<table>
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<tr>
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<th>Terms</th>
<th>Definition</th>
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<tbody>
<tr>
<td>1</td>
<td>Acyclic compounds</td>
<td>Compounds that contain no rings.</td>
</tr>
<tr>
<td>1</td>
<td>Atomic number</td>
<td>The number of protons in the nucleus of an atom.</td>
</tr>
<tr>
<td>1</td>
<td>Atomic orbitals</td>
<td>The spaces occupied by electron pairs or unpaired electrons in atoms.</td>
</tr>
<tr>
<td>1</td>
<td>Atomic weight</td>
<td>The sum of the number of protons and neutrons in the nucleus of an atom.</td>
</tr>
<tr>
<td>1</td>
<td>Bond energy (BE)</td>
<td>The energy needed to break a mole of covalent bonds. The amount of energy depends on the type of bond broken.</td>
</tr>
<tr>
<td>1</td>
<td>Carbo cyclic compounds</td>
<td>Compounds that contain rings of carbon atoms.</td>
</tr>
<tr>
<td>1</td>
<td>Catenation</td>
<td>The ability of an element to form chains of its own atoms through covalent bonding.</td>
</tr>
<tr>
<td>1</td>
<td>Covalent bond(s)</td>
<td>A bond in which two atoms share one or more electron pairs – for example, C—C, C—H, or N—N.</td>
</tr>
<tr>
<td>1</td>
<td>Electronegativity</td>
<td>The tendency of atoms to accept electrons and form anions; the greater the electronegativity, the more the atom accepts electrons.</td>
</tr>
<tr>
<td>1</td>
<td>Electrons</td>
<td>Negatively charged particles that surround the nucleus of an atom.</td>
</tr>
<tr>
<td>1</td>
<td>Electropositivity</td>
<td>The tendency of atoms to give up electrons and form cations; the greater the electropositivity, the more easily the atom gives up electrons.</td>
</tr>
<tr>
<td>1</td>
<td>Formal charge</td>
<td>The formal charge of an atom in a molecule is equal to the number of valence electrons in the neutral atom, minus the number of covalent bonds in the atom, minus the number of unshared electrons on the atom.</td>
</tr>
<tr>
<td>1</td>
<td>Functional groups</td>
<td>Groups of atoms that have characteristic chemical properties regardless of the molecular framework to which they are attached: usually characteristic of a class of organic compounds – for example, C=C for alkenes and C—O—C for ethers.</td>
</tr>
<tr>
<td>1</td>
<td>Ionic compounds</td>
<td>Compounds composed of positively charged cations and negatively charged anions.</td>
</tr>
<tr>
<td>1</td>
<td>Molecular formula</td>
<td>The number of different atoms present in a molecule.</td>
</tr>
<tr>
<td>1</td>
<td>Molecular orbitals</td>
<td>The spaces occupied by electron pairs or unpaired electrons in molecules.</td>
</tr>
<tr>
<td>1</td>
<td>Molecule</td>
<td>Two or more atoms joined by covalent bonds.</td>
</tr>
<tr>
<td>1</td>
<td>Neutrons</td>
<td>Uncharged particles that reside in the nucleus of an atom.</td>
</tr>
<tr>
<td>1</td>
<td>Polar covalent bond</td>
<td>A covalent bond in which the electron pair is not shared equally between two atoms – for example, C—O or C—Cl.</td>
</tr>
<tr>
<td>1</td>
<td>Radical (or free radical)</td>
<td>A molecular fragment with an odd number of unshared electrons.</td>
</tr>
<tr>
<td>1</td>
<td>Structural formula(s)</td>
<td>A representation of how atoms are connected in a given molecule.</td>
</tr>
<tr>
<td>1</td>
<td>Valence</td>
<td>The valence of an element is the number of bonds that an atom of the element can form.</td>
</tr>
<tr>
<td>2</td>
<td>Axial</td>
<td>The six positions perpendicular to the mean plane of the ring in the chair conformation of a six-membered ring – for example, in cyclohexane.</td>
</tr>
<tr>
<td>2</td>
<td>Equatorial</td>
<td>The six positions parallel to the mean plane of the ring in the chair conformation of a six-membered ring – for example, in cyclohexane.</td>
</tr>
<tr>
<td>2</td>
<td>Free-radical chain reaction</td>
<td>A reaction that involves free radical intermediates and involves propagation steps, the sum of which constitutes the overall equation for the reaction.</td>
</tr>
<tr>
<td>2</td>
<td>Homologous series</td>
<td>A series of compounds that grow by addition of a regular unit of structure and share similar properties – for example, methane, ethane, propane, and so on represent a homologous series of alkanes, wherein the regular unit is a methylene group.</td>
</tr>
<tr>
<td>2</td>
<td>Isobutyl group (2-methylpropyl group)</td>
<td>The (CH₃)₂CHCH₂— group.</td>
</tr>
<tr>
<td>2</td>
<td>IUPAC</td>
<td>International Union of Pure and Applied Chemistry.</td>
</tr>
<tr>
<td>2</td>
<td>Natural gas</td>
<td>Methane from petroleum.</td>
</tr>
<tr>
<td>2</td>
<td>Reaction mechanism</td>
<td>A step-by-step description of the bond-breaking and bond-making processes that occur when reagents react to form products.</td>
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</tr>
<tr>
<td>2</td>
<td>sec-Butyl group</td>
<td>The CH3CH2CH(CH3)— group.</td>
</tr>
<tr>
<td>2</td>
<td>tert-Butyl group</td>
<td>The (CH3)3C— group.</td>
</tr>
<tr>
<td>3</td>
<td>Alkadienes</td>
<td>Compounds with two carbon–carbon double bonds.</td>
</tr>
<tr>
<td>3</td>
<td>Allyl group</td>
<td>The CH2==CHCH2— group.</td>
</tr>
<tr>
<td>3</td>
<td>Catalysts</td>
<td>Compounds that increase the rate of reaction but can be recovered unchanged at the end of the reaction.</td>
</tr>
<tr>
<td>3</td>
<td>Conjugated</td>
<td>Multiple bonds that are separated by one single bond (C==C—C==C or C==C—C==O or C==C—C==C).</td>
</tr>
<tr>
<td>3</td>
<td>Cumulated double bonds</td>
<td>Double bonds that are next to each other (C==C==C).</td>
</tr>
<tr>
<td>3</td>
<td>Electrophiles</td>
<td>Electron-poor reactants: they seek electrons and form bonds to nucleophiles.</td>
</tr>
<tr>
<td>3</td>
<td>Electrophilic addition reaction</td>
<td>A reaction in which an electrophile adds to a carbon–carbon multiple bond.</td>
