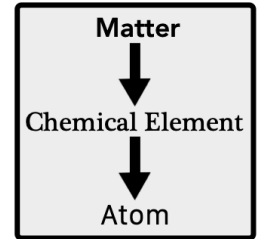
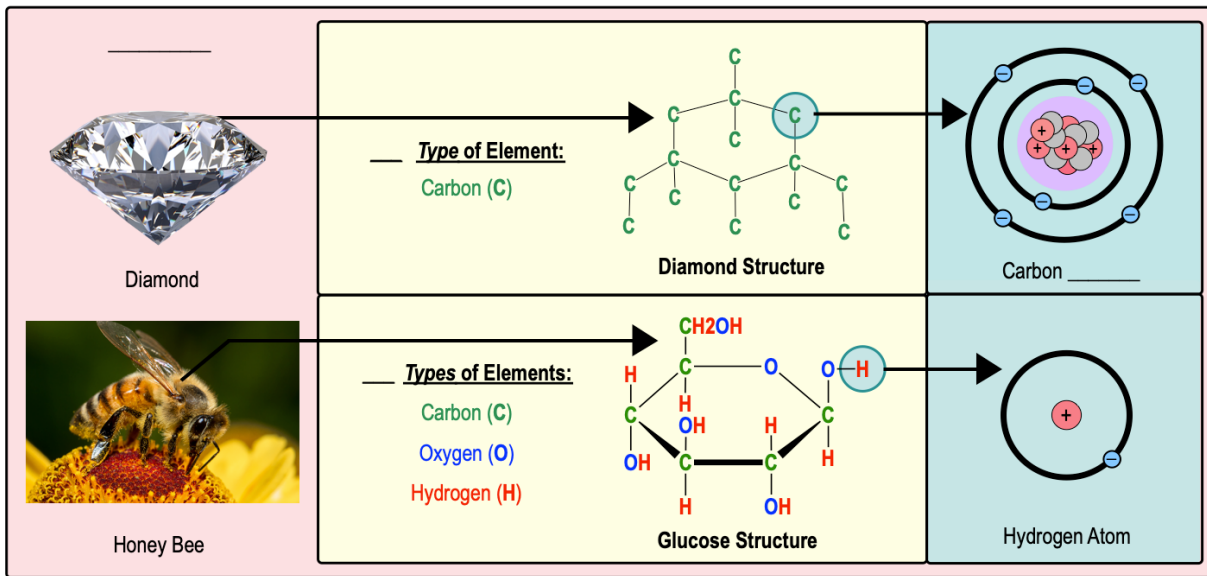


CONCEPT: ATOMS - SMALLEST UNIT OF MATTER

- _____: anything that takes up *space* & has *mass* (ex. organisms, rocks, oceans, etc.).
 - All *matter* consists of at least 1 *chemical* _____.
- *Chemical Elements*: pure substances made of only *one* type of _____.
 - *Atom*: the _____ unit of an *element* (& therefore, the smallest unit of *matter*).
 - Atoms makes up both _____ & _____ matter.



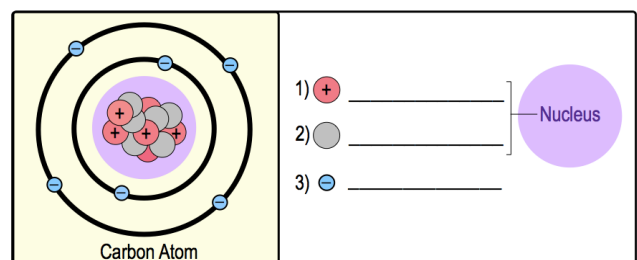
EXAMPLE: Atoms are the Smallest Units of Matter.



Atomic Structure

- *Atoms* are made of _____ *subatomic particles*, each with a characteristic *charge*, *mass* & *location* in the atom.

Subatomic Particle	Electric Charge	Atomic Mass Unit (AMU)	Location
① Proton	—	—	Nucleus
② Neutron	—	—	—
③ Electron	—	—	Orbiting Nucleus



EXAMPLE: Negatively charged particles of atoms with almost no mass are called:

- a) Electrons. b) Protons. c) Neutrons. d) Ions. e) Polymers.

PRACTICE: A proton _____:

- a) Has one positive charge. b) Has one AMU. c) Is found in the nucleus of the atom.
 d) Only a and b are true. e) a, b, and c are true.

CONCEPT: ATOMS - SMALLEST UNIT OF MATTER

EXAMPLE: The atomic number of an element is equal to the number of:

- a) Neutrons only.
- b) Protons plus electrons.
- c) Protons plus neutrons.
- d) Neutrons plus electrons.
- e) Protons only.

