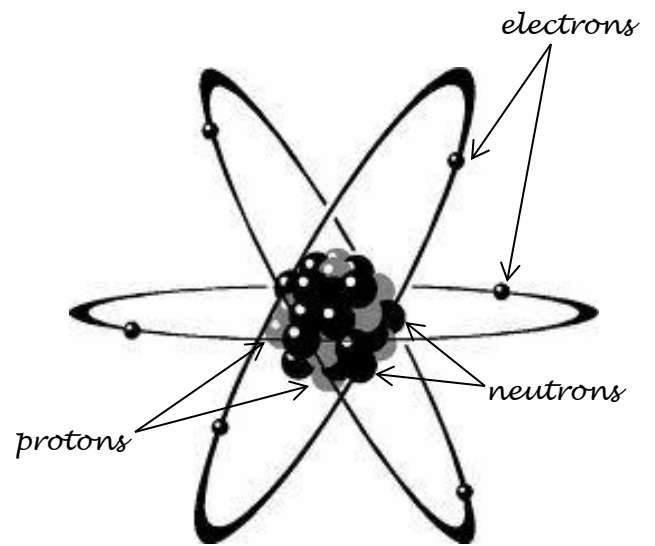


<h1>The Atom</h1>	<h1>Subatomic Particles</h1>		
<p>The atom defined: <i>the smallest particle of an element that retains the properties of that element</i></p> <p>The development of modern atomic theory began with the work of <i>John Dalton</i> in the 19th century. While his theory has since been revised, several points persist in modern atomic theory:</p> <ol style="list-style-type: none"> ① All matter is <i>composed of atoms</i>. ② Atoms of a specific element are <i>different</i> from those of other <i>elements</i>. ③ Atoms cannot be <i>created or destroyed</i>. ④ Different atoms combine in simple whole-number <i>ratios</i> to form <i>compounds</i>. ⑤ In a chemical reaction, atoms are <i>separated, combined, or rearranged</i>. <p>Atoms are <i>submicroscopic</i> matter and can only be viewed with a <i>scanning tunneling microscope</i> (STM). How small is an atom?</p> <p>World population (2012) 7,000,000,000</p> <p>Cu atoms in penny 29,000,000,000,000,000,000,000</p> <p>Experiments with cathode rays detected <i>negative</i> particles that are part of all matter. In the 1890s, <i>J.J. Thomson</i> determined the charge-to-mass ratio of this particle and identified the <i>electron</i>.</p> <p>In his Oil Drop Experiment (1909), <i>Milliken</i> calculated the <i>charge</i> of the electron and its <i>mass</i>, using the known charge-to-mass ratio.</p> <p><i>Ernest Rutherford</i> conducted his Gold Foil Experiment in 1911 and developed <i>nuclear</i> atomic model. His results showed that an atom consists of:</p> <ul style="list-style-type: none"> • The <i>nucleus</i>: a tiny, dense, center region containing all the atom's <i>positive</i> charge and virtually all of its <i>mass</i>. • The <i>electron cloud</i>: mostly <i>empty space</i> through which electrons rapidly move while held within the atom by their <i>attraction to the nucleus</i>. <p>In 1920, Rutherford identified the positively charged particle in the nucleus called the <i>proton</i>.</p> <p><i>James Chadwick</i> identified the third subatomic particle, the <i>neutron</i>, in 1932.</p>	<h2>The Electron</h2>		
	Symbol	<i>e⁻</i>	
	Charge	<i>1-</i>	
	Location	<i>empty space outside nucleus</i>	
	Actual Mass (g)	<i>9.11 × 10⁻²⁸ g</i>	
	Relative Mass (amu)	<i>1/1840 amu</i>	
	Discovered or identified by	<i>J.J. Thomson</i>	
	<h2>The Proton</h2>		
	Symbol	<i>p or p⁺</i>	
	Charge	<i>1+</i>	
	Location	<i>nucleus</i>	
	Actual Mass (g)	<i>1.673 × 10⁻²⁴ g</i>	
	Relative Mass (amu)	<i>1 amu</i>	
	Discovered or identified by	<i>Ernest Rutherford</i>	
	<h2>The Neutron</h2>		
	Symbol	<i>n or n⁰</i>	
	Charge	<i>0</i>	
	Location	<i>nucleus</i>	
	Actual Mass (g)	<i>1.675 × 10⁻²⁴ g</i>	
Relative Mass (amu)	<i>1 amu</i>		
Discovered or identified by	<i>James Chadwick</i>		

Draw the atom as described by modern atomic theory.



In a well-developed paragraph, explain the atom as proposed by modern atomic theory. [Define the atom and discuss the three subatomic particles and their locations, charges, and masses.]