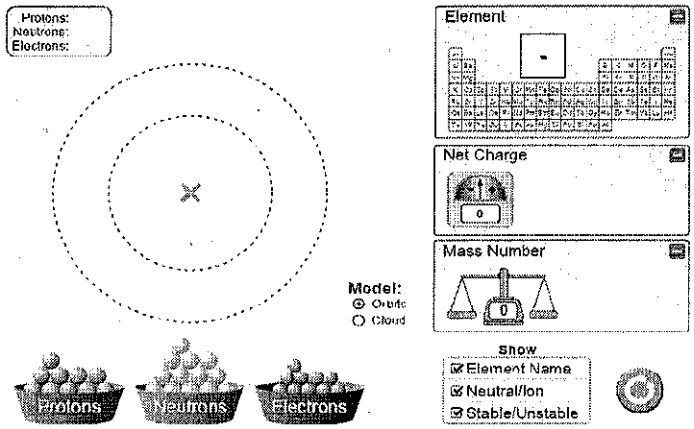
Name Key Date Period

https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_en.html

For use with HTML 5 (Chromebooks or Tablets)

Build An Atom WebLab PhET

Choose <ATOM> Set up your options with check marks to show: orbits, element name, neutral/ion and stable/unstable



Part 1: Investigating Elements Names

Procedure:

1. Build an atom with 1 proton and 1 electron and fill in the chart below
2. Build an atom with 1 protons and 0 electrons and fill in the chart below
3. Build an atom with 1 protons and 2 electrons and fill in the chart below
4. If the name of your element did not change, try adding different types of particles until your get a new element.

Element Symbol	#Protons	#Neutrons	#Electrons	Net Charge	-ion, +ion or neutral	Stable or Unstable	Mass Number
H	1	0	1	0	N	S	1
H	1	0	0	+1	+	S	1
H	1	0	2	-1	-	S	1

Questions:

1. In trials #1-3, did changing the number of electrons change the name of the element? If not, what did it change? no, it only changes net charge on neutral/(+)/(-).

2. What particle must you change in order to change the name of the element?

Protons

Part 2: Investigating Mass

Procedure:

1. Create neutral & stable hydrogen with a mass of 2. Fill in the chart below
2. Create neutral & stable helium with one neutron and a mass of 3. Fill in the chart below
3. Add one neutron to the helium. Fill in the chart below
4. Create neutral & stable lithium with 3 neutrons. Fill in the chart below
5. Add one neutron to the lithium. Fill in the chart below
6. Vary the number of electrons and notice any change in mass

Element Symbol	#Protons	#Neutrons	#Electrons	Net Charge	-ion, +ion or neutral	Stable or Unstable	Mass Number
H	1	1	1	0	N	S	2
He	2	1	2	0	N	S	3
He	2	2	2	0	N	S	4
Li	3	3	3	0	N	S	6
Li	3	4	3	0	N	S	7

Questions:

1. To go from Hydrogen (Trial #1) to Helium (Trial #2) to Lithium (Trial #4), what particle did you have to change? Hint: Recall that in trials #3-Helium and #4-Lithium you still had 3 neutrons!
   Protons
2. When you changed this particle, what was the effect on the mass of the atom?
   adding 1 proton increased mass by 1
3. When you increased the number of neutrons by one in Trials #3 & #5, what happens to the mass number? went up by 1
4. What is the likely mass of a single proton? 1 neutron? 1
5. Does adding or removing extra electrons have any effect on the mass? Explain why or why not:
   no - they are too small

Part 3: Investigating Charge

1. Before you begin - Define the scientific or mathematical meaning of:
   a. Ion b. Net c. Charge

2. Complete the sentence using the terms above: When a neutral atom gains or loses electrons, it is called a(n) ion and it's net charge DOES NOT equal zero.

Procedure:

1. Create neutral & stable hydrogen with a mass of 1 (no neutrons). Fill in the chart below
2. Add one extra electron to the hydrogen. Fill in the chart below
3. Take away two electrons (you now have 0 electrons). Fill in the chart below

Element Symbol	#Protons	#Neutrons	#Electrons	Net Charge	-ion, +ion or neutral	Stable or Unstable	Mass Number
H	1	0	1	0	N	S	1
H	1	0	2	-1	-	S	1
H	1	0	0	+1	+	S	1

Questions:

1. To create a neutral atom, what must be true about
   a. The protons? Same # as electrons
   b. The electrons? same # as protons
   c. The net charge? ∅
2. To create a (+) ion, what must be true about
   a. The protons? more than # electrons
   b. The electrons? fewer than # protons
   c. The net charge? +
3. To create a (-) ion, what must be true about
   a. The protons? fewer than # electrons
   b. The electrons? more than # protons
   c. The net charge? -

Part 4: Investigating Stability of Isotopes

For the nucleus to stay together, it must have neutral charges to separate protons from each other and from ~~neutrons~~ electrons. An unstable nucleus will break apart into more stable pieces in a process known as radioactive decay. In this part, you will be building different isotopes for the same element. Before you begin, look up the scientific meaning of:

a. isotope b. radioactivity c. nucleus

Procedure:

1. Create the heaviest, largest stable, neutral atom possible! Fill in the chart
2. Make the same atom UNSTABLE by removing particles without changing the number of protons. Fill in the chart 3
3. Try making it unstable by adding particles without changing the number of protons. Fill in the chart

Return to conditions in #10

Element Symbol	#Protons	#Neutrons	#Electrons	Net Charge	-ion, +ion or neutral	Stable or Unstable	Mass Number
Ne	10	12	10	0	N	S	22
Ne	10	9	10	0	N	U	19
Ne	10	13	10	0	N		23

Questions:

1. What particle did you add or remove to change the atom from stable to unstable?

Neutrons

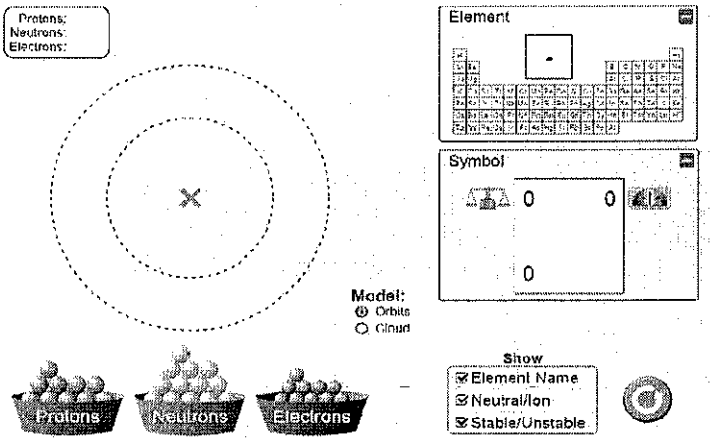
2. Is the mass of the stable atom the same as the mass of the unstable atom? Explain

no, the unstable ones had more or less mass.

3. NUCLEUS or ORBITS What part of the atom is affected by the addition or removal of neutrons? (Circle one)

Choose <SYMBOL> Set up your options with check marks to show: orbits, element name, neutral/ion and stable/unstable

The nuclear symbol is a short cut method of showing some of the things you've investigated so far.



1. Build a Fluorine atom that is neutral and stable
2. Play around with adding and removing neutrons and notice how the top left number changes
3. Play around with adding and removing electrons and notice how the top right number changes.
4. Add and remove protons and notice all the changes to the symbol
5. On the sample below, explain what each number represents:

Mass # 22 +2 Net Charge

F Symbol

Protons 9

If time allows:

Choose <Game> and play each of the games