











Introduction to  
**Organic Chemistry**

HSSP

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# Periodic Table

KEY																	
	<b>Alkali metals</b>		<b>Other metals</b>														
	<b>Alkali-earth metals</b>		<b>Semimetals</b>														
	<b>Transition metals</b>		<b>Non-metals</b>														
	<b>Rare earths</b>		<b>Noble gases</b>														
	<b>Radioactive rare earths</b>		<b>Hydrogen</b>														
1 <b>H</b> Hydrogen 1																	2 <b>He</b> Helium 4
3 <b>Li</b> Lithium 7	4 <b>Be</b> Beryllium 9											5 <b>B</b> Boron 11	6 <b>C</b> Carbon 12	7 <b>N</b> Nitrogen 14	8 <b>O</b> Oxygen 16	9 <b>F</b> Fluorine 19	10 <b>Ne</b> Neon 20
11 <b>Na</b> Sodium 23	12 <b>Mg</b> Magnesium 24											13 <b>Al</b> Aluminum 27	14 <b>Si</b> Silicon 28	15 <b>P</b> Phosphorus 31	16 <b>S</b> Sulphur 32	17 <b>Cl</b> Chlorine 35	18 <b>Ar</b> Argon 40
19 <b>K</b> Potassium 39	20 <b>Ca</b> Calcium 40	21 <b>Sc</b> Scandium 45	22 <b>Ti</b> Titanium 48	23 <b>V</b> Vanadium 51	24 <b>Cr</b> Chromium 52	25 <b>Mn</b> Manganese 55	26 <b>Fe</b> Iron 56	27 <b>Co</b> Cobalt 59	28 <b>Ni</b> Nickel 58	29 <b>Cu</b> Copper 63	30 <b>Zn</b> Zinc 64	31 <b>Ga</b> Gallium 69	32 <b>Ge</b> Germanium 74	33 <b>As</b> Arsenic 75	34 <b>Se</b> Selenium 80	35 <b>Br</b> Bromine 79	36 <b>Kr</b> Krypton 84
37 <b>Rb</b> Rubidium 85	38 <b>Sr</b> Strontium 88	39 <b>Y</b> Yttrium 89	40 <b>Zr</b> Zirconium 90	41 <b>Nb</b> Niobium 93	42 <b>Mo</b> Molybdenum 98	43 <b>Tc</b> Technetium 97	44 <b>Ru</b> Ruthenium 102	45 <b>Rh</b> Rhodium 103	46 <b>Pd</b> Palladium 106	47 <b>Ag</b> Silver 107	48 <b>Cd</b> Cadmium 114	49 <b>In</b> Indium 115	50 <b>Sn</b> Tin 120	51 <b>Sb</b> Antimony 121	52 <b>Te</b> Tellurium 130	53 <b>I</b> Iodine 127	54 <b>Xe</b> Xenon 132
55 <b>Cs</b> Caesium 133	56 <b>Ba</b> Barium 138	57-71	72 <b>Hf</b> Hafnium 180	73 <b>Ta</b> Tantalum 181	74 <b>W</b> Tungsten 184	75 <b>Re</b> Rhenium 187	76 <b>Os</b> Osmium 192	77 <b>Ir</b> Iridium 193	78 <b>Pt</b> Platinum 195	79 <b>Au</b> Gold 197	80 <b>Hg</b> Mercury 202	81 <b>Tl</b> Thallium 205	82 <b>Pb</b> Lead 208	83 <b>Bi</b> Bismuth 209	84 <b>Po</b> Polonium 209	85 <b>At</b> Astatine 210	86 <b>Rn</b> Radon 222
87 <b>Fr</b> Francium 223	88 <b>Ra</b> Radium 226	89-103	104 <b>Unq</b> Unnilquadium 260	105 <b>Unp</b> Unnilpentium 262	106 <b>Unh</b> Unnilhexium 263	107 <b>Uns</b> Unnilseptem 262	108 <b>Uno</b> Unniloctium 265	109 <b>Une</b> Unnilennium 266									
57 <b>La</b> Lanthanum 139	58 <b>Ce</b> Cerium 140	59 <b>Pr</b> Praseodymium 141	60 <b>Nd</b> Neodymium 142	61 <b>Pm</b> Promethium 145	62 <b>Sm</b> Samarium 152	63 <b>Eu</b> Europium 153	64 <b>Gd</b> Gadolinium 158	65 <b>Tb</b> Terbium 159	66 <b>Dy</b> Dysprosium 164	67 <b>Ho</b> Holmium 165	68 <b>Er</b> Erbium 168	69 <b>Tm</b> Thulium 169	70 <b>Yb</b> Ytterbium 174	71 <b>Lu</b> Lutetium 175			
89 <b>Ac</b> Actinium 227	90 <b>Th</b> Thorium 232	91 <b>Pa</b> Protactinium 231	92 <b>U</b> Uranium 238	93 <b>Np</b> Neptunium 237	94 <b>Pu</b> Plutonium 244	95 <b>Am</b> Americium 243	96 <b>Cm</b> Curium 247	97 <b>Bk</b> Berkelium 247	98 <b>Cf</b> Californium 251	99 <b>Es</b> Einsteinium 254	100 <b>Fm</b> Fermium 257	101 <b>Md</b> Mendelevium 258	102 <b>No</b> Nobelium 255	103 <b>Lr</b> Lawrencium 256			