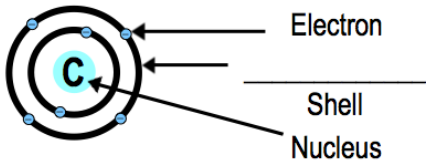
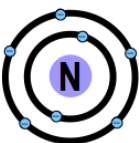
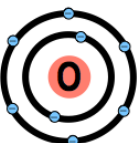
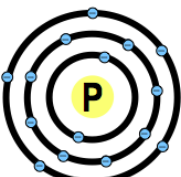
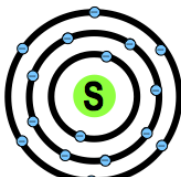
PRACTICE: The average oxygen atom has a mass number of 16 and an atomic number of 8. This means that the number of neutrons in this oxygen atom is:

- a) 24.
- b) 8.
- c) 16.
- d) 4.
- e) 2.

Electron Orbitals & Energy Shells

- **Electron** _____: 3D-regions around a nucleus where electrons are found (envisioned in 2D as *energy shells*).
 - Shells *closer* to the nucleus are _____ in energy than distant shells, which are *higher* in energy.
 - **Valence Electrons**: electrons found in the _____ energy shell (*valence shell*).
 - *1st shell* holds up to _____ electrons; *2nd shell* holds up to _____ electrons; each shell holds varying #'s.

EXAMPLE: Energy Shells for C, H, N, O, P, S.

Carbon	Hydrogen	Nitrogen	Oxygen	Phosphorus	Sulfur
					
_____ Number → 12 _____ Number → 6 C ← Chemical Symbol	1 H 1	14 N _____	16 O _____	31 P 15	32 S _____

PRACTICE: How many valence electrons does an atom with five total electrons have?

- a) 5.
- b) 7.
- c) 3.
- d) 2.
- e) 1.

PRACTICE: Which of the following is true about electron energy shells?

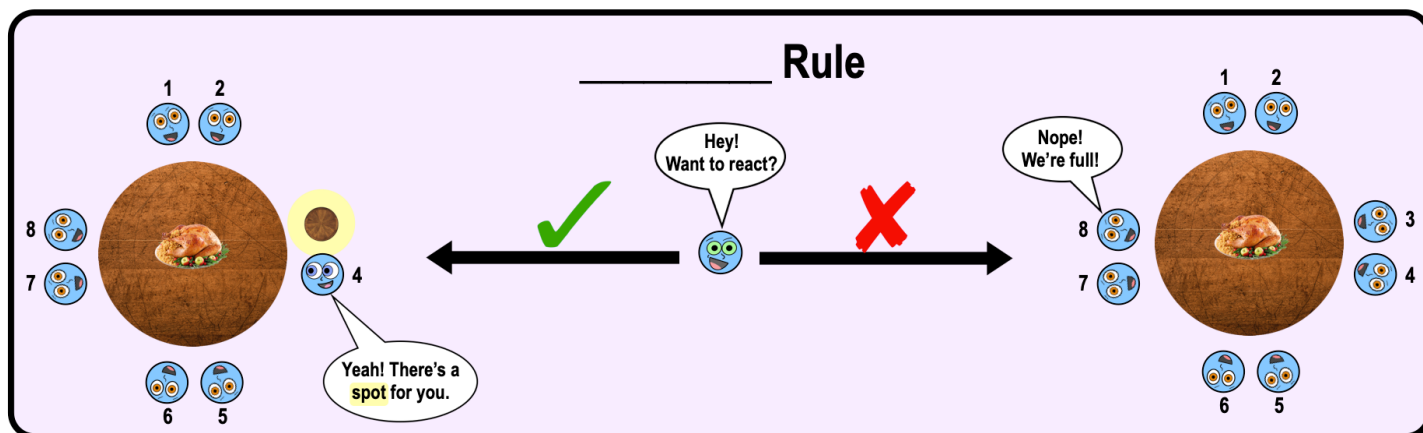
- a) They represent regions around the nucleus in which the electrons orbit.
- b) The shells closest to the nucleus contain electrons with higher energy.
- c) They contain electrons of the same energy.
- d) a and b only.

e) a and c only.

CONCEPT: ATOMS- SMALLEST UNIT OF MATTER

Octet Rule

- _____ Rule: atoms are more stable (less reactive) when their valence shells are *fully occupied*.
 - Recall: 1st energy shell holds up to _____ electrons; 2nd energy shell holds up to _____ electrons.
 - Atoms are _____ reactive when their outer valence shells are _____.



EXAMPLE: According to the octet rule, electron distribution in each shell of a neutral nitrogen atom (atomic number 7) is:

- a) 1,5. b) 2,4. c) 2,5. d) 1,4.

PRACTICE: An average neon atom (Ne) is unreactive for which of the following reasons?

- a) It has 7 valence electrons. b) It has 8 valence electrons.
c) Its valence shell is full of electrons. d) It has 20 valence electrons.
e) b and c only.

20.180	10
Ne	
Neon	

PRACTICE: How many electrons does an Oxygen atom need to fulfill the octet rule by filling its valence shell?

- a) 8.
b) 4.
c) 1.
d) 2.
e) 6.

15.999	8
O	
Oxygen	