

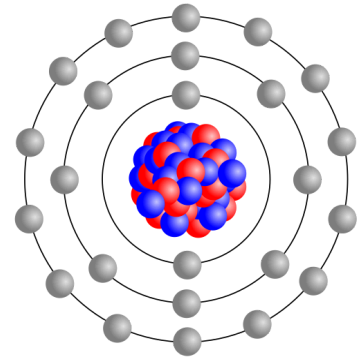
Name: _____ Date: _____

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 elements 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 \leftrightarrow 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 _____