# Bonding in Carbon

- Carbon-12
  - $1s^2 2s^2 2p^2$
  - How many valence electrons in carbon? How can you tell?
- Organic Chemistry
  - Study of carbon containing compounds and its properties
  - Synthesis

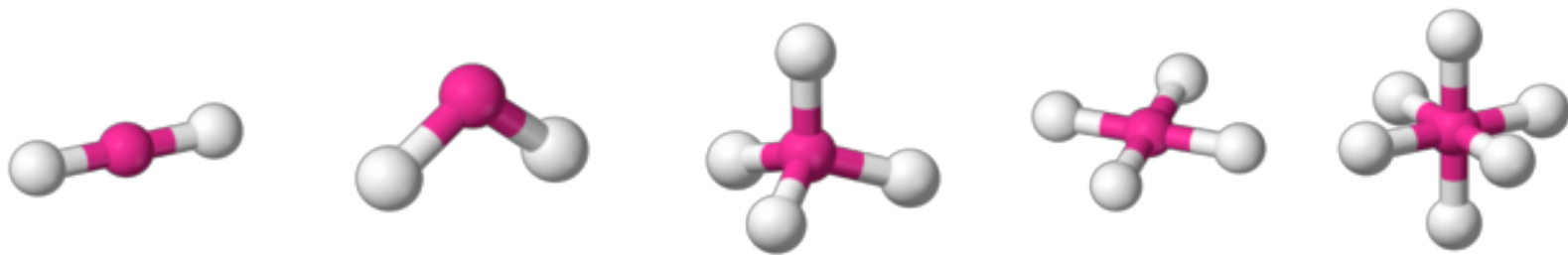
# Quick Review

- Covalent Bonds
  - Sharing of electrons between atoms in a molecule
- Octet Rule
  - Atoms combining together to give stable structure with 8 valence electrons in outer shell

