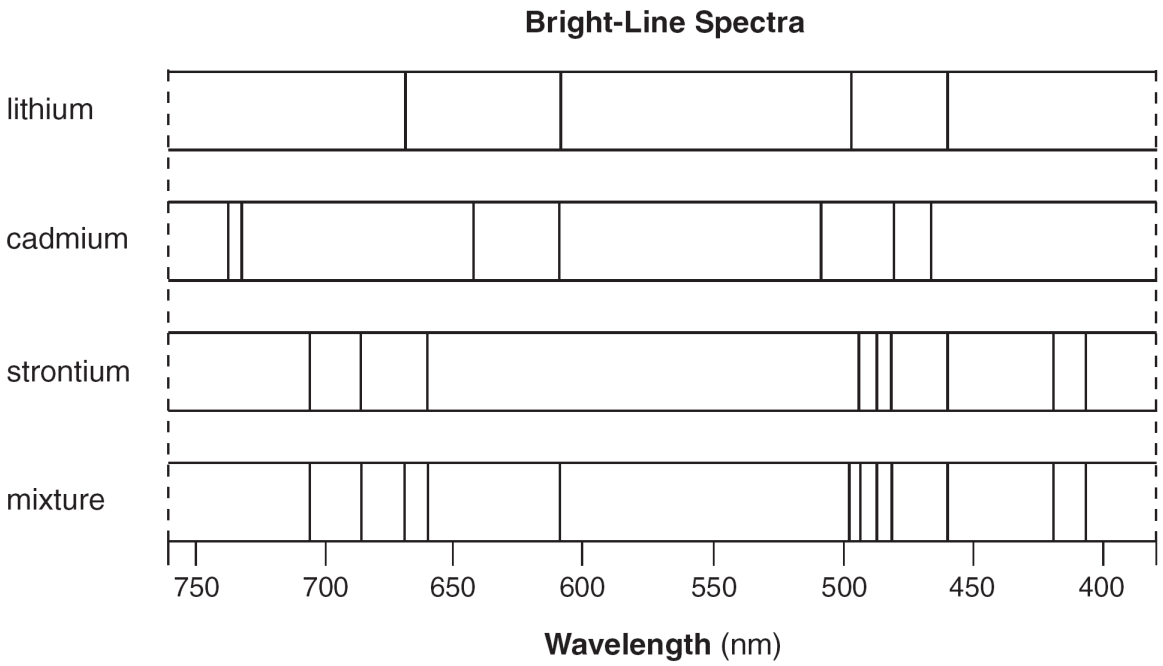
Name_____

First Quarter Review- Short Answer

Base your answers to questions **1** through **3** on the information below.
The bright-line spectra for three elements and a mixture of elements are shown below.



1. Explain, in terms of *both electrons and energy, how the bright-line spectrum of an element is produced.*

2. Identify *all the elements in the mixture.*

3. State the total number of valence electrons in a cadmium atom in the ground state.

Base your answers to questions **4** through **7** on
the reading passage below and on your knowledge of chemistry.

A Glow in the Dark, and Scientific Peril

The [Marie and Pierre] Curies set out to study radioactivity in 1898. Their first accomplishment was to show that radioactivity was a property of atoms themselves. Scientifically,that was the most important of their findings, because it helped other researchers refine their understanding of atomic structure. More famous was their discovery of polonium and radium. Radium was the most radioactive substance the Curies had encountered. Its radioactivity is due to the large size of the atom, which makes the nucleus unstable and prone to decay, usually to radon and then lead, by emitting particles and energy as it seeks a more stable configuration.Marie Curie struggled to purify radium for medical uses, including early radiation treat-ment for tumors. But radiums bluish glow caught peoples fancy, and companies in theUnited States began mining it and selling it as a novelty: for glow-in-the-dark light pulls, for instance, and bogus cure-all patent medicines that actually killed people.What makes radium so dangerous is that it forms chemical bonds in the same way as calcium, and the body can mistake it for calcium and absorb it into the bones. Then, it can bombard cells with radiation at close range, which may cause bone tumors or bone-marrow damage that can give rise to anemia or leukemia.