</tr>
<tr>
<td>3</td>
<td>Hydroboration</td>
<td>The addition of borane (H—B bond) to an alkene.</td>
</tr>
<tr>
<td>3</td>
<td>Lindlar's catalyst</td>
<td>A palladium catalyst used in the hydrogenation of alkynes to alkenes.</td>
</tr>
<tr>
<td>3</td>
<td>Ozonolysis</td>
<td>A reaction of alkenes with ozone to give carbonyl compounds; proceeds via intermediate molozonides and ozonides.</td>
</tr>
<tr>
<td>3</td>
<td>Platforming</td>
<td>A process that dehydrogenates alkanes to cycloalkanes and aromatic hydrocarbons.</td>
</tr>
<tr>
<td>3</td>
<td>Reaction rate</td>
<td>How fast a reaction takes place.</td>
</tr>
<tr>
<td>3</td>
<td>sp2-hybrid orbitals</td>
<td>Orbitals that are one part s and two parts p in character and are directed, from the atom to which they belong, toward the three vertices (corners) of an equilateral triangle. The angle between two sp2-hybrid orbitals is 120 degrees.</td>
</tr>
<tr>
<td>3</td>
<td>sp-hybrid orbitals</td>
<td>Orbitals that are one part s and one part p in character and are directed, from the atom to which they belong, in opposite directions along a line. The angle between two sp-hybrid orbitals is 180 degrees.</td>
</tr>
<tr>
<td>3</td>
<td>Transition state</td>
<td>The structure with maximum energy for a particular reaction step.</td>
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<td>4</td>
<td>Activating groups</td>
<td>Substituents that, when on a benzene ring, increase the rate of electrophilic aromatic reactions relative to benzene – for example, alkyl, alkoxy, and amino groups.</td>
</tr>
<tr>
<td>4</td>
<td>Aromaticity</td>
<td>The unusual stability of certain fully conjugated cyclic systems.</td>
</tr>
<tr>
<td>4</td>
<td>Benzyl group</td>
<td>The C6H5CH2— group.</td>
</tr>
<tr>
<td>4</td>
<td>Cyano group</td>
<td>The —C==N group.</td>
</tr>
<tr>
<td>4</td>
<td>Deactivating groups</td>
<td>Substituents that, when on a benzene ring, slow the rate of electrophilic aromatic reactions relative to benzene – for example, nitro, halogen, and acyl groups.</td>
</tr>
<tr>
<td>4</td>
<td>meta-directing group</td>
<td>A substituent on a benzene that directs an electrophile to positions meta to it on the ring.</td>
</tr>
<tr>
<td>4</td>
<td>Resonance energy (stabilization energy)</td>
<td>The difference between the energy of a real molecule and the calculated energy of the most stable contributing resonance structure.</td>
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<td>5</td>
<td>Absolute configuration</td>
<td>The configuration (R or S) of a stereogenic center in a molecule.</td>
</tr>
<tr>
<td>5</td>
<td>Achiral</td>
<td>Lacking the property of handedness.</td>
</tr>
<tr>
<td>5</td>
<td>Chiral</td>
<td>The property of handedness; an object is chiral if it is not superimposable on its mirror image.</td>
</tr>
<tr>
<td>5</td>
<td>Configuration(s)</td>
<td>The arrangement of four groups attached to a stereogenic center, usually defined by the R-S convention.</td>
</tr>
<tr>
<td>5</td>
<td>Dextrorotatory</td>
<td>The property of rotating plane-polarized light in a clockwise direction.</td>
</tr>
<tr>
<td>5</td>
<td>E-Z convention</td>
<td>A method of assigning geometry at double bonds in alkenes.</td>
</tr>
<tr>
<td>5</td>
<td>Levorotatory</td>
<td>The property of rotating plane-polarized light in a counter-clockwise direction.</td>
</tr>
<tr>
<td>5</td>
<td>Meso compounds</td>
<td>Compounds that are achiral but contain stereogenic centers; such compounds always have a mirror plane of symmetry.</td>
</tr>
<tr>
<td>5</td>
<td>Optical activity</td>
<td>The property of rotating plane-polarized light.</td>
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<tr>
<td>5</td>
<td>Plane of symmetry (mirror plane)</td>
<td>A plane that passes through a molecule (or object) in such a way that what is on one side is the exact reflection of what is on the other side. A molecule with a mirror plane of symmetry is achiral.</td>
</tr>
<tr>
<td>5</td>
<td>Plane-polarized light</td>
<td>Light composed of waves that vibrate in parallel planes.</td>
</tr>
<tr>
<td>5</td>
<td>Polarimeter</td>
<td>An instrument used to measure optical activity.</td>
</tr>
<tr>
<td>5</td>
<td>Racemic mixture</td>
<td>A 50:50 mixture of enantiomers.</td>
</tr>
<tr>
<td>5</td>
<td>Resolution</td>
<td>The process of separating the two enantiomers of a racemic mixture.</td>
</tr>
<tr>
<td>5</td>
<td>R-S convention</td>
<td>Systematic method of assigning the configuration of a stereogenic center.</td>
</tr>
<tr>
<td>5</td>
<td>Specific rotation</td>
<td>A property of a pure enantiomer that indicates the direction (levorotatory or dextrorotatory) and magnitude to which it rotates plane-polarized light.</td>
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<tr>
<td>6</td>
<td>Chlorofluorocarbons (CFCs or Freons)</td>
<td>Polyhalogenated compounds containing chlorine and fluorine.</td>
</tr>
<tr>
<td>6</td>
<td>Dehydrohalogenation</td>
<td>Reactions of alkyl halides in which a hydrogen atom and a halogen atom from adjacent carbons are eliminated and a carbon–carbon double bond is formed.</td>
</tr>
<tr>
<td>6</td>
<td>E1 mechanism</td>
<td>An elimination reaction mechanism: a two-step process in which a leaving group departs from the substrate, followed by loss of a proton from the carbon adjacent to the resulting carbocation with overall formation of a C**C.</td>
</tr>
<tr>
<td>6</td>
<td>E2 mechanism</td>
<td>An elimination reaction mechanism: a one-step process in which a hydrogen atom and leaving group are eliminated from adjacent carbon atoms and a carbon–carbon double bond is formed.</td>
</tr>
<tr>
<td>6</td>
<td>Halons</td>
<td>Polyhalogenated compounds containing bromine, chlorine, and fluorine.</td>
</tr>
<tr>
<td>6</td>
<td>Leaving group</td>