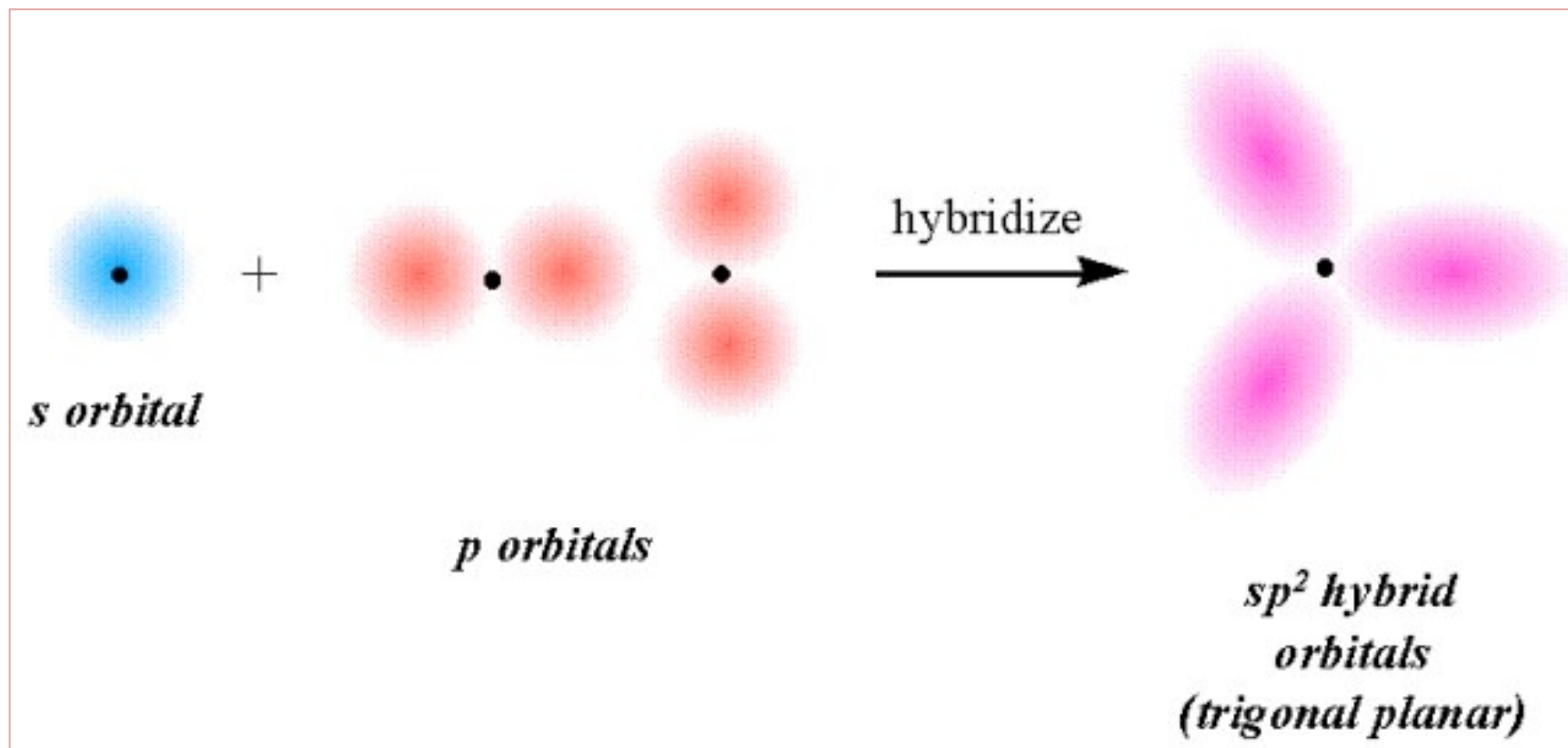
# Quick Review Contd.

- Valence Shell Electron Pair Repulsion Theory (VESPR)
  - Geometry of compound determined by electrostatic repulsion of valence electrons
- Hybridization Theory
  - Mixing of atomic orbitals to form new hybrid orbitals
- Molecular Orbital Theory (MO)
  - Determining molecular structures with moving electrons

