesium 24.31											13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.87	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.64	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Ytterbium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.1	45 Rh Rhodium 102.9	46 Pd Palladium 106.4	47 Ag Silver 107.9	48 Cd Cadmium 112.4	49 In Indium 114.8	50 Sn Tin 118.7	51 Sb Antimony 121.8	52 Te Tellurium 127.6	53 I Iodine 126.9	54 Xe Xenon 131.3
55 Cs Cesium 132.9	56 Ba Barium 137.3	57 La Lanthanum 138.9	72 Hf Hafnium 178.5	73 Ta Tantalum 180.9	74 W Tungsten 183.8	75 Re Rhenium 186.2	76 Os Osmium 190.2	77 Ir Iridium 192.2	78 Pt Platinum 195.1	79 Au Gold 197.0	80 Hg Mercury 200.6	81 Tl Thallium 204.4	82 Pb Lead 207.2	83 Bi Bismuth 209.0	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (277)	109 Mt Meitnerium (268)	110 Ds Darmstadtium (281)	111 Rg Roentgenium (272)	112 Cn Copernicium (285)	113 Uut Ununtrium (284)	114 Fl Flerovium (289)	115 Uup Ununpentium (288)	116 Lv Livermorium (293)	117 Uus Ununseptium (294)	118 Uuo Ununoctium (294)

58 Ce Cerium 140.1	59 Pr Praseodymium 140.9	60 Nd Neodymium 144.2	61 Pm Promethium (145)	62 Sm Samarium 150.4	63 Eu Europium 152.0	64 Gd Gadolinium 157.3	65 Tb Terbium 158.9	66 Dy Dysprosium 162.5	67 Ho Holmium 164.9	68 Er Erbium 167.3	69 Tm Thulium 168.9	70 Yb Ytterbium 173.0	71 Lu Lutetium 175.0
90 Th Thorium 232.0	91 Pa Protactinium 231.0	92 U Uranium 238.0	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)

Activity

1) Start the Chemistry AR+ App on your device.
2) Click the atom viewer tab on the main menu of the app.
3) Select Hydrogen and view the model.

Use the app to determine how many electrons the hydrogen atom has. The electrons are green in color.

Information: In the center of the model is a place called the nucleus of the atom. The nucleus is the place where particles called protons and neutrons are found. In this app the protons are **red** in color and the neutrons are **white** in color.

Question: How many protons and neutrons can be found in the nucleus of Hydrogen?

Information: The electrons found in the outermost energy level (furthest away from the nucleus) are called ***valence electrons***. These electrons are involved when the atom shares electrons with another atom to form a chemical bond. These electrons are also used when an atom reacts with other atoms in a chemical reaction.

Question: How many valence electrons does Hydrogen have?

Now return to the atom viewer menu and select Helium from the menu.

Question: How many protons and neutrons does Helium have?

Question: How many valence electrons does Helium have?

Now return to the atom viewer menu and select Lithium from the menu.

Question: How many protons and neutrons does Lithium have?

Question: How many electrons does Lithium have in total?

Question: What do you notice about the number of energy levels in Lithium compared to the first two elements you examined.

Question: How many valence electrons does Beryllium have? (remember these are just the electrons on the outermost energy level).

Question: So far we have examined Hydrogen, Helium and Lithium. What do you notice about the relative number of protons and the total number of electrons for each atom?

Now return to the atom viewer and view the following atoms in this order: Boron, Carbon, Nitrogen, Oxygen and Fluorine.

As you examine each model make a note of the number of protons and electrons in each model and place your answers in the following table:

Element	Lithium	Beryllium	Boron	Carbon	Nitrogen	Oxygen	Fluorine	Neon
# of Protons								
# electrons								
# of valence electrons								

Question: Now you have filled out all of the cells in the table. Has your observation of the number of protons and the number of electrons changed?

Take a look at the periodic table and find sodium. Then load the Sodium atom into your viewer on the app.

Question: What do you notice about the number of energy levels now?

Question: How many valence electrons does Sodium have?

Activity

Go through all of the elements in the third row of the periodic table and fill in the values in the following table.

Element	Sodium	Magnesium	Aluminum	Silicon	Phosphorus	Sulfur	Chlorine	Argon
# of Protons								
# electrons								
# of valence electrons								

<u>Thinking It Through</u>

Using your answers so far, or by using the app, answer the following questions:

1) What is the maximum amount of valence electrons that the first energy level can hold?

2) What is the maximum amount of valence electrons that the second and third energy levels can hold?

Information

The relative charge of an electron is -1, the charge on a proton is +1 and the charge on a neutron is 0.

3) Given the information provided above, what does that mean the overall charge is on an atom for each of the models that you viewed in the app?

Activity Extension

To end this activity you could do the following extensions.

1) Use the blank periodic table to indicate the number of protons, neutrons and electrons for each element and research the symbol for each element and include that as well.

2) Use the blank periodic table to write in the number of valence electrons for each element for the first three rows of the table. Use your work to discover any underlying patterns in the periodic table.