<td>An atom or group of atoms that leaves from a substrate (along with a pair of electrons) in a nucleophilic substitution reaction.</td>
</tr>
<tr>
<td>6</td>
<td>Polar protic solvents</td>
<td>Solvents that are polar and can donate protons – for example, water, alcohols, and low-molecular-weight carboxylic acids.</td>
</tr>
<tr>
<td>6</td>
<td>SN1 mechanism</td>
<td>A nucleophilic substitution reaction mechanism: a two-step process in which the bond from the substrate carbon to a leaving group breaks to give a carbocation, followed by reaction of the carbocation with a nucleophile.</td>
</tr>
<tr>
<td>6</td>
<td>SN2 mechanism</td>
<td>A nucleophilic substitution reaction mechanism: a one-step process in which the bond from the substrate carbon to a leaving group breaks as the bond from that carbon to the nucleophile begins to form.</td>
</tr>
<tr>
<td>7</td>
<td>Bronsted-Lowry acid</td>
<td>A proton donor.</td>
</tr>
<tr>
<td>7</td>
<td>Bronsted-Lowry base</td>
<td>A proton acceptor.</td>
</tr>
<tr>
<td>7</td>
<td>Conjugate base</td>
<td>The product of deprotonation of a given acid is the conjugate base of the acid.</td>
</tr>
<tr>
<td>7</td>
<td>Disulfides</td>
<td>Compounds containing a disulfide bond (S—S).</td>
</tr>
<tr>
<td>7</td>
<td>Jones’ reagent</td>
<td>An oxidizing agent composed of CrO3 dissolved in aqueous H2SO4 and commonly used with acetone as a solvent.</td>
</tr>
<tr>
<td>7</td>
<td>Lewis acid (s)</td>
<td>An electron-pair acceptor.</td>
</tr>
<tr>
<td>7</td>
<td>Sulphydryl group</td>
<td>The functional group —SH.</td>
</tr>
<tr>
<td>8</td>
<td>Antioxidants</td>
<td>Compounds that prevent oxidation of substances sensitive to oxygen in air.</td>
</tr>
<tr>
<td>8</td>
<td>Carbanions</td>
<td>An alkyl or aryl group with a negatively charged carbon atom.</td>
</tr>
<tr>
<td>8</td>
<td>Crown ethers</td>
<td>Macrocyclic polyethers that form complexes with positive ions.</td>
</tr>
<tr>
<td>8</td>
<td>Pheromones</td>
<td>Chemical substances emitted by insects and animals for the purpose of communication.</td>
</tr>
<tr>
<td>8</td>
<td>Williamson synthesis</td>
<td>The preparation of an ether by reaction of an alkoxide with an alkyl halide.</td>
</tr>
<tr>
<td>9</td>
<td>a-Carbon</td>
<td>The carbon atom bonded to a carbonyl carbon.</td>
</tr>
<tr>
<td>9</td>
<td>Acetal(s)</td>
<td>Compounds with two alkoxy groups bonded to the same carbon atom.</td>
</tr>
<tr>
<td>9</td>
<td>Aldol</td>
<td>A 3-hydroxyaldehyde or 3-hydroxyketone.</td>
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<tr>
<td>9</td>
<td>Aldol condensation</td>
<td>A reaction in which an enolate anion adds to the carbonyl group of an aldehyde or ketone to give an aldol.</td>
</tr>
<tr>
<td>9</td>
<td>Cyanohydrins</td>
<td>Compounds with a hydroxyl group and a cyano group bonded to the same carbon.</td>
</tr>
<tr>
<td>9</td>
<td>Enolate anion(s)</td>
<td>The anion formed by removal of the α-hydrogen of a carbonyl compound by a base.</td>
</tr>
<tr>
<td>9</td>
<td>Tautomerism</td>
<td>The process of interconversion of tautomers, such as keto and enol forms of a carbonyl compound.</td>
</tr>
<tr>
<td>9</td>
<td>Tautomers</td>
<td>Structural isomers that differ in the location of a proton and a double bond.</td>
</tr>
<tr>
<td>10</td>
<td>Acetyl group (ethanol group)</td>
<td>The CH₃CO— group.</td>
</tr>
<tr>
<td>10</td>
<td>Acid anhydrides</td>
<td>Carboxylic acid derivatives formed by condensing two carboxylic acid molecules with elimination of a molecule of water.</td>
</tr>
<tr>
<td>10</td>
<td>Acyl halides</td>
<td>A carboxylic acid derivative in which the —OH group is replaced by a halogen atom.</td>
</tr>
<tr>
<td>10</td>
<td>Benzoyl group</td>
<td>The C₆H₅CO— group.</td>
</tr>
<tr>
<td>10</td>
<td>Carboxylate salt(s)</td>
<td>The conjugate base of a carboxylic acid.</td>
</tr>
<tr>
<td>10</td>
<td>Claisen condensation</td>
<td>Reaction of the enolate of an ester with another ester to give a β-keto ester.</td>
</tr>
<tr>
<td>10</td>
<td>Fischer esterification</td>
<td>The acid-catalyzed condensation of a carboxylic acid with an alcohol.</td>
</tr>
<tr>
<td>10</td>
<td>Formyl group</td>
<td>The —CHO group.</td>
</tr>
<tr>
<td>10</td>
<td>Isoelectric point (pI)</td>
<td>The pH at which an amino acid is in its dipolar form and has no net charge.</td>
</tr>
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<td>10</td>
<td>Lactones</td>
<td>Cyclic esters.</td>
</tr>
<tr>
<td>10</td>
<td>Nucleophilic acyl substitution</td>
<td>A substitution reaction in which the hydroxyl group of a carboxylic acid is replaced with another group; also used in reference to conversion of one carboxylic acid derivative to another carbonyl compound.</td>
</tr>
<tr>
<td>11</td>
<td>Alkaloids</td>
<td>Basic nitrogen-containing compounds of plant or animal origin.</td>
</tr>
<tr>
<td>11</td>
<td>Alkylammonium salts</td>
<td>Ionic compounds formed from reaction of alkyl amines with strong acids.</td>
</tr>
<tr>
<td>11</td>
<td>Amidate anion</td>
<td>The anion formed by removal of a proton from an amide nitrogen.</td>
</tr>
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<td>11</td>
<td>Azo compound(s)</td>
<td>Compounds with an azo group.</td>
</tr>
<tr>
<td>11</td>
<td>Azo group</td>
<td>The —N=N— group.</td>
</tr>
<tr>
<td>11</td>
<td>Diazonio group</td>
<td>The —N₂⁺ group.</td>
</tr>
<tr>
<td>11</td>
<td>Diazotization</td>
<td>The reaction of an amine with nitrous acid to give a diazonium salt.</td>
</tr>
<tr>
<td>11</td>
<td>Frequency</td>
<td>A property of radiation that is directly proportional to its energy; the greater the frequency of light, the greater its energy.</td>
</tr>
<tr>
<td>11</td>
<td>Quaternary ammonium salts</td>
<td>Ionic compounds with four organic groups (alkyl or aryl) bonded to nitrogen.</td>
</tr>
<tr>
<td>11</td>
<td>Sandmeyer reaction</td>