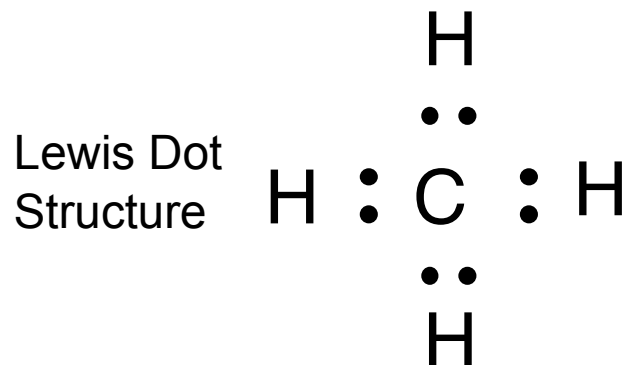
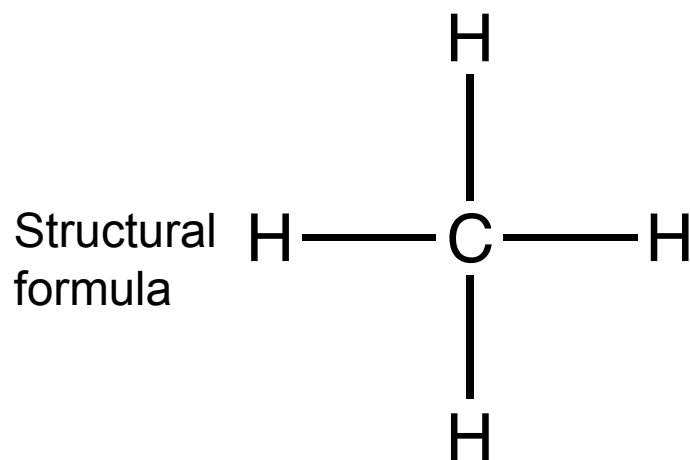
# VESPR



# Hybridization

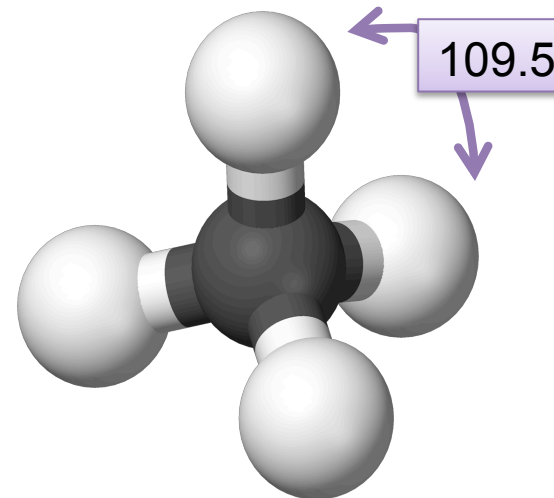


# Methane – CH<sub>4</sub>



- ▶ Valence Shell Electron Pair Repulsion model (VSEPR)
  - ▶ Carbon has four valence electrons
  - ▶ Forms 4 bonds
  - ▶ Tetrahedral

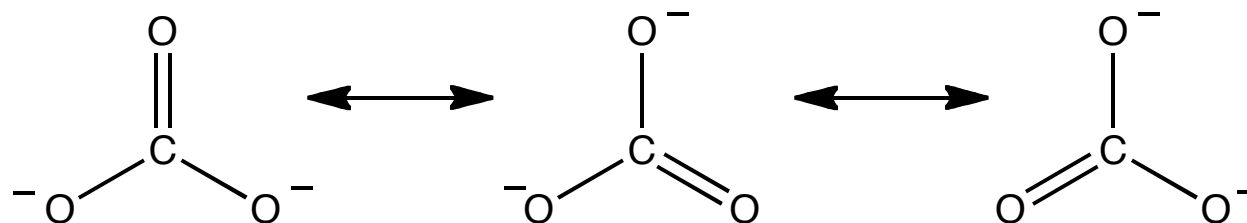
- ▶ Hybridization
  - ▶ sp<sup>3</sup> orbitals





# Resonance

- Movement of delocalized electrons in compound that gives more than 1 Lewis Structure
  - Major & Contributing structures
  - Gives compound stability!



