

1. Both atoms and ions have an identical number of protons, electrons, and neutrons, but an atom has a neutral charge while an ion has a positive or negative charge.
2. Molecular bonds: ionic or covalent bonds
3. An element is a pure substance on the periodic table, a compound is a substance made up of multiple molecules held together by chemical bonds, and a mixture is a substance made up of multiple substances that are mixed together without chemical bonds.
4. Ionic bonds are between a metal and a non-metal. In an ionic compound, the valence electrons stay closer to the metal due to its higher electronegativity. In a covalent bond, valence electrons are shared between atoms.
5. Nested question
 - a. Since each level of nesting requires some text.
 - i. 1
 - ii. 2
 - iii. 4
 - iv. 3
 - b. The number of covalent bonds is the number of extra electrons required for an atom's outer shell to be stable
6. Matching questions
 - a. Matched to ii.
 - b. Matched to i.
 - c. Matched to iv.
 - d. Matched to iii.
7. Nested questions
 - a. An acid increases the number of H^+ ions in a solution.
 - b. An base increases the number of OH^- ions in a solution.
 - c. An ionic compound, called a salt, and water (H_2O)
 - d. Acids taste sour and react with metals to make H_2 gas. Bases taste bitter and feel slippery.
 - e. The pH scale measures how acidic or basic a solution is from the concentration of H^+ or OH^- ions in a solution. A more acidic solution, with many more H^+ ions, will have a low pH (between 0 and 7)
8. Oxygen has 6 valence electrons, 2 of which are shared between the oxygen and the hydrogen to form two single bonds. Both hydrogen atoms and 2 lone electron pairs are as far apart as possible, and the 2 lone electron pairs exert some repulsion on the two bonding hydrogen atoms to produce the 104.5 degree angle.
9. Nested questions
 - a. The law of conservation of mass states that the mass in a closed system remains constant over time. This implies that the mass of the system does not change, regardless of the state (solid, liquid, or gaseous) of the system's contents.
 - b. Food chains demonstrate the law of conservation of mass through the reducing population of predatory species; the mass of food that animals on the lowest trophic level consumed is transferred to animals on higher trophic levels. Animals

on higher trophic levels tend to have more mass and have a smaller population to share a constant amount of mass from prey.

10. Nested questions

- a. The law of conservation of energy states that the energy in a closed system remains constant over time. This implies that the energy of a system does not change, regardless of any reactions within the system.
- b. Food chains demonstrate the law of conservation of energy as the primary provider of energy, the sun, provides energy that flows through the entire food chain. Furthermore, all chemical products created by organisms from taking resources from the environment still conserve mass and energy.

11. Nested questions

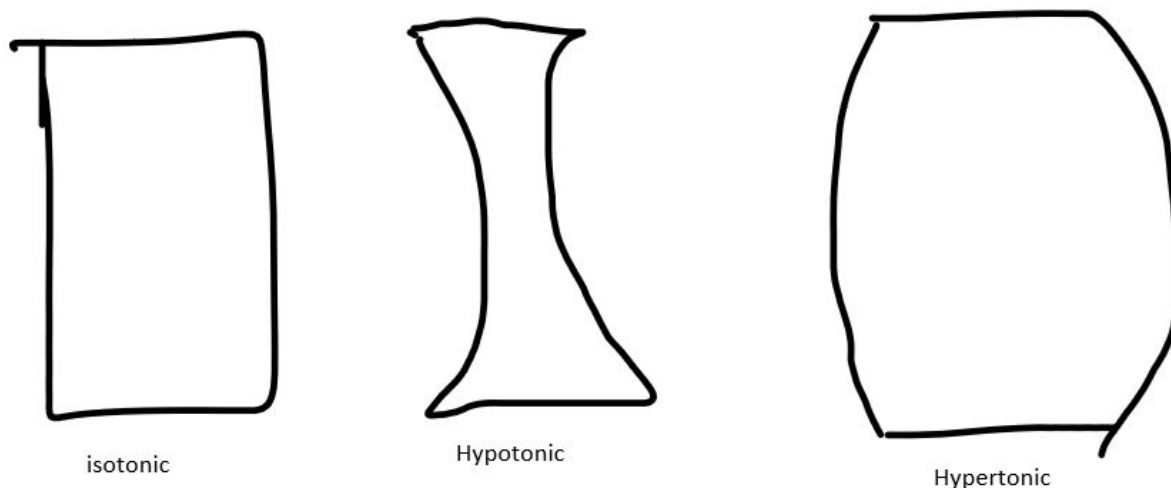
- a. I'll have to nest again for this one.
 - i. A: Golgi Apparatus: Packages and transports proteins into vesicles
 - ii. B: Cell membrane: Separates the inside of the cell and the outside and protects the cell
 - iii. C: Mitochondria: The powerhouse of the cell babe; produces energy for the cell.
 - iv. D: Lysosome: An organelle that contains digestive enzymes to break down excess cell parts
 - v. E: Cytoplasm: A jelly-like substance that provides a medium for all organelles to be suspended within
 - vi. F: Rough endoplasmic reticulum: Produces and transports proteins required for the cell to function. Studded with ribosomes to produce proteins.
 - vii. G: Nucleus: Controls and regulates the activities of the cell; contains all genetic information of the cell
 - viii. H: Smooth endoplasmic reticulum: Involved in creating lipids
- b. Animal cell; plant cells have a rigid cell wall while animal cells lack a rigid cell wall due to the increased mobility of animals

12. Photosynthesis is the process of how plants convert energy from the sun, carbon dioxide and water into glucose and oxygen. The products of photosynthesis are exactly what cells need to carry out cellular respiration to produce energy, creating ATP, carbon dioxide, and water as products that can be used for photosynthesis.

