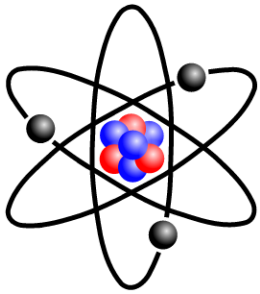
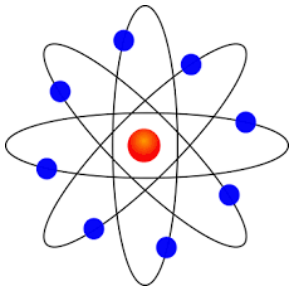
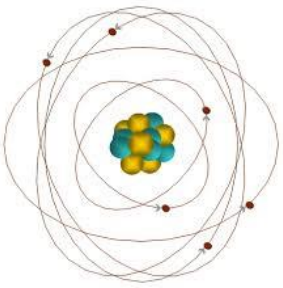
Name: _____ Pd: _____ Ast: _____

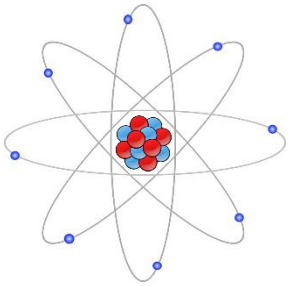
Atoms

I. Use the diagrams below to answer the following questions.

A. 

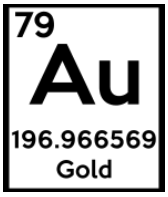
B. 

C. 

D. 

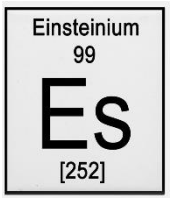
1) Which of the diagrams show electrons orbiting a nucleus? ***ALL***
2) Which of the diagrams does not show neutrons as part of the atom? ***B***
3) Which of the diagrams does the best job of communicating the relative size/mass of electrons? ***C (ALL)***
4) Which of the diagrams does the best job of showing the concept of energy levels within the electron cloud? ***C***
5) Which of the diagrams misrepresent the relative size of the nucleus compared to the electron cloud? ***ALL***

II. Use the information about each element below to answer the following questions.



6) What is gold's atomic number? ***79***
7) How many protons are in a gold atom? ***79***
8) What is the atomic mass of gold? ***196.97***
9) How many sub-atomic particles are in the nucleus of the average gold atom? ***197***
10) Most gold atoms have 118 neutrons, some have 117. What is the term for these two types of gold atoms? ***ISOTOPES***

11) How many protons are in a chlorine atom? ***17***
12) Chlorine's atomic mass is 35.453, what does this mean? ***Chlorine atoms have an average of 35.453 particles in the nucleus (17 protons & 18-19 neutrons)***
13) How many electrons would be in a neutral atom of chlorine? ***17***
14) Chlorine often takes in an extra electron. What kind of atom does it become when this happens? ***It would become an ION (charged atom) with a charge of -1***



15) For Einsteinium, identify the:
    a. Atomic Number – ***99***
    b. Atomic Mass – ***252***

III. Identify the correct word for each definition

16) ***ELEMENT*** - a substance made of only one kind of atom
17) ***ION*** - an atom that has a charge because it has gained or lost electrons
18) ***NUCLEUS*** - the region at the center of an atom that contains most of the mass of the atom
19) ***ATOMIC NUMBER*** - the number of protons in the nucleus of an atom of an element
20) ***ISOTOPES*** - atoms of the same element with different numbers of neutrons

21) ***PROTON*** - a positively charged (+) particle in the nucleus of an atom

22) ***ELECTRON*** - a negatively charged (-) particle that occupies the space outside the nucleus

23) ***NEUTRON*** - an uncharged (Ø) particle in the nucleus of an atom

24) ***ELECTRON CLOUD*** - the region surrounding an atom's nucleus where electrons orbit

IV. Provide a short response for the following questions.

25) Where did the modern word, "atom", come from?
Democritus used the latin word, "atomos", to describe the smallest particle of a substance. Atomos means, "uncuttable."

26) When J.J. Thomson put a magnet next to a cathode ray tube, how did it change the way we understand atoms?
The magnet caused the beam inside the cathode ray tube to bend. This showed that the beam was made of negatively charged particles, which caused the discovery of the electron as the first sub-atomic particle.

27) When Ernest Rutherford shot alpha particles at gold foil, what was the result and what did he conclude?
Most of the alpha particles shot right through the foil as expected, indicating that most of the atom is empty space. However, once in a while an alpha particle would deflect at an angle or even bounce back. Rutherford concluded that these alpha particles deflected because they had collided with a small, dense, positively charged nucleus.

28) Why was James Chadwick's discovery of the neutron so important in understanding atoms?
Before Chadwick's discovery, scientists observed the mass of atoms to be at least twice what they should have been based on the number of protons (remember, the mass of the electrons is so small it can be ignored). Chadwick suggested that this extra mass was the result of neutrons in the nucleus, which have a mass equal to that of a proton.

29) Why do we call the modern model of the atom the "electron cloud" model?
Scientists refer to the "electron cloud" because they cannot pinpoint the exact location of an electron at any given moment. The cloud represents a probability that an electron exists in a certain region of the atom.

30) If a sodium atom has 11 protons, 12 neutrons, and 10 electrons…
   a. What is its atomic number? ***11 (the number of protons)***
   b. What is its atomic mass? ***23 (the number of protons + neutrons)***
   c. Is it an ion? *If no, why not? If yes, what is its charge?* ***It is an ion, because it has an unequal number of protons and electrons. Because it has lost an electron, this sodium atom is an ion with a charge of +1.***