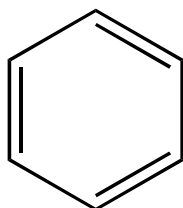
Carbonate ion

# Resonance

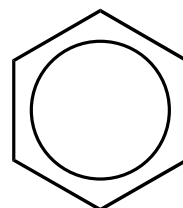
- Conjugation

- System where atoms are covalently bonded with alternating single and multiple bonds

benzene

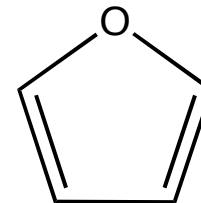


or

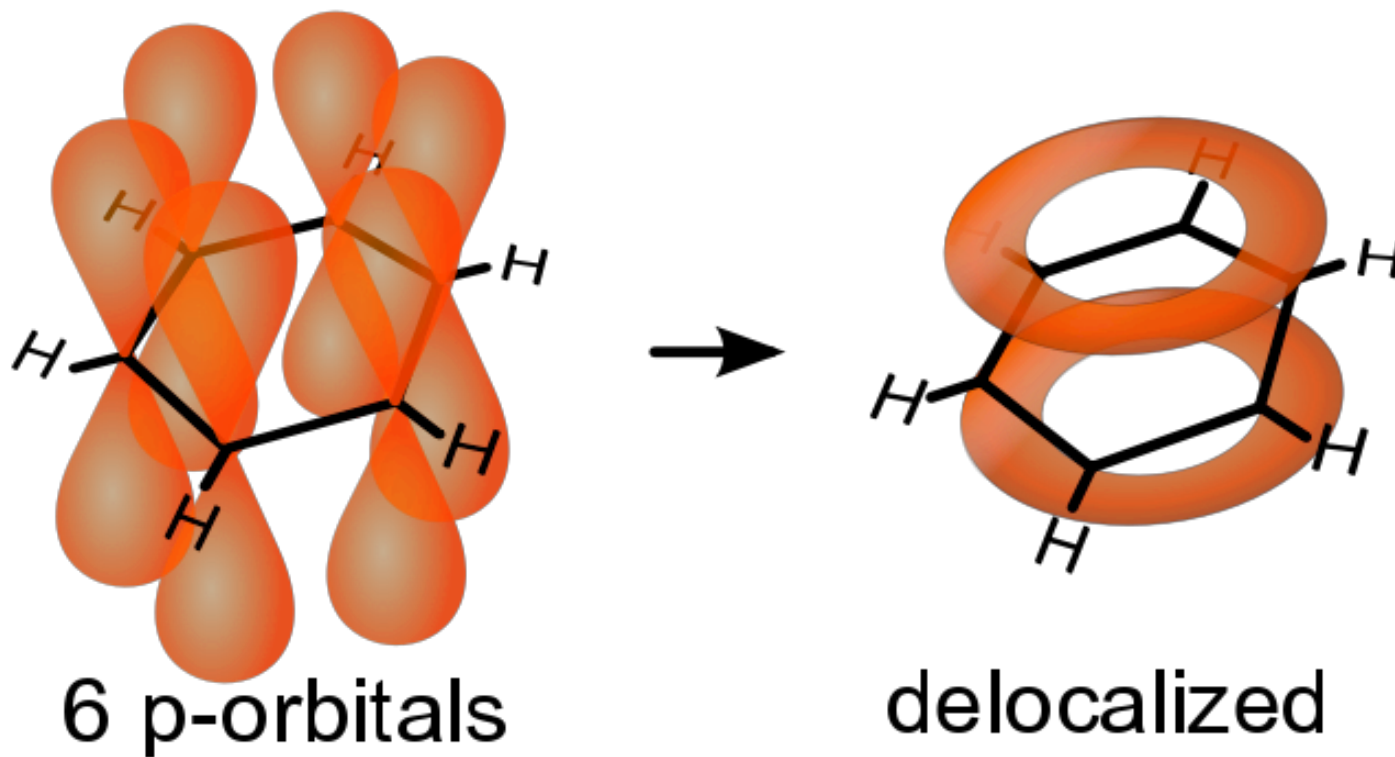


- Can have atoms with electrons available in p-orbitals (like oxygen)

furan



# Benzene



P-orbitals (lobes on top) mix together to form delocalized "donut" from moving e-  
Same occurs for bottom lobes of p-orbitals