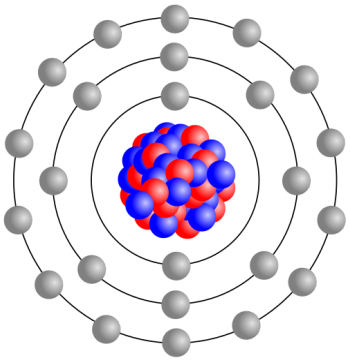
Name:_____Date:_____

Reading Guide: Chapter 2.1, The Chemical Foundation of Life (OpenStax Biology 2E)



1. What is matter? _____
2. A form of matter that cannot be broken down into smaller substances is an _____
3. What are the four elements common to all living organisms? _____

The Structure of the Atom

4. What is found in the nucleus of an atom? _____
5. Electrons are [smaller / larger] in mass than protons.
6. Which particles are positive? _____ Negative? _____ Neutral?_____

Atomic Number and Mass

7. What determines the atomic number of an element? _____
8. What determines the mass number? _____
9. How many neutrons are in Carbon-12? _____ Carbon-13? _____ *(Visual Connection)*

Isotopes

10. Isotopes differ in the number of _____ they contain.
11. Radioactive decay will cause carbon-14 to eventually become what? _____

Evolution Connection - Carbon Dating

12. How long does it take for half of the carbon-14 to convert back to nitrogen? _____
13. What is carbon dating only useful for formerly living organisms? _____

The Periodic Table

14. How are elements grouped on the periodic table? _____
15. How are they arranged? _____
16. What is a molecule? _____

Electron Shells and the Bohr Model

17. Orbitals show the location and number of [electrons / protons / neutrons] .
18. How many electrons can occupy the inner shell? _____ How many in the outer shells? _____

19. What type of elements are most energetically stable? _____
20. Why are some elements (like neon and helium) called “Noble gasses?” _____

Electron Orbitals

21. Electrons behave like particles and _____.
22. Consider lithium (Li) which has an electron configuration of $1s^2 2s^1$
    What do those numbers mean? _____

Chemical Reactions and Molecules

23. A chemical bond occurs when the obtain or share _____
24. Consider this reaction: $2H + O \rightarrow H_2O$ What are the reactants? _____
    What is the product? _____
25. The Law of Conservation of _____ requires there to be the same number of elements on each side of an equation.
26. What is a compound? _____
27. What does a double arrow ↔ indicate in a reaction? _____

Ions and Ionic Bonds

28. Cations form when an element [loses / gains] electrons. Cations are [positive / negative]
    Anions form when an element [loses / gains] electrons Anions are [positive / negative]
29. Why does chlorine tend to gain an electron? _____
30. Ionic bonds form between ions with _____ charges.
31. Why are electrolytes necessary for living organisms? _____

Covalent Bonds and Other Bonds and Interactions

32. Covalent bonds are formed when atoms [share / donate] electrons.
33. Where are these bonds found in living organisms? _____
34. Why is it difficult for living organisms to gain nitrogen from the atmosphere? _____
35. If atoms unequally share electrons, it is called a _____ covalent bond.
    An example of a polar molecule is _____
36. What is an example of a molecule formed by nonpolar covalent bonds? _____

Hydrogen Bonds and Van Der Waals Interactions

37. Why are hydrogen bonds critical to life? _____
38. Van der Waals interactions contribute to the properties of _____