

HW 2. Chapter 2.

1. Define the following terms;(a) rare earth metals;(b) Van der Waals radius; (c) effective nuclear charge.
2. Define the following terms;(a) second, ionization energy; (b) electron affinity; (c) Bertrand's rule.
3. Why is iron the highest atomic number element formed in stellar processes?
4. Identify
 - (a) the highest atomic number element for which stable isotopes exist;
 - (b) the only transition metal for which no stable isotopes are known;
 - (c) the only liquid nonmetal at SATP (standard ambient temperature and pressure).
5. Identify the only two radioactive elements to exist in significant quantities on Earth. Explain why they are still present.
6. Suggest the number of neutrons in the most common isotope of calcium.
7. Suggest why polonium-210 and astatine-211 are the isotopes of those elements with the longest half-lives.
8. Which atom should have the larger covalent radius, potassium or calcium? Give your reasoning.
9. Suggest a reason why the covalent radius of germanium (122 pm) is almost the same as that of silicon (117 pm), even though germanium has 18 more electrons than silicon.
10. Using Slater's rules, calculate the effective nuclear charge on an electron in each of the orbitals in an atom of potassium.
11. Which element should have the higher ionization energy, silicon or phosphorus?
12. An element has the following first through fourth ionization energies in $\text{MJ}\cdot\text{mol}^{-1}$: 0.7, 1.5, 7.7, 10.5. Deduce to which group in the periodic table it probably belongs. Give your reasoning.
13. When element 117 is synthesized, what would you expect qualitatively in terms of its physical and chemical properties?