All atoms except hydrogen are formed in stars: fusion in core, in nova events. Atoms extremely small—smaller than wavelengths of visible light. Elements are substances composed of a single type of atom—about 115 known, some are synthetic. Atomic symbol has a capital letter, and some also have small letter. Formed of subatomic particles: proton, electron, neutron. Protons: positive charge, 1 atomic mass unit. Atomic number is the number of protons, identifies the element. Electrons: negative charge, 1/1841 of an atomic mass unit (negligible). Neutrons have mass but no charge. Nucleus is made of protons and neutrons, surrounded by electron cloud. Mostly empty space: the electron cloud. Electrons are negative, repel other atoms’ electrons, so they don’t pass through one another. Isotopes: same element with differing mass. Protons: atomic number, constant for substance. Neutrons: no set number. Mass = protons + neutrons = mass NUMBER. Atomic MASS on periodic table is average mass of collective isotopes. C mostly 12, N mostly 14, Cl divided between 35 and 37 at 3:1 ratio. Periodic table:
- Metals: shiny opaque, ductile malleable conductors
- Nonmetals: poor conductors, may be transparent, brittle
- Metalloids: intermediate properties
Periods: properties change across row gradually, repeat changes in next period. Interact electrically: lose, gain, share electrons—number lost or gained is the strength of their charge, their valence. Groups have similar properties:
- Alkali: mix with water make grease remover, soap
- Alkali earth: also above, and don’t degrade with fire
- Chalcogens: ore makers—Oxygen, sulfur (also known as oxygen group)
- Halogens: salt makers
- Transition metals: harder, less reactive than alkalis
- Inner transition metals: hard to separate, so chemically similar
- Noble gases: non-reactive
Electrons travel in waves around atoms—certain locations due to wave lengths. Electron Shell model of atoms:
- Periodic table arranged by electron shells—build from inner shells to outer ones
- Outer electrons interact with other atoms: valence electrons
- same group have same # of valence electrons in outermost shell
- greater numbered periods have larger shells, can hold more electrons