

## Chemistry Semester 1

### Essay Questions

1. What is ionization energy? How, and why, is it affected by atomic radius? Relate the trend in ionization energy down a group to the trend in atomic radius as atomic number increases down a group.
2. When Dmitri Mendeleev wrote the first periodic table, it did not include the Noble gases. In terms of electron configurations and bonding, explain why the Noble gases were not discovered until much later.
3. Oxygen is a gas at normal conditions. Scientists report that oxygen is the most common element in the earth's crust. The earth's crust is composed of solids and liquids. Explain this apparent contradiction.
4. Explain how a nuclear bomb is capable of releasing more than a million times the energy that is released by a conventional bomb of the same mass.
5. Explain why ionic compounds almost exclusively form between metals and nonmetals, rather than between nonmetals and nonmetals, or even between metals and other metals.
6. Two students are asked to draw Lewis structures for a compound containing two atoms of carbon, one atom of oxygen, and six atoms of hydrogen. They each produce a valid structure, but the structures are not alike. Explain how this is possible. Provide at least one of the valid structures in your response.
7. The equation for the formation of water,
$$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$$
shows two moles of hydrogen and one mole of oxygen (3 moles total) reacting to form only two moles of water. What happened to the missing mole? Did mass disappear in this reaction?
8. The halogens all form diatomic molecules rather than being stable as individual atoms. Draw a Lewis structure for a diatomic molecule of ANY one of the halogens. Explain why the individual atom of the halogen is not stable.
9. Density is a property of substances that cannot be measured directly. Explain how you would determine the density of an irregular solid in the laboratory. Include descriptions of both the experimental methods and the calculations required.
10. Explain how it is possible for two atoms of the same element to have different masses. Use the atoms carbon-12 and carbon-14 as your examples in explaining the different masses.