

## Organic II: Common Definitions

### Lesson 1

<b>Conjugation</b>	A series of overlapping p orbitals, usually in alternating single and multiple bonds.
<b>Electrophilic 1,2 addition</b>	The addition of an electrophile to an alkene to yield a saturated product.
<b>Electrophilic 1,4 addition</b>	The addition of an electrophile to an alkene to yield a saturated product.
<b>Allylic Bromination</b>	Substituting Br for H in a position next to a double bond.
<b><math>\pi</math> - bond delocalization</b>	The pi electrons are spread out over the entire pi framework.
<b>Allylic carbocation</b>	Carbocation that is next to a double bond.

## Lesson 2

<b>Thermodynamic control</b>	An equilibrium reaction that yields the lowest-energy, most stable product is said to be thermodynamically controlled.
<b>Kinetic Control</b>	A reaction that follows the lowest activation energy pathway is said to be kinetically controlled. The product is the most rapidly formed, but is not necessarily the most stable.
<b>Diene</b>	Compound with two double bonds and is conjugated.
<b>Dienophile</b>	A compound containing a double bond that can take part in the Diels-Alder cycloaddition reaction.
<b>Cycloaddition</b>	A pericyclic reaction in which two reactants add together in a single step to yield a cyclic product.
<b>Pericyclic reaction</b>	A reaction that occurs by a concerted reorganization of bonding electrons in a cyclic transition state.
<b>Diels-Alder Reaction</b>	The cycloaddition reaction of a diene and dienophile to yield a cyclohexane.

### Lesson 3

<b>Aromatic</b>	Compound that has aromaticity.
<b>Aromaticity</b>	The special characteristics of cyclic conjugated p electron molecules. Aromatic molecules are planar, cyclic, conjugated species that have $4n + 2$ pi electrons.
<b>Antiaromatic</b>	Referring to a planar, conjugated molecule with $4n$ pi electrons. Delocalization of the pi electrons leads to an increase in energy.
<b>Resonance Form</b>	An individual Lewis structure of a resonance hybrid.
<b>Arene</b>	An alkyl-substituted benzene.
<b>Phenyl group</b>	The name for the $-C_6H_5$ unit when the benzene ring is considered as a substituent. A phenyl group is abbreviated as -Ph.
<b>Ortho</b>	Position next to 1 <sup>st</sup> substitute
<b>Meta</b>	Position two locations away from 1 <sup>st</sup> substitute
<b>Para</b>	Position opposite 1 <sup>st</sup> substitute
<b>Huckel <math>4n+2</math> Rule</b>	A rule stating that monocyclic conjugated molecules having $4n + 2$ pi electrons ( $n = \text{an integer}$ ) are aromatic.

Lesson 4 –

<b>Heterocyclic Compound</b>	A cyclic molecule whose ring contains more than one kind of atom. For example, pyridine is a heterocycle that contains five carbon atoms and one nitrogen atom in its ring.
<b>Polycyclic aromatic compound</b>	A compound with two or more benzene-like aromatic rings fused together.
<b>Ring current</b>	The circulation of pi electrons induced in aromatic rings by an external magnetic field. This effect accounts for the downfield shift of aromatic ring protons in the $^1\text{H}$ NMR spectrum.

Lesson 5-

<b>Electrophilic aromatic substitution</b>	A reaction in which an electrophile (E <sup>+</sup> ) reacts with an aromatic ring and substitutes for one of the ring hydrogens.
<b>Aromatic halogenation</b>	A reaction that adds a halide to an aromatic ring.
<b>Aromatic nitration</b>	A reaction that adds a nitro group to an aromatic ring.
<b>Aromatic Sulfonation</b>	A reaction that adds a SO <sub>3</sub> H group to an aromatic ring.
<b>Acyl group</b>	A -COR group.
<b>Acylation</b>	The introduction of an acyl group, -COR, onto a molecule.
<b>Alkylation</b>	Introduction of an alkyl group onto a molecule.
<b>Friedel-Crafts acylation</b>	An electrophilic aromatic substitution reaction to acylate an aromatic ring.
<b>Friedel-Crafts Alkylation</b>	An electrophilic aromatic substitution reaction to alkylate an aromatic ring.
<b>Alkali fusion</b>	A process for converting an aryl halide into a phenol by melting with NaOH.