– Denise Grady, The New York Times, October 6, 1998

4. If a scientist purifies 1.0 gram of radium-226, how many years must pass before only 0.50 gram of the original radium-226 sample remains unchanged?

5. Using information from the Periodic Table, explain why radium forms chemical bonds in the same way as calcium does.

6. State one risk associated with the use of Radium.

7. Using Reference Table *IV*, complete the equation for the nuclear decay of $^{226}_{88}\mathrm{Ra}$. Include *both* atomic number and mass number for *each* particle.

8. Copper has two naturally occurring isotopes. Information about the two isotopes is shown in the table below.

Naturally Occurring Isotopes of Copper

Isotope	**Atomic Mass** (atomic mass units, u)	**Percent Natural Abundance** (%)
Cu-63	62.93	69.17
Cu-65	64.93	30.83

In the space *in your answer booklet*, show a numerical setup for calculating the atomic mass of copper.

Base your answers to questions **9** and **10** on the information below.

In 1897, J. J. Thomson demonstrated in an experiment that cathode rays were deflected by an electric field. This suggested that cathode rays were composed of negatively charged particles found in all atoms. Thomson concluded that the atom was a positively charged sphere of almost uniform density in which negatively charged particles were embedded. The total negative charge in the atom was balanced by the positive charge, making the atom electrically neutral.

In the early 1900s, Ernest Rutherford bombarded a very thin sheet of gold foil with alpha particles. After interpreting the results of the gold foil experiment, Rutherford proposed a more sophisticated model of the atom.

9. State *one* aspect of the modern model of the atom that agrees with a conclusion made by Thomson.

10. State *one* conclusion from Rutherford's experiment that contradicts one conclusion made by Thomson.

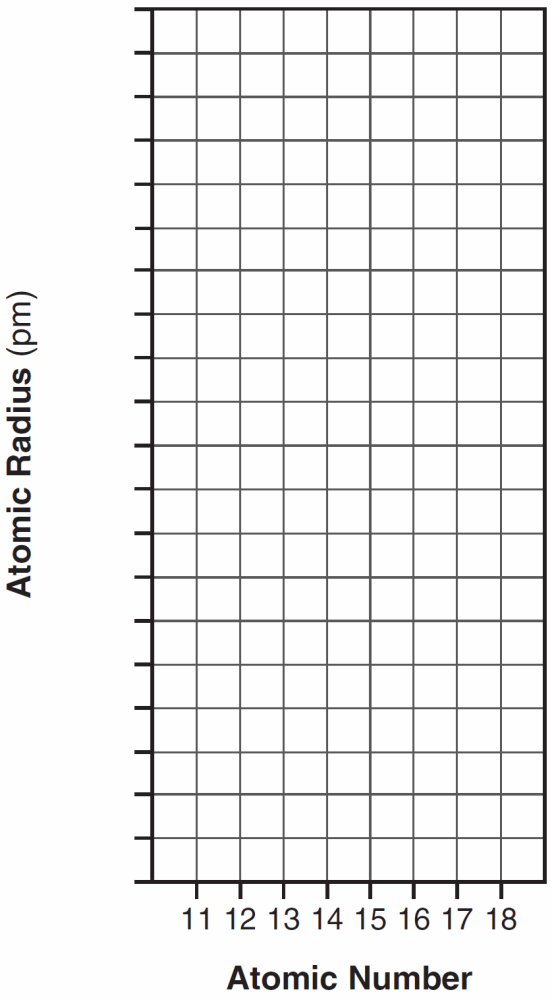
Base your answers to questions **11** and **12** on the information below.

The atomic number and corresponding atomic radius of the Period 3 elements are shown in the data table below.

Data Table

Atomic Number	Atomic Radius (pm)
11	160.
12	140.
13	124
14	114
15	109
16	104
17	100.
18	101

Atomic Radius Versus Atomic Number



11. State the general relationship between the atomic number and the atomic radius for the Period 3 elements.

12. Explain, in terms of electrons, the change in radius when a sodium atom becomes a sodium ion.

13. Explain, in terms of protons and neutrons, why U-235 and U-238 are different isotopes of uranium.