<td>The reaction of aryldiazonium salts with cupric salts to form aryl chlorides, bromides, or cyanides.</td>
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<td>12</td>
<td>Chemical shift</td>
<td>The position where a given nucleus will appear in an NMR spectrum relative to a standard nucleus.</td>
</tr>
<tr>
<td>12</td>
<td>Coupling constants (J)</td>
<td>The number of hertz by which NMR signals for a nucleus are split due to the phenomenon of spin-spin splitting.</td>
</tr>
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<td>12</td>
<td>Functional group bands</td>
<td>Absorptions in IR spectroscopy that indicate the presence of a specific functional group, such as carbonyl or hydroxyl groups.</td>
</tr>
<tr>
<td>12</td>
<td>Infrared spectroscopy (IR)</td>
<td>A type of spectroscopy in which infrared radiation is used to induce the stretching and bending of bonds.</td>
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<td>12</td>
<td>Mass spectrometry (MS)</td>
<td>A spectroscopic technique used to determine the elemental composition of compounds.</td>
</tr>
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<td>12</td>
<td>Spectroscopy</td>
<td>The study of the absorption of light by molecules.</td>
</tr>
<tr>
<td>12</td>
<td>Spin-spin splitting</td>
<td>A phenomenon that gives rise to multiple signals for a single nucleus in NMR spectroscopy.</td>
</tr>
<tr>
<td>12</td>
<td>Ultraviolet-visible spectroscopy</td>
<td>A type of spectroscopy in which ultraviolet or visible radiation is used to induce electronic transitions in molecules.</td>
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</tr>
<tr>
<td>12</td>
<td>Visible-ultraviolet spectroscopy</td>
<td>A type of spectroscopy in which ultraviolet or visible radiation is used to induce electronic transitions in molecules.</td>
</tr>
<tr>
<td>12</td>
<td>Wavelength</td>
<td>A property of radiation that is inversely proportional to its energy; the greater the wavelength of light, the lower its energy.</td>
</tr>
<tr>
<td>12</td>
<td>Wavenumber</td>
<td>The number of waves per centimeter (of light); used in infrared spectroscopy, this quantity is directly proportional to the energy of radiation; the greater the wavenumber of light, the greater its energy.</td>
</tr>
<tr>
<td>13</td>
<td>Antihistamines</td>
<td>Compounds that counteract effects of the imidazole-containing toxin histamine.</td>
</tr>
<tr>
<td>13</td>
<td>Azoles</td>
<td>Five-membered ring heterocycles with an O, N, or S atom at position 1 and an N atom at position 3.</td>
</tr>
<tr>
<td>13</td>
<td>Diazines</td>
<td>Six-membered ring aromatic heterocycles containing two N atoms.</td>
</tr>
<tr>
<td>13</td>
<td>Heteroatoms</td>
<td>Atoms other than carbon or hydrogen.</td>
</tr>
<tr>
<td>13</td>
<td>Indoles</td>
<td>Biologically important heterocyclic aromatic compounds that consist of a benzene ring fused to the C2—C3 bond of pyrrole.</td>
</tr>
<tr>
<td>14</td>
<td>Addition polymer(s)</td>
<td>Macromolecules formed by addition of one monomer unit to another in a repetitive manner – for example, polyethylene or polystyrene.</td>
</tr>
<tr>
<td>14</td>
<td>Atactic polymer</td>
<td>Vinyl polymer with random configurations at stereogenic centers.</td>
</tr>
<tr>
<td>14</td>
<td>Condensation polymer (step-growth polymer)</td>
<td>A polymer formed by reaction of two different functional groups with a loss of a small molecule – for example, a polyamide (nylon) or polyester (Dacron).</td>
</tr>
<tr>
<td>14</td>
<td>Copolymers</td>
<td>Addition polymers formed from two different monomers.</td>
</tr>
<tr>
<td>14</td>
<td>Homopolymer(s)</td>
<td>Polymer formed from one kind of monomer.</td>
</tr>
<tr>
<td>14</td>
<td>Isocyanates</td>
<td>A class of compound with the functional group —N<strong>C</strong>O.</td>
</tr>
<tr>
<td>14</td>
<td>Isotactic polymer</td>
<td>Vinyl polymer with the same configuration at each stereogenic center.</td>
</tr>
<tr>
<td>14</td>
<td>Lactams</td>
<td>Cyclic amides.</td>
</tr>
<tr>
<td>14</td>
<td>Plasticizers</td>
<td>Low-molecular-weight compounds, frequently esters, that act as lubricants between polymer chains to soften polymers.</td>
</tr>
<tr>
<td>14</td>
<td>Polyamide</td>
<td>A condensation (step-growth) polymer made from diacid and diamine monomers – for example, nylon.</td>
</tr>
<tr>
<td>14</td>
<td>Polyurethanes</td>
<td>Step-growth polymers made from diisocyanate and diol monomers.</td>
</tr>
<tr>
<td>14</td>
<td>Thermoplastic polymer</td>
<td>A polymer that melts upon heating and hardens again upon cooling – for example, polystyrene.</td>
</tr>
<tr>
<td>14</td>
<td>Thermosetting polymer</td>
<td>A polymer that when heated forms cross-links and hardens irreversibly.</td>
</tr>
<tr>
<td>14</td>
<td>Urethanes (carbamates)</td>
<td>A class of compounds that contain the ester and amide functional groups at the same carbonyl group (RNHCO2R').</td>
</tr>
<tr>
<td>14</td>
<td>Vulcanization</td>
<td>A process of cross-linking rubber by heating it with sulfur.</td>
</tr>
<tr>
<td>15</td>
<td>Fatty acids</td>
<td>Long-chain carboxylic acids obtained from saponification of fats and oils.</td>
</tr>
<tr>
<td>15</td>
<td>Hardening</td>
<td>The process of converting oils to fats by catalytic hydrogenation of double bonds.</td>
</tr>
<tr>
<td>15</td>
<td>Hydrophilic</td>
<td>Attracted to or soluble in water.</td>
</tr>
<tr>
<td>15</td>
<td>Lipids</td>
<td>Constituents of plants or animals that are insoluble in water but soluble in nonpolar organic solvents – for example, animal fat, vegetable oils, and cholesterol.</td>
</tr>
<tr>
<td>15</td>
<td>Lipophilic</td>
<td>Attracted to or soluble in fats and oils.</td>
</tr>
<tr>
<td>15</td>
<td>Micelle</td>
<td>A spherical aggregate of molecules (such as soaps) in water with the nonpolar (hydrophobic) groups in the center and the polar (hydrophilic) groups at the surface.</td>