Lesson 7 –

<b>Inductive effect</b>	The electron-attracting or electron-withdrawing effect transmitted through sigma bonds. Electronegative elements have an electron-withdrawing inductive effect.
<b>Meta-directing deactivator</b>	Substituents go to the meta position.
<b>Ortho-, Para-directing activators</b>	Substituents go to the ortho or para positions.
<b>Ortho-, Para-directing deactivators</b>	Substituents go to the ortho or para positions.
<b>Meisenheimer Complex</b>	An intermediate formed by addition of a nucleophile to a halo-substituted aromatic ring.
<b>Resonance effect</b>	The donation or withdrawal of electrons through orbital overlap with neighboring p bonds.
<b>Nucleophilic aromatic substitution</b>	The substitution reaction of an aryl halide by a nucleophile.

Lesson 8 –

<b>Benzyne</b>	An unstable compound having a triple bond in a benzene ring.
<b>Benzylic Hydrogens</b>	The position next to an aromatic ring that contains hydrogen.
<b>Benzylic radical</b>	The position next to an aromatic ring that contains a radical.
<b>Reduction of Aromatic Substituents</b>	Reducing Carbonyls on an aromatic ring.
<b>Hydrogenation of aromatic rings</b>	Converting a aromatic ring to a cyclo compound.
<b>Oxidation of side chains</b>	Converting Alkyl side chains into carbonyls.

Lesson 11 –

<b>Alcohol</b>	A compound with an -OH group bonded to a saturated, alkane-like carbon.
<b>Phenol</b>	A compound with an -OH group directly bonded to an aromatic ring, ArOH.
<b>Alkoxide ion</b>	The anion RO <sup>-</sup> formed by deprotonation of an alcohol.
<b>Phenoxide ion</b>	The anion ArO <sup>-</sup> formed by deprotonation of an alcohol.
<b>enol</b>	A vinylic alcohol that is in equilibrium with a carbonyl compound.

Lesson 12 –

<b>Sodium Borohydride</b>	$\text{NaBH}_4$ used to reduce ketones and aldehydes into alcohols.
<b>Lithium aluminum hydride</b>	$\text{LiAlH}_4$ used to reduce ketones and aldehydes into alcohols. More reactive than $\text{NaBH}_4$ but more dangerous.
<b>Grignard reaction</b>	An organomagnesium halide, $\text{RMgX}$ .
<b>Phosphorus oxychloride</b>	$\text{POCl}_3$ used to dehydrate $2^\circ$ and $3^\circ$ alcohols.
<b>Pyridium chlorochromate</b>	PCC, $\text{C}_5\text{H}_5\text{N}[\text{CrO}_2\text{Cl}]$ used to convert primary alcohols into aldehydes and secondary alcohols into ketones.
<b>Chromium trioxide</b>	$\text{CrO}_3$ used to convert primary alcohols into carboxylic acids.
<b>Sodium dichromate</b>	$\text{NaCr}_2\text{O}_7$ is used to convert secondary alcohols into ketones.

Lesson 13 –

<b>Protecting Group</b>	A group that is introduced to protect a sensitive functional group toward reaction elsewhere in the molecule. After serving its protective function, the group is removed.
<b>Quinone</b>	A 2,5-cyclohexadiene-1,4-dione.
<b>Hydroquinone</b>	A 1,4-dihydroxybenzene.
<b>Fremy's salt</b>	$(\text{KSO}_3)_2\text{NO}$ – potassium nitrosodisulfonate

Lesson 15 –

<b>Ether</b>	A compound that has two organic substituents bonded to the same oxygen atom, R-O-R.
<b>Alkoxymercuration</b>	A method for synthesizing ethers by addition of an alcohol to an alkene.
<b>Claisen rearrangement</b>	The pericyclic conversion of an allyl phenyl ether to an O-allylphenol by heating.
<b>Williamson ether synthesis</b>	A method for synthesizing ethers by $S_N2$ reaction of an alkyl halide with an alkoxide ion.

