

Unit 1 Review

Chemistry 0

Fall 2021, L. Tracey Gao

Matter and Elements

- **Matter:** The term **matter** refers to anything that occupies space and has mass.
- **Elements:** All matter is made up of substances called **elements**, which have specific chemical and physical properties.





Elements and Atoms

- An element is a substance made up of only one type of atom.
- The atomic number of an atom is equal to the number of **protons** in its nucleus.
- The number of **electrons** surrounding the nucleus of an atom is equal to the number of **protons** in its nucleus.



Elements and Atoms

- Different atoms of the same element can have a different number of neutrons.
- Atoms of the same element with different numbers of neutrons are called “**isotopes**” of that element.
- The atomic weight (average atomic mass) of an element is the average mass of the different isotopes of the element.
- The atoms in the periodic table are arranged to show characteristics and relationships between atoms and groups of atoms.



Atoms

- Atoms are the building blocks of matter.
- Atoms themselves consist of protons, neutrons and electrons.
- The number of the protons determines its atomic number.
- Different numbers of neutrons in one atom determine the different isotopes of this element.
- Electron structure is the chief factor in determining the chemical behavior of an element.



Elements and Atoms

- The periodic table is a chart containing information about the atoms that make up all matter.
- The elements are numbered according to their **atomic number**.
- The elements are organized by their **electron structure**.

The Periodic Table (Elements 1-20)

PERIODIC TABLE ELEMENTS 1-20							
HYDROGEN 1 H 1.01							HELIUM 2 He 4.00
LITHIUM 3 Li 6.94	BERYLLIUM 4 Be 9.01	BORON 5 B 10.81	CARBON 6 C 12.01	NITROGEN 7 N 14.01	OXYGEN 8 O 16.00	FLUORINE 9 F 19.00	NEON 10 Ne 20.18
SODIUM 11 Na 22.99	MAGNESIUM 12 Mg 24.31	ALUMINUM 13 Al 26.98	SILICON 14 Si 28.09	PHOSPHORUS 15 P 30.97	SULFUR 16 S 32.07	CHLORINE 17 Cl 35.45	ARGON 18 Ar 39.95
POTASSIUM 19 K 39.10	CALCIUM 20 Ca 40.08						





















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Energy Levels

- The electrons surrounding an atom are located in regions around the nucleus called “energy levels”.
- When the first energy level has 2 electrons, the next electrons go into the second energy level until the second level has 8 electrons.
- When the second energy level has 8 electrons, the next electrons go into the third energy level until the third level has 8 electrons.
- When the third energy level has 8 electrons, the next electrons go into the fourth energy level.

Energy Levels for Element 1-20

ENERGY LEVELS ELEMENTS 1-20							
HYDROGEN 1  1.01							HELIUM 2  4.00
LITHIUM 3  6.94	BERYLLIUM 4  9.01	BORON 5  10.81	CARBON 6  12.01	NITROGEN 7  14.01	OXYGEN 8  16.00	FLUORINE 9  19.00	NEON 10  20.18
SODIUM 11  22.99	MAGNESIUM 12  24.31	ALUMINUM 13  26.98	SILICON 14  28.09	PHOSPHORUS 15  30.97	SULFUR 16  32.07	CHLORINE 17  35.45	ARGON 18  39.95
POTASSIUM 19  39.10	CALCIUM 20  40.08						



Valence Electrons

- The electrons on the outermost energy level of the atom are called valence electrons.
- The valence electrons are involved in bonding one atom to another.



Chemical Bonding- Covalent Bonding

- The sharing of electrons between atoms is called a covalent bond, which holds the atoms together as a molecule.
- A covalent bond happens if the attractions are strong enough in both atoms and if each atom has room for an electron in its outer energy level.
- Atoms will covalently bond until their outer energy level is full.
- Atoms covalently bonded as a molecule are more stable than they were as separate atoms.



Chemical Bonding- Ionic Bonding

- The attractions between the protons and electrons of atoms can cause an electron to move completely from one atom to the other.
- When an atom loses or gains an electron, it is called an ion. The atom that loses an electron becomes a positive ion. The atom that gains an electron becomes a negative ion.
- A positive and negative ion attract each other and form an ionic bond.



Chemical Bonding

- Atoms bond with one another in two different ways-
 - Covalent bonds
 - Ionic bonds
- When two nonmetals share one or more electrons, they form a covalent bond.
- When a metal transfers one or more electrons to a nonmetal, they form an ionic bond.
- Both types of bonds are based on the same concept: Atoms tend to behave in such a way as to effectively fill their outer energy level.



Lewis dot structures

- A Lewis dot structure is like a simplified electron energy level model.
- The Lewis structure contains the element symbol with dots representing electrons.
- The only electrons shown are those on the outer energy level or valence electrons.
- The electrons are placed around the element symbol, one at a time, clockwise or counterclockwise, and then grouped in pairs as more electrons are added.

Lewis dot structures

PERIODIC TABLE ELEMENTS 1-20							
HYDROGEN 1 H ·							HELIUM 2 · He ·
LITHIUM 3 Li ·	BERYLLIUM 4 Be ·	BORON 5 · B ·	CARBON 6 · C ·	NITROGEN 7 · N ·	OXYGEN 8 · O ·	FLUORINE 9 · F ·	NEON 10 · Ne ·
SODIUM 11 Na ·	MAGNESIUM 12 Mg ·	ALUMINUM 13 · Al ·	SILICON 14 · Si ·	PHOSPHORUS 15 · P ·	SULFUR 16 · S ·	CHLORINE 17 · Cl ·	ARGON 18 · Ar ·
POTASSIUM 19 K ·	CALCIUM 20 Ca ·						



Week 7 Homework

How many electrons are shown in the Lewis electron-dot structure of Nitrogen (N)?

Answer: 5

**Explanation: Atomic number for Nitrogen: 7,
valence electrons: 5**

In Lewis structures, the valence electrons are represented by [dots](#).

Week 7 Homework

Please write the Lewis dot structure for Silicon (Si).

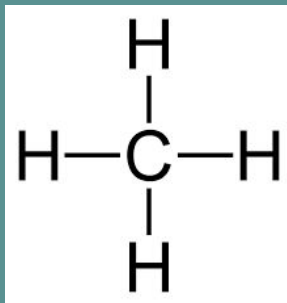
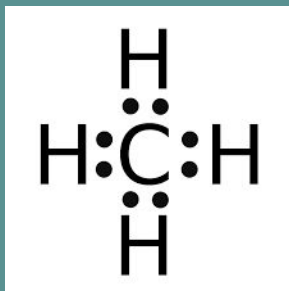


Explanation:

Atomic Number for Si is 14

Valence electrons: 4

Please draw the Lewis dot structure for methane (CH₄) below.



Week 7 Homework

Please draw the Lewis dot structure for calcium chloride (CaCl_2) below.