</tr>
<tr>
<td>15</td>
<td>Oils</td>
<td>Triglycerides with a high unsaturated fatty acid content.</td>
</tr>
<tr>
<td>15</td>
<td>Phospholipids</td>
<td>Fats in which one ester is replaced by a phosphatidylamine.</td>
</tr>
<tr>
<td>15</td>
<td>Soaps</td>
<td>The salts (usually sodium) of long-chain fatty acids.</td>
</tr>
<tr>
<td>15</td>
<td>Steroids</td>
<td>Tetracyclic lipids derived from the acyclic triterpene squalene.</td>
</tr>
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<td>Definition</td>
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</tr>
<tr>
<td>15</td>
<td>Surfactants</td>
<td>Molecules with polar and nonpolar parts (for example, soaps) that effect interface between different substances (for example, oil and water).</td>
</tr>
<tr>
<td>15</td>
<td>Synthetic detergents (syndets)</td>
<td>Synthetic soaplike molecules designed to work well in hard water and produce neutral solutions.</td>
</tr>
<tr>
<td>16</td>
<td>Aldaric acid</td>
<td>A polyhydroxy diacid obtained by oxidation of the aldehyde and primary alcohol carbons of an aldose to carboxylic acids.</td>
</tr>
<tr>
<td>16</td>
<td>Alditols</td>
<td>The polyol obtained when the carbonyl group of an aldose or ketose is reduced.</td>
</tr>
<tr>
<td>16</td>
<td>Aldonic acid</td>
<td>The polyhydroxy acid obtained upon oxidation of the aldehyde group of an aldose.</td>
</tr>
<tr>
<td>16</td>
<td>Aldose(s)</td>
<td>Polyhydroxylaldehyde(s).</td>
</tr>
<tr>
<td>16</td>
<td>Amino sugars</td>
<td>Carbohydrates in which a hydroxyl group is replaced by an amino group.</td>
</tr>
<tr>
<td>16</td>
<td>Anomeric carbon</td>
<td>The hemiacetal carbon in a cyclic monosaccharide.</td>
</tr>
<tr>
<td>16</td>
<td>Anomers</td>
<td>Monosaccharides that differ in configuration only at the anomeric carbon.</td>
</tr>
<tr>
<td>16</td>
<td>Carbohydrates</td>
<td>Polyhydroxylaldehydes, polyhydroxy ketones, or substances that give such compounds upon hydrolysis with aqueous acid (the hydroxyl group and the carbonyl group are the major functional groups in carbohydrates).</td>
</tr>
<tr>
<td>16</td>
<td>Disaccharide(s)</td>
<td>A carbohydrate in which a glycosidic bond links the anomeric carbon of one monosaccharide to a hydroxyl group of another monosaccharide.</td>
</tr>
<tr>
<td>16</td>
<td>Epimers</td>
<td>Diastereomers that differ in configuration at only one stereogenic center.</td>
</tr>
<tr>
<td>16</td>
<td>Furanose</td>
<td>Monosaccharide with a five-membered ring oxygen heterocycle.</td>
</tr>
<tr>
<td>16</td>
<td>Glycosides</td>
<td>Acetals derived by replacing the anemic hydroxyl (OH) group of a monosaccharide with an alkoxy (OR) group.</td>
</tr>
<tr>
<td>16</td>
<td>Glycosidic bond</td>
<td>The bond from the anomeric carbon to the alkoxy (OR) group in a glycoside.</td>
</tr>
<tr>
<td>16</td>
<td>Ketose(s)</td>
<td>A polyhydroxyketone.</td>
</tr>
<tr>
<td>16</td>
<td>Monosaccharides</td>
<td>Carbohydrates that cannot be hydrolyzed by aqueous acid to simpler carbohydrates (sometimes called simple sugars).</td>
</tr>
<tr>
<td>16</td>
<td>Mutarotation</td>
<td>Changes in optical rotation due to interconversion of anomers in solution.</td>
</tr>
<tr>
<td>16</td>
<td>Oligosaccharides</td>
<td>Carbohydrates in which a few monosaccharides are linked together by glycosidic bonds.</td>
</tr>
<tr>
<td>16</td>
<td>Pentose</td>
<td>A monosaccharide that contains five carbon atoms.</td>
</tr>
<tr>
<td>16</td>
<td>Polysaccharides</td>
<td>Carbohydrates that contain hundreds or even thousands of monosaccharide units linked together by glycosidic bonds.</td>
</tr>
<tr>
<td>16</td>
<td>Pyranose</td>
<td>Monosaccharide with a six-membered ring oxygen heterocycle.</td>
</tr>
<tr>
<td>16</td>
<td>Reducing sugar</td>
<td>A carbohydrate that reduces Ag+ or Cu2+ and is itself oxidized to a carboxylic acid.</td>
</tr>
<tr>
<td>16</td>
<td>Tetrose</td>
<td>A monosaccharide that contains four carbon atoms.</td>
</tr>
<tr>
<td>16</td>
<td>Triose</td>
<td>A monosaccharide that contains three carbon atoms.</td>
</tr>
<tr>
<td>16</td>
<td>Trisaccharide</td>
<td>A carbohydrate in which three monosaccharides are linked together by glycosidic bonds.</td>
</tr>
<tr>
<td>17</td>
<td>a-Amino acid(s)</td>
<td>A carboxylic acid (RCO2H) with an amino group or substituted amino group on the carbon next to the carboxyl group (alpha carbon).</td>
</tr>
<tr>
<td>17</td>
<td>Electrophoresis</td>
<td>A method for separating amino acids and proteins based on their charge differences and direction of migration in an electric field at controlled pH.</td>
</tr>
<tr>
<td>17</td>
<td>Essential amino acids</td>
<td>Amino acids that cannot be synthesized by adult humans and therefore must be included in the diet in the form of protein.</td>
</tr>
<tr>
<td>17</td>
<td>Fibrous proteins</td>
<td>Water-insoluble proteins used for structural purposes – for example, as skin, hair, feathers, claws and nails, and connective tissue.</td>
</tr>
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</tr>
<tr>
<td>17</td>
<td>Globular proteins</td>
<td>Proteins that tend to be spherical in shape and are soluble in water – for example, some enzymes and hormones.</td>
</tr>
<tr>
<td>17</td>
<td>Peptide bond</td>
<td>An amide bond linking two amino acids.</td>
</tr>
<tr>
<td>17</td>
<td>Peptides</td>
<td>A few α-amino acids joined together by amide (peptide) bonds.</td>
</tr>
<tr>
<td>17</td>
<td>Pleated-sheet</td>
<td>A common secondary structure in proteins wherein peptide chains lie side-by-side and are held together by interchain hydrogen bonds.</td>
</tr>
<tr>
<td>17</td>
<td>Quaternary structure (of proteins)</td>
<td>The structure of aggregates formed by subunits of a high-molecular-weight protein – for example, hemoglobin.</td>
</tr>
<tr>
<td>17</td>