Lesson 16 –

<b>Epoxide</b>	A three-membered-ring ether functional group.
<b>Oxirane</b>	An alternative name for an epoxide.
<b>Peroxyacid</b>	A compound with the $-\text{CO}_3\text{H}$ functional group.
<b>Crown ether</b>	A large-ring polyether; used as a phase-transfer catalyst.
<b>Sulfide</b>	A compound that has two organic substituents bonded to the same sulfur atom, $\text{RSR}'$ .
<b>Thiol</b>	A compound containing the $-\text{SH}$ functional group.
<b>Disulfide</b>	A compound of the general structure $\text{RSSR}'$ .
<b>Thiolate</b>	The anion of thiol, $\text{RS}^-$
<b>Mercapto group</b>	An alternative name for the thiol group, $-\text{SH}$ .

Lesson 17 – CH384

<b>Nucleophilic addition reaction</b>	A reaction in which a nucleophile adds to the electrophilic carbonyl group of a ketone or aldehyde to give an alcohol.
<b>Nucleophilic acyl substitution rxn</b>	A reaction in which a nucleophile attacks a carbonyl compound and substitutes for a leaving group bonded to the carbonyl carbon.
<b>Alpha-substitution rxn</b>	The substitution of the alpha hydrogen atom of a carbonyl compound by reaction with an electrophile.
<b>Carbonyl condensation rxn</b>	A reaction that joins two carbonyl compounds together by a combination of alpha-sub and nucleophilic addition rxns.
<b>Tollens reagent</b>	A solution of $\text{Ag}_2\text{O}$ in aqueous ammonia; used to oxidize aldehydes to carboxylic acids.
<b>DIBALH</b>	Diisobutylaluminum hydride
<b>Geminal Diol</b>	Referring to two alcohols attached to the same carbon atom.

Lesson 18 –

<b>Grignard Reagent</b>	An organomagnesium halide, $\text{RMgX}$ .
<b>Hydride Reagent</b>	An H- reagent
<b>Enamine</b>	A compound with the $\text{R}_2\text{N-CR}=\text{CR}_2$ functional group.
<b>Imine</b>	A compound with the $\text{R}_2\text{C}=\text{NR}$ functional group.
<b>Carbinolamine</b>	A molecule that contains the $\text{R}_2\text{C}(\text{OH})\text{NH}_2$ functional group. Carbinolamines are produced as intermediates during the nucleophilic addition of amines to carbonyl compounds.
<b>2,4-DNP</b>	2,4-dinitrophenylhydrazine
<b>Hydrazine</b>	$\text{N}_2\text{H}_4$
<b>Hydrazone</b>	$\text{R}_2\text{C}=\text{NNR}_2$
<b>Wolff-Kishner Rxn</b>	The conversion of an aldehyde or ketone into an alkane by reaction with hydrazine and base.
<b>Acetal</b>	A functional group consisting of two -OR groups bonded to the same carbon. Acetals are often used as protecting groups for ketones and aldehydes.
<b>Hemiacetal</b>	A functional group consisting of one -OR and one -OH group bonded to the same carbon.

Lesson 20 –

<b>Betaine</b>	A neutral dipolar molecule with nonadjacent positive and negative charges.
<b>Phosphorane</b>	A Phosphorus ylide
<b>Ylide</b>	A neutral dipolar molecule with adjacent positive and negative charges.
<b>Wittig Rxn</b>	The reaction of a phosphorus ylide with a ketone or aldehyde to yield an alkene.
<b>Alpha,beta-unsaturated carbonyl</b>	A carbonyl that has a multiple bond between the alpha and beta carbon.
<b>Cannizzaro Rxn</b>	The disproportionation reaction of an aldehyde to yield an alcohol and a carboxylic acid on treatment with base.
<b>Disproportionation</b>	An oxidation-reduction reaction in which the same element is both oxidized and reduced.
<b>Conjugate addition</b>	Addition of a nucleophile to the beta carbon atom of an alpha,beta-unsaturated carbonyl compound.
<b>McLafferty Rearrangement</b>	A mass-spectral fragmentation pathway for carbonyl compounds.

Lesson 23 –

<b>Carboxylic acid</b>	A compound containing the -COOH functional group.
<b>Carboxylate ion</b>	Deprotonated form of a carboxylic acid
<b>Benzoic acid</b>	Benzene ring with a CO <sub>2</sub> H group.
<b>Benzoyl group</b>	The C <sub>6</sub> H <sub>5</sub> CO-group.
<b>Benzoate ion</b>	Deprotonated form of benzoic acid
<b>Electron-withdrawing group</b>	A group that withdraws electrons through resonance or inductive effects.
<b>pKa</b>	The negative log of the K <sub>a</sub> value.
<b>K<sub>a</sub></b>	Acidity constant.
<b>Acyl group</b>	A -COR group.
<b>Electron-donating group</b>	A group that donates electrons through resonance or inductive effects.