13. The nested questions

- a. Matched to iii.
- b. Matched to iv.
- c. Matched to ii.
- d. Matched to i.

14. Osmosis is the process by which molecules of a solvent move from an area of higher concentration to an area of lower concentration through a semi-permeable membrane. Diffusion is the movement of a substance from an area of higher concentration to an area of lower concentration and does not require a medium like water to occur.



15.

- Isotonic solutions are those with an equal concentration of solvent between the intracellular and extracellular space
- Hypotonic solutions are those with a lower concentration of solvent than the extracellular space
- Hypertonic solutions are those with a higher concentration of solvent than the extracellular space.

16.

| Name of element | symbol | Number of Protons | Number of neutrons | Atomic Mass |
|-----------------|--------|-------------------|--------------------|-------------|
| Neon | Ne | 10 | 10 | 20 |
| Chlorine | Cl | 17 | 18 | 35 |
| Nickle | Ni | 28 | 31 | 59 |
| Chromium | Cr | 24 | 24 | 52 |
| Tungsten | W | 74 | 110 | 184 |

17. Nested questions

- CH_4 has 5 atoms and ~16 amu.
- $\text{C}_6\text{H}_{12}\text{O}_6$ has 24 atoms and ~180 amu.
- $\text{C}_3\text{H}_7\text{NO}_2\text{S}$ has 14 atoms and ~121 amu.

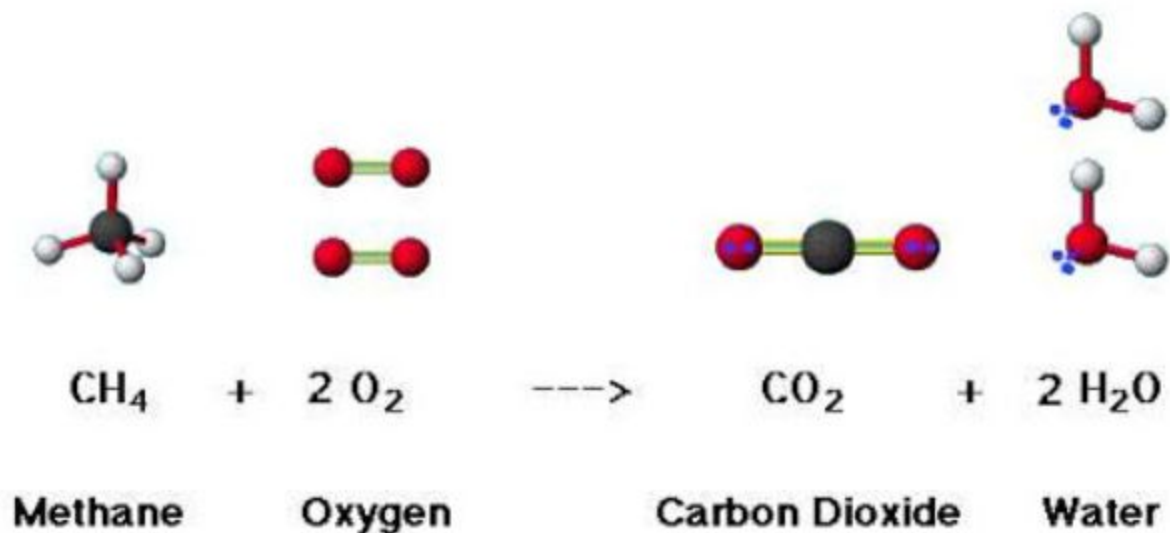
18. Nested questions

- $\text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- $2\text{CH}_2\text{O}_2 \rightarrow \text{C}_2\text{H}_2\text{O}_3 + \text{H}_2\text{O}$
- $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_6\text{O} + 2\text{CO}_2$

19. Nested questions

- A combustion reaction occurs between a hydrocarbon and oxygen to produce carbon dioxide and water. Equation ii) fits this description.

- b. A neutralization reaction occurs between an acid and a base to produce an ionic compound and water. Equation i) fits this description.

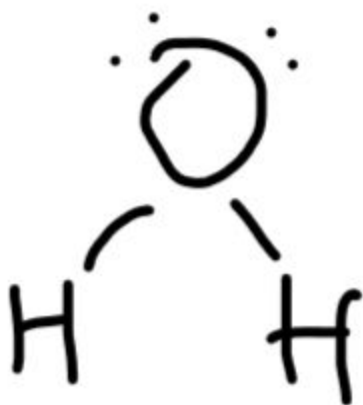


20.

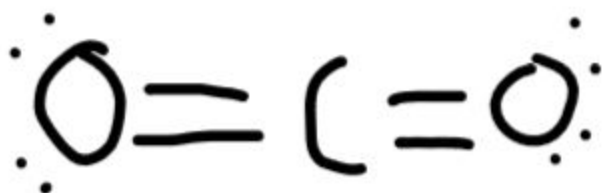
Combustion Reaction

21. Both reactions produce carbon dioxide and water as products.

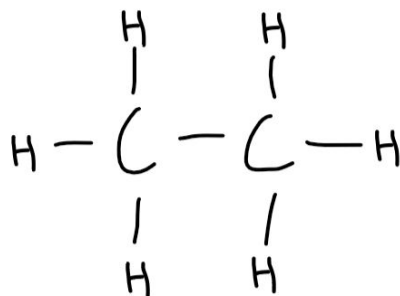
22. Nested question



a.



b.



c.

I apologize for my poor drawings!