<td>t-Butoxycarbonyl (Boc) group</td>
<td>An amino protecting group frequently used in peptide synthesis [—CO2C(CH3)3].</td>
</tr>
<tr>
<td>18</td>
<td>Anticodon loop</td>
<td>A portion of a tRNA with three base pairs complementary to the three-base code for a specific amino acid on an mRNA.</td>
</tr>
<tr>
<td>18</td>
<td>Codon</td>
<td>A three-base sequence located on mRNA that codes for the introduction of one amino acid into a protein.</td>
</tr>
<tr>
<td>18</td>
<td>DNA replication</td>
<td>The process by which copies of DNA molecules are made.</td>
</tr>
<tr>
<td>18</td>
<td>Genetic code</td>
<td>The relationship between the base sequence in DNA and the amino acid sequence in a protein.</td>
</tr>
<tr>
<td>18</td>
<td>Nucleoside</td>
<td>An N-glycoside in which a pyrimidine or purine base is connected to the anomeric carbon of either 2-deoxy-D-ribose (in DNA) or D-ribose (in RNA) by a carbon–nitrogen bond.</td>
</tr>
<tr>
<td>18</td>
<td>Nucleotide</td>
<td>Phosphate ester of a nucleoside.</td>
</tr>
<tr>
<td>18</td>
<td>Oligonucleotide</td>
<td>A chain of several nucleotides connected by phosphodiester linkages.</td>
</tr>
<tr>
<td>18</td>
<td>Polymerase chain reaction (PCR)</td>
<td>A technique for making many copies of a specific DNA sequence.</td>
</tr>
<tr>
<td>18</td>
<td>Ribozymes</td>
<td>RNA molecules that function as catalysts, like enzymes.</td>
</tr>
<tr>
<td>18</td>
<td>Transcription</td>
<td>The process of converting DNA to messenger RNA, an important step in protein biosynthesis.</td>
</tr>
<tr>
<td>18</td>
<td>Transfer RNA (tRNA)</td>
<td>A nucleic acid that carries activated amino acids to ribosomes for peptide biosynthesis.</td>
</tr>
<tr>
<td>1, 10, 11, 12</td>
<td>Nitrile(s)</td>
<td>Compound with a cyano group.</td>
</tr>
<tr>
<td>1, 10, 11, 14, 16, 17</td>
<td>Amides</td>
<td>Carboxylic acid derivatives in which the —OH group is replaced by —NH2, —NHR, or —NR2.</td>
</tr>
<tr>
<td>1, 10, 12, 16</td>
<td>Esters</td>
<td>Carboxylic acid derivatives in which the hydroxyl group is replaced by an alkoxy (OR) group.</td>
</tr>
<tr>
<td>1, 11</td>
<td>Resonance structures</td>
<td>Two or more structures of a molecule or ion with identical arrangements of the atoms but different arrangements of the electrons.</td>
</tr>
<tr>
<td>1, 12</td>
<td>Protons</td>
<td>Positively charged particles that reside in the nucleus of an atom.</td>
</tr>
<tr>
<td>1, 13</td>
<td>Heterocyclic compounds</td>
<td>Cyclic organic compounds in which one or more carbon atoms are replaced with heteroatoms, atoms other than C or H.</td>
</tr>
<tr>
<td>1, 16</td>
<td>Chair conformation</td>
<td>The most stable conformation of a six-membered ring in which all bonds are staggered – for example, the chair conformation of cyclohexane.</td>
</tr>
<tr>
<td>1, 2</td>
<td>sp3-hybrid orbitals</td>
<td>Orbitals that are one part s and three parts p in character and are directed, from the atom to which they belong, toward the corners of a tetrahedron. The angle between such orbitals is 109.5 degrees.</td>
</tr>
<tr>
<td>1, 2</td>
<td>Structural isomers (constitutional isomers)</td>
<td>Isomers with the same molecular formula but with different structural formulas.</td>
</tr>
<tr>
<td>1, 2, 17</td>
<td>Bond angle(s)</td>
<td>The angle made by two covalent bonds to the same atom.</td>
</tr>
<tr>
<td>1, 2, 3</td>
<td>Petroleum</td>
<td>A complex mixture of organic compounds, many of which are alkanes and cycloalkanes.</td>
</tr>
<tr>
<td>1, 2, 3, 4</td>
<td>Hydrocarbons</td>
<td>Organic compounds that contain only carbon and hydrogen atoms.</td>
</tr>
<tr>
<td>1, 2, 3, 5, 9, 10</td>
<td>Isomers</td>
<td>Molecules with the same number and kinds of atoms but different arrangements of the atoms.</td>
</tr>
<tr>
<td>1, 2, 3, 8, 11, 12</td>
<td>Alkanes</td>
<td>Saturated hydrocarbons that are acyclic.</td>
</tr>
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<td>Definition</td>
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</tr>
<tr>
<td>1, 2, 3, 9</td>
<td>Sigma bond (σ bond)</td>
<td>A bond formed by end-on overlap of two orbitals on adjacent atoms. Electron density in the bond is space around a line connecting the adjacent atoms.</td>
</tr>
<tr>
<td>1, 3</td>
<td>Cracking</td>
<td>A process that uses catalysts to convert alkanes (from petroleum) to lower molecular weight alkanes and alkenes.</td>
</tr>
<tr>
<td>1, 3</td>
<td>Trigonal carbon</td>
<td>When a carbon atom is bonded to only three other atoms, as the carbon C<strong>C and C</strong>O groups.</td>
</tr>
<tr>
<td>1, 3, 4, 17</td>
<td>Bond length</td>
<td>The average distance between two covalently bonded atoms.</td>
</tr>
<tr>
<td>1, 3, 4, 5, 12</td>
<td>Double bond(s)</td>
<td>A bond in which two electron pairs are shared between the same two atoms – for example, C<strong>C or C</strong>O.</td>
</tr>
<tr>
<td>1, 3, 5, 10, 12</td>
<td>Triple bond</td>
<td>A bond in which three electron pairs are shared between the same two atoms – for example, C<em><strong>C or C</strong></em>N.</td>
</tr>
<tr>
<td>1, 3, 6, 7, 8, 9, 10, 11, 12, 14, 16</td>
<td>Alcohols</td>
<td>Compounds with a hydroxyl group.</td>
</tr>
<tr>
<td>1, 3, 7, 8, 12, 14</td>
<td>Alkenes</td>
<td>Compounds with a carbon–carbon double bond.</td>
</tr>
<tr>
<td>1, 3, 9, 12</td>
<td>Alkynes</td>
<td>Compounds with a carbon–carbon triple bond.</td>
</tr>
<tr>
<td>1, 4</td>
<td>Arenes</td>
<td>Aromatic hydrocarbons in which an aryl group is bonded to one or more alkyl groups.</td>
</tr>
<tr>
<td>1, 4, 10, 17</td>
<td>Carboxyl group</td>
<td>The functional group —CO2H, from attachment of a hydroxyl group to the carbon atom of a carbonyl group.</td>
</tr>
<tr>
<td>1, 4, 11, 17</td>
<td>Amino group</td>
<td>The functional group —NH2.</td>
</tr>
<tr>
<td>1, 5</td>
<td>Tetrahedral carbon</td>