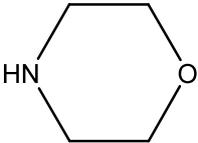
Lesson 24 – CH384

<b>Carboxylation</b>	The addition of CO <sub>2</sub> to a molecule.
<b>Decarboxylation</b>	The loss of CO <sub>2</sub> from a molecule.
<b>Nitrile</b>	-CN group

Lesson 25 –

<b>Carboxylic acid anhydride</b>	A compound containing the $\text{RCO}_2\text{COR}'$ functional group.
<b>Carboxylic acid halide</b>	A compound containing the $\text{RCOX}$ functional group.
<b>Amide</b>	A compound containing the $-\text{CONR}_2$ functional group.
<b>Ester</b>	A compound containing the $-\text{COOR}$ functional group.
<b>Fischer esterification</b>	The acid-catalyzed reaction of an alcohol with a carboxylic acid to yield an ester.
<b>Nucleophilic acyl substitution</b>	A reaction in which a nucleophile attacks a carbonyl compound and substitutes for a leaving group bonded to the carbonyl carbon.
<b>Hydolysis</b>	Reaction with water to yield a carboxylic acid.
<b>Alcoholysis</b>	Reaction with an alcohol to yield a carboxylic acid.
<b>Aminolysis</b>	Reaction with ammonia or an amine to yield a carboxylic acid.
<b>Reduction</b>	A reaction that causes an increase of electron ownership by carbon.
<b>Grignard reaction</b>	Reaction with an organomagnesium halide, $\text{RMgX}$ .

Lesson 26 –

<b>Saponification</b>	An old term for the base-induced hydrolysis of an ester to yield a carboxylic acid salt.
<b>Morpholine</b>	
<b>DIBAH</b>	Diisobutyl-aluminum hydride
<b>Lactone</b>	A cyclic ester.
<b>LiAlH(O-<i>t</i>-Bu)<sub>3</sub></b>	Lithium tri- <i>tert</i> -butoxyaluminum hydride

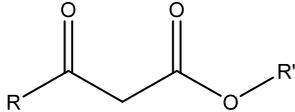
Lesson 28 –

<b>Lactam</b>	A cyclic amide.
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Lesson 29 –

<b>Alpha position</b>	The position next to a carbonyl group.
<b>Beta position</b>	The position two spaces from a carbonyl
<b>Enol</b>	A vinylic alcohol that is in equilibrium with a carbonyl compound.
<b>Enolate</b>	The anion of an enol.
<b>Alpha-substitution rxn</b>	The substitution of a hydrogen atom of a carbonyl compound by reaction with an electrophile.
<b>Hell-Vollhard-Zelinski rxn</b>	The reaction of a carboxylic acid with Br <sub>2</sub> and phosphorus to give an alpha-bromo carboxylic acid.
<b>Tautomer</b>	Isomers that are rapidly interconverted.
<b>Tautomerism</b>	The process of interconverting two compounds/.

Lesson 30 –

<b>Alpha-Hydrogen</b>	Hydrogen adjacent to a carbonyl group.
<b>Beta-diketone</b>	1,3 diketones
<b>Beta-Keto ester</b>	<p>3-oxo esters; </p>
<b>Haloform</b>	A trihalomethane, such as $\text{CHCl}_3$ , $\text{CHBr}_3$ , or $\text{CHI}_3$ .
<b>Haloform rxn</b>	The rxn of methyl ketones with halogen and a base to yield a haloform and a carboxylic acid.
<b>Lithium diisopropyl Amide (LDA)</b>	$[\text{Li}^+\text{N}(i\text{-C}_3\text{H}_7)_2]$

Lesson 31 –

<b>Acetoacetic ester synthesis</b>	The synthesis of a methyl ketone by alkylation of an alkyl halide, followed by hydrolysis and decarboxylation.
<b>Malonic ester synthesis</b>	The synthesis of a carboxylic acid by alkylation of an alkyl halide, followed by hydrolysis and decarboxylation.

Lesson 32 –

<b>Beta-hydroxy aldehyde</b>	An aldehyde that has an alcohol group in the Beta position.
<b>Aldol</b>	Common name for Beta-hydroxy aldehyde.
<b>Aldol reaction</b>	The carbonyl condensation reaction of an aldehyde or ketone to give a beta-hydroxy carbonyl compound.
<b>Beta-hydroxy carbonyl compound</b>	An aldehyde or ketone that has an alcohol group in the Beta position.
<b>Alpha,beta-unsaturated carbonyl compound</b>	An aldehyde or ketone that has a double bond between the alpha and beta carbons.
<b>Carbonyl condensation RXN</b>	The loss of water to create the alpha,beta-unsaturated carbonyl compound.

Lesson 33 –

<b>Claisen condensation</b>	The carbonyl condensation reaction of an ester to give a beta-keto ester product.
<b>Dieckmann cyclization reaction</b>	An intramolecular Claisen condensation reaction to give a cyclic beta-keto ester.
<b>Mixed aldol reaction</b>	An aldol reaction using two different carbonyl compounds.
<b>Mixed Claisen condensation</b>	A Claisen condensation between two different esters.

Lesson 34 –

<b>Alpha,beta-unsaturated carbonyl compound</b>	An aldehyde or ketone that has a double bond between the alpha and beta carbons.
<b>Conjugate addition</b>	Addition of a nucleophile to the beta carbon atom of an $\alpha$ - $\beta$ -unsaturated carbonyl compound.
<b>Michael reaction</b>	The conjugate addition reaction of an enolate ion to an unsaturated carbonyl compound.
<b>Enamine</b>	A compound with the $R_2N-CR=CR_2$ functional group.
<b>Stork enamine reaction</b>	A reaction involving an enamine adding to an $\alpha$ , $\beta$ -unsaturated carbonyl acceptor in a Michael-like process.
<b>Annulation</b>	The building of a new ring onto an existing molecule.
<b>Robinson annulation reaction</b>	A synthesis of cyclohexenones by sequential Michael reaction and intramolecular aldol reaction.

Lesson 35 –

<b>1<sup>o</sup>,2<sup>o</sup>,3<sup>o</sup> amine</b>	A compound containing one or more organic substituents bonded to a nitrogen atom, RNH <sub>2</sub> , R <sub>2</sub> NH, or R <sub>3</sub> N.
<b>4<sup>o</sup> ammonium salt</b>	Nitrogen with four attached groups and a positive charge.
<b>Arylamine</b>	An amino-substituted aromatic compound, ArNH <sub>2</sub> .
<b>Heterocyclic amine</b>	Compounds where the nitrogen atom occurs as part of a ring.

Lesson 37 –

<b>Curtius rearrangement</b>	The conversion of an acid chloride into an amine by reaction with azide ion, followed by heating with water.
<b>Hoffman rearrangement</b>	The conversion of an amide into an amine by reaction with Br <sub>2</sub> and base.
<b>Gabriel amine synthesis</b>	A method for preparing an amine by SN <sub>2</sub> reaction of an alkyl halide with potassium phthalimide, followed by hydrolysis.
<b>Imide</b>	A compound with the -CONHCO- functional group.
<b>Reductive amination</b>	A method for preparing an amine by reaction of an aldehyde or ketone with ammonia and a reducing agent.
<b>Azo compound</b>	A compound with the general structure R-N=N-R'.
<b>Hofmann elimination</b>	The elimination reaction of an amine to yield an alkene by reaction with iodomethane, followed by heating with Ag <sub>2</sub> O.
<b>Zaitsev elimination</b>	E2 elimination reactions normally yield the more highly substituted alkene as a major product.
<b>Azide synthesis</b>	A method for preparing amines by SN <sub>2</sub> reaction of an alkyl halide with azide ion, followed by reduction.

Lesson 38 –

<b>Arenediazonium salt</b>	A compound with an $N_2^+$ group bonded to an aromatic ring, used in the Sandmeyer reaction.
<b>Azo compound</b>	A compound with the general structure $R-N=N-R'$ .
<b>Sandmeyer reaction</b>	The nucleophilic substitution reaction of an arenediazonium salt with a cuprous halide to yield an aryl halide.
<b>Phase transfer</b>	Substances that cause the transfer of ions between water and organic phases, thus catalyzing reactions.
<b>Nitrogen rule in MS</b>	A compound with an odd number of nitrogen atoms has an odd-numbered molecular weight.