# 3 Chemicals Commonly Used in Biochemistry and Molecular Biology and Their Properties

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Chemical Name</th>
<th>M.W.</th>
<th>Properties and Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACES</td>
<td>2-(2-amino-2-oxyethyl)-amino]ethanesulfonic Acid</td>
<td>182.20</td>
<td>One of the several “Good” buffers.</td>
</tr>
</tbody>
</table>

**ACES, 2-[(2-amino-2-oxyethyl)amino]ethanesulfonic acid**


**Acetaldehyde**


**Acetic Acid**


**Acetic Anhydride**

![Acetic Anhydride](image)

Acetic anhydride


**Acetone**

![Acetone](image)

Acetone


**Acetonitrile**

\[
\begin{align*}
\text{H}_3\text{C}\quad \equiv \quad \text{N} \\
\text{Acetonitrile}
\end{align*}
\]


**Acetyl Chloride**

\[
\begin{align*}
\text{H}_3\text{C}\quad \equiv \quad \text{Cl} \\
\text{Acetyl chloride}
\end{align*}
\]


**Acetylcysteine**

\[
\begin{align*}
\text{H}_3\text{C}\quad \equiv \quad \text{SH} \\
\text{N-acetylcysteine}
\end{align*}
\]

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N-Acetylimidazole


Acetylsalicylic Acid


**Acrylamide**

![Acrylamide](image1)

2-propanamide

Monomer unit of polyacrylamide in gels, hydrogels, hard polymers; environmental carcinogen; fluorescence quencher.

**Acrylic acid**

![Acrylic acid](image2)

**N-isopropylacrylamide**

**Methacrylic acid**

![Methacrylic acid](image3)

**Methacrylamide**

![Methacrylamide](image4)


**Gamma (γ)-aminobutyric Acid (GABA)**

![Gamma-aminobutyric acid](image5)

4-aminobutanoic acid

Neurotransmitter.

Amiloride 3,5-diamino-\(\text{N}-(\text{amino-}\text{iminomethyl})-6\)-chloropyrazine-carboxamide 229.63 Sodium ion channel blocker.


2-Aminopyridine \(\alpha\)-aminopyridine 94.12 Precursor for synthesis of pharmaceuticals and reagents; used to derivatize carbohydrates for analysis; blocker of K\(^+\) channels.


Ammonium Bicarbonate Acid Ammonium Carbonate

Ammonium bicarbonate, \(\text{NH}_4\text{CO}_3\)

\[\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3\]

ANS

![1-anilino-8-naphthalenesulfonate](image)

**ANS**

1-anilino-8-naphthalenesulfonate, ANS

**Fluorescent probe for protein conformation; considered a hydrophobic probe; study of molten globules.**


**Arachidonic Acid**

![Arachidonic Acid](image)

Arachidonic acid

5,8,11,14(all cis)-eicosatetraenoic Acid

**Essential fatty acid; precursor of prostaglandins, thromboxanes, and leukotrienes.**


**Ascorbic Acid**

Vitamin C; 3-oxo-L-gulofuranolactone 176.13 Nutrition, antioxidant (reducing agent); possible antimicrobial function.


**Benzaldehyde**

Intermediate in manufacture of pharmaceuticals, flavors; reacts with amino groups, semicarbazidizide.

Benzamