

1. Be able to draw and label the structure of an atom.
2. Be able to distinguish between endergonic & exergonic reactions as well as endothermic & exothermic reactions.
3. Be able to state what is represented by the columns and rows within the Periodic Table of the Elements. Be able to point out trends (e.g., number of valence electrons, electron shell being filled, atomic diameter, atomic number, atomic mass) that exist within columns and rows.
4. Be able to define isotope. Be capable of stating the similarities and differences between two isotopes of a given element.
5. Be able to distinguish between chemical reactions and nuclear reactions?
6. Be able to state which provides more energy, an exothermic chemical reaction or an exothermic nuclear reaction. Be able to justify your answer.
7. Be prepared to state the force that holds the nucleus of an atom together.
8. Be able to define nuclear fusion. Be prepared to state the point (chemical element) to which nuclear fusion is exothermic. Be able to explain why nuclear fusion requires such extremely high temperatures and pressures.
9. Be prepared to explain what is meant by beta decay. Be able to state what is ejected from the nucleus as well as what remains in the nucleus after beta decay. Be able to provide or recognize an example of beta decay.
10. Given its atomic mass, be prepared to state the number of protons, neutrons, and electrons that would be found within an atom of any given element.
11. In the core of massive stars, fusion can take place up until iron (atomic number = 26) is formed. Be prepared to explain how elements larger than iron (i.e., elements with more than 26 protons in their nuclei) are created.
12. Be able to explain why a nucleus that contains only two protons and nothing else is unstable and, thus, does not exist in nature. Note : the most common isotope of helium contains two protons and two neutrons in the nucleus. Be able to explain why one of these nuclei is stable but the other is not.
13. Be able to explain what is meant by the Doppler Effect as it applies to sound or light waves. Be able to explain the contribution of Edwin Hubble to the understanding that our universe is expanding. Be able to explain the contribution of Arno Penzias and Robert Wilson to the general scientific acceptance of the Big Bang theory.

14. Each element exhibits a unique atomic spectrum ... a spectral fingerprint that can be used to identify the existence of that element in a quantity of matter. Each emission line within this spectrum represents a particular frequency of light (a particular color). Be able to explain what gives rise to any one atomic spectral line.
15. Be able to list evidence that supports the existence of 'dark matter' in our Universe.
16. Be able to distinguish among the three types of interatomic (intramolecular) bonding (i.e., ionic bonding, metallic bonding, and covalent bonding). Be prepared to distinguish between the two types of intermolecular forces discussed in class, i.e., dipole-dipole interactions (hydrogen bonds) and van der Waals forces. Although we will discuss it again in a future unit, now would be a good time to get a handle on the concept of saturated fatty acids versus unsaturated fatty acids and cis- unsaturated fatty acids versus trans- unsaturated fatty acids.
17. Be able to explain, in terms of intermolecular attractions, why common cis- unsaturated fatty acids tend to be oily at room temperature whereas saturated fatty acids and trans unsaturated fatty acids tend to be solid at room temperature.
18. Be able to define electronegativity. Be prepared to state where (on The Periodic Table of the Elements) you would see the most (or the least) electronegative elements.
19. Be prepared to predict whether two atoms will interact via ionic, metallic, or covalent bonding. Be able to distinguish between polar and nonpolar covalent bonding. Be prepared to predict whether a covalent bond will be polar or nonpolar.
20. Be able to list five important properties of metals. Be prepared to define alloy and able to provide a brief explanation of why one might desire an alloy instead of a pure metal.
21. Be prepared to list properties of water that make it highly unusual. Be able to state the source of these unusual properties.