<td>When a carbon atom is bonded to four other atoms.</td>
</tr>
<tr>
<td>1, 6, 10, 11, 12</td>
<td>Amines</td>
<td>Organic bases derived from ammonia; primary amines (RNH2) have an alkyl or aryl group bonded to an amino group; secondary (R2NH) and tertiary amines (R3N) have two and three groups bonded to nitrogen.</td>
</tr>
<tr>
<td>1, 6, 7, 10, 11</td>
<td>Alkyl halides</td>
<td>Compounds with halogen substituents (fluoro, chloro, bromo, and iodo groups) bonded to alkyl groups.</td>
</tr>
<tr>
<td>1, 6, 7, 10, 12, 17</td>
<td>Thiols (mercaptans)</td>
<td>Compounds with the functional group —SH.</td>
</tr>
<tr>
<td>1, 7, 9, 10, 11, 12</td>
<td>Aldehydes</td>
<td>Compounds with at least one hydrogen atom bonded to the carbon of a carbonyl group.</td>
</tr>
<tr>
<td>1, 7, 9, 10, 11, 12</td>
<td>Ketones</td>
<td>Compounds with two carbon atoms bonded to the carbon of a carbonyl group.</td>
</tr>
<tr>
<td>1, 8, 9, 16</td>
<td>Ethers</td>
<td>Compounds with two alkyl or aryl groups bonded to the same oxygen (R—O—R).</td>
</tr>
<tr>
<td>1, 9, 10, 12</td>
<td>Carboxylic acid(s)</td>
<td>Compounds with a carboxyl group.</td>
</tr>
<tr>
<td>1, 9, 14</td>
<td>Carbonyl group</td>
<td>The functional group C***O.</td>
</tr>
<tr>
<td>10, 15</td>
<td>Saponification</td>
<td>The reaction of fats and oils with aqueous sodium hydroxide to give glycerol and sodium salts of fatty acids (soaps); also used in reference to hydrolysis of any ester.</td>
</tr>
<tr>
<td>13, 16, 18</td>
<td>DNA (deoxyribonucleic acid)</td>
<td>A nucleic acid in which the sugar is 2-deoxy-D-ribose and the bases are thymine, adenine, cytosine, and guanine.</td>
</tr>
<tr>
<td>13, 18</td>
<td>Nucleic acids</td>
<td>Macromolecules with a backbone of sugar molecules, each with a heterocyclic base (either cytosine, thymine, adenine, guanine, or uracil) attached.</td>
</tr>
<tr>
<td>13, 18</td>
<td>Purines</td>
<td>Biologically important heterocyclic compounds containing a pyrimidine ring fused to an imidazole ring.</td>
</tr>
<tr>
<td>13, 18</td>
<td>Pyrimidines</td>
<td>Six-membered ring aromatic heterocycles containing two N atoms at ring positions 1 and 3.</td>
</tr>
<tr>
<td>14, 16</td>
<td>Polyester</td>
<td>A condensation (step-growth) polymer made from diacid and diol monomers – for example, Dacron.</td>
</tr>
<tr>
<td>15, 16</td>
<td>Fats</td>
<td>Triglycerides with a high saturated fatty acid content; solids at room temperature.</td>
</tr>
<tr>
<td>15, 16</td>
<td>Triglycerides</td>
<td>Triesters of glycerol.</td>
</tr>
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<td>Definition</td>
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<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>16, 18</td>
<td>RNA (ribonucleic acid)</td>
<td>A nucleic acid in which the sugar is D-ribose and the bases are uracil, adenine, cytosine, and guanine.</td>
</tr>
<tr>
<td>17, 18</td>
<td>Primary structure (of proteins)</td>
<td>The sequence of amino acids in a protein.</td>
</tr>
<tr>
<td>17, 18</td>
<td>Proteins</td>
<td>Natural polymers composed of α–amino acids joined one to another by amide (or peptide) bonds.</td>
</tr>
<tr>
<td>17, 18</td>
<td>Secondary structure (of proteins)</td>
<td>The local shape of a peptide sequence in a protein, for example, an α-helix or a pleated sheet.</td>
</tr>
<tr>
<td>2, 10</td>
<td>cis-trans isomerism (geometric isomerism)</td>
<td>A type of stereoisomerism that occurs in alkenes (in which substituents are either on the same or opposite sides of a double bond) and cycloalkanes (in which substituents are either on the same or opposite sides of a ring).</td>
</tr>
<tr>
<td>2, 15</td>
<td>Methyl group</td>
<td>The alkyl group CH3—</td>
</tr>
<tr>
<td>2, 15</td>
<td>Waxes</td>
<td>Monoesters in which the acid and alcohol portions both have long saturated hydrocarbon chains.</td>
</tr>
<tr>
<td>2, 16</td>
<td>Conformations (rotamers)</td>
<td>Stereoisomers that can be interconverted by rotation around single bonds.</td>
</tr>
<tr>
<td>2, 3</td>
<td>Cycloalkanes</td>
<td>Saturated hydrocarbons that contain rings of carbon atoms</td>
</tr>
<tr>
<td>2, 3</td>
<td>Unsaturated hydrocarbons</td>
<td>Hydrocarbons that contain multiple bonds – for example, carbon–carbon double and/or triple bonds.</td>
</tr>
<tr>
<td>2, 3, 4</td>
<td>Aromatic hydrocarbons</td>
<td>Unsaturated hydrocarbons structurally related to benzene.</td>
</tr>
<tr>
<td>2, 3, 4</td>
<td>Exothermic reaction</td>
<td>A reaction that evolved heat.</td>
</tr>
<tr>
<td>2, 3, 6, 7, 10, 13</td>
<td>Substitution reaction(s)</td>
<td>A reaction in which one atom or group of atoms is replaced with another atom or group of atoms.</td>
</tr>
<tr>
<td>2, 3, 7, 8, 9, 10, 16</td>
<td>Oxidation reaction(s)</td>
<td>A reaction that increases the oxidation state of atoms in a molecule or ion. In organic chemistry, this frequently involved reactions in which C—H bonds are replaced by C—O bonds.</td>
</tr>
<tr>
<td>2, 4</td>
<td>Substituents</td>
<td>Groups attached to the main chain of a molecule.</td>
</tr>
<tr>
<td>2, 5</td>
<td>Configurational isomers</td>
<td>Stereoisomers that can be interconverted only by breaking and remaking bonds – for example, cis-trans isomers in alkenes or cycloalkanes, structural isomers such as 1-bromopropane and 2-bromopropane, enantiomers such as (R)-2-bromobutane and (S)-2-bromobutane, or any pair of diastereomers.</td>
</tr>
<tr>
<td>2, 5</td>
<td>Isopropyl group (1-methylethyl group)</td>
<td>The alkyl group (CH3)2CH—</td>
</tr>
<tr>
<td>2, 7, 8, 10, 11</td>
<td>Boiling point(s)</td>
<td>The temperature at which a pure substance undergoes a change from the liquid to the vapor state.</td>
</tr>
<tr>
<td>3, 10, 9, 5,</td>
<td>Addition reaction(s)</td>
<td>A reaction in which a reagent adds to a multiple bond; the pi-bond is broken and sigma-bonds are formed between the reagent and the atoms in the multiple bond, such as addition of hydrogen to an alkene (to give an alkane) or an alkyne (to give an alkene) or a ketone (to give an alcohol).</td>
</tr>
<tr>
<td>3, 14</td>
<td>Monomer(s)</td>
<td>Small molecules from which polymers are formed.</td>
</tr>
<tr>
<td>3, 14</td>
<td>Polymerization</td>
<td>The process of polymer formation</td>
</tr>
<tr>
<td>3, 14</td>
<td>Polymers</td>
<td>Large molecules (macromolecules) built by repetitive linking of smaller molecules called monomers.</td>
</tr>
<tr>
<td>3, 4, 14</td>
<td>Carbocations</td>
<td>A positively charged carbon atom; classified as primary, secondary, or tertiary when one, two, or three alkyl groups, respectively, are bonded to the positively charged carbon atom.</td>
</tr>
<tr>
<td>3, 4, 15</td>
<td>Hydrogenation</td>
<td>Addition of hydrogen to a multiple bond with the aid of a catalyst.</td>
</tr>
<tr>
<td>3, 6</td>
<td>Reaction energy diagram</td>
<td>A graph that shows the changes in energy that occur in the course of a reaction.</td>
</tr>
<tr>
<td>3, 6, 8, 9, 10, 11</td>
<td>Nucleophiles</td>
<td>Electron-rich reactants that form bonds by sharing electrons with electrophiles.</td>
</tr>
<tr>
<td>3, 7</td>
<td>Equilibrium constant (Keq)</td>
<td>A constant that indicates the direction that is favored for a given reaction; the greater the equilibrium constant, the more product formation is favored.</td>
</tr>
<tr>
<td>3, 7, 8, 9</td>
<td>Glycols</td>
<td>Compounds with two hydroxyl groups on adjacent carbons.</td>
</tr>
<tr>
<td>Chapter, Terms</td>
<td>Definition</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
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<td></td>
</tr>
<tr>
<td>3, 8, 14 Epoxides</td>
<td>Cyclic three-membered ring ethers.</td>
<td></td>
</tr>
<tr>
<td>3, 9 Pi bond (π bond)</td>
<td>A bond formed by lateral overlap of p-orbitals on adjacent atoms. Electron density in a pi bond lies in space above and below a line connecting the adjacent atoms.</td>
<td></td>
</tr>
<tr>
<td>4, 10 Acyl group</td>
<td>The group RCO—</td>
<td></td>
</tr>
<tr>
<td>4, 7 Nitro group</td>
<td>The —NO2 group.</td>
<td></td>
</tr>
<tr>
<td>4, 7, 10 Hydroxyl group</td>
<td>The —OH functional group.</td>
<td></td>
</tr>
<tr>
<td>4, 7, 11, 13 Electrophilic aromatic substitution</td>
<td>A reaction of an aromatic compound with an electrophile that gives a substituted aromatic compound.</td>
<td></td>
</tr>
<tr>
<td>4, 8 Alkoxy group</td>
<td>The functional group —OR.</td>
<td></td>
</tr>
<tr>
<td>4, 9 Friedel-Crafts reaction</td>
<td>The alkylation or acylation of an aromatic compound using carbocations or acylium ions, respectively, as electrophiles.</td>
<td></td>
</tr>
<tr>
<td>5, 11, 16 Diastereomers</td>
<td>Stereoisomers that are not mirror images of each other.</td>
<td></td>
</tr>
<tr>
<td>5, 11, 16 Enantiomers</td>
<td>A pair of molecules that are nonsuperimposable mirror images of one another.</td>
<td></td>
</tr>
<tr>
<td>5, 16 Stereogenic center</td>
<td>A carbon atom to which four different groups are attached.</td>
<td></td>
</tr>
<tr>
<td>5, 6, 15, 17, 18 Vinyl group</td>
<td>The CH2—CH— group.</td>
<td></td>
</tr>
<tr>
<td>6, 10 Nucleophilic substitution reactions</td>
<td>A reaction in which a nucleophile displaces a leaving group from a substrate; examples include SN2, SN1, and nucleophilic acyl substitution reactions.</td>
<td></td>
</tr>
<tr>
<td>6, 10, 11 Cyanides (nitriles)</td>
<td>Compounds with a cyano group.</td>
<td></td>
</tr>
<tr>
<td>6, 7, 9 Alkoxide(s)</td>
<td>The conjugate base of an alcohol.</td>
<td></td>
</tr>
<tr>
<td>7, 10 Acidity constant (Ka)</td>
<td>A quantitative measure of the strength of an acid; the greater Ka, the greater the acid strength.</td>
<td></td>
</tr>
<tr>
<td>7, 10 Inductive effect</td>
<td>An effect that results from the electron-donating or electron-withdrawing properties of nearby substituents.</td>
<td></td>
</tr>
<tr>
<td>7, 10, 17 pKa</td>
<td>A quantitative measure of acid strength; the negative logarithm of the acidity constant; the lower the pKa the stronger the acid.</td>
<td></td>
</tr>
<tr>
<td>7, 11 Conjugate acid</td>
<td>The product of protonation of a given base is the conjugate acid of that base.</td>
<td></td>
</tr>
<tr>
<td>7, 11, 12 Phenols</td>
<td>Compounds with a hydroxyl group attached to an aromatic benzene ring.</td>
<td></td>
</tr>
<tr>
<td>7, 15 Terpenes</td>
<td>Natural compounds containing multiples of five-carbon isoprene units – for example, monoterpenes (C10), sesquiterpenes (C15), diterpenes (C20), triterpenes (C30), and tetraterpenes (C40).</td>
<td></td>
</tr>
<tr>
<td>7, 15, 17 Amphoteric</td>
<td>A substance that can act as an acid or as a base.</td>
<td></td>
</tr>
<tr>
<td>7, 17 Disulfide bond(s)</td>
<td>An S—S bond commonly found in proteins.</td>
<td></td>
</tr>
<tr>
<td>7, 8 Lewis base (s)</td>
<td>An electron-pair donor.</td>
<td></td>
</tr>
<tr>
<td>7, 8, 10 Hydrogen bond</td>
<td>An attractive interaction that occurs between hydrogen atoms bonded to highly electronegative atoms (O, N, F) and the nonbonding electron pairs on other highly electronegative atoms.</td>
<td></td>
</tr>
<tr>
<td>8, 9, 10 Grignard reagent(s)</td>
<td>Alkylmagnesium halides; a kind of organometallic compound.</td>
<td></td>
</tr>
<tr>
<td>8, 9, 14 Organometallic compounds</td>
<td>Compounds with a carbon–metal bond – for example, Grignard reagents and alkylithium reagents.</td>
<td></td>
</tr>
<tr>
<td>9, 10 α-Hydrogen(s)</td>
<td>Hydrogen(s) on an α-carbon</td>
<td></td>
</tr>
<tr>
<td>9, 11, 12 Imines</td>
<td>Compounds with a carbon–nitrogen double bond (C=N).</td>
<td></td>
</tr>
<tr>
<td>9, 16 Hemiacetal(s)</td>
<td>A compound with one alkoxy group and one hydroxyl group bonded to the same carbon atom.</td>
<td></td>
</tr>
</tbody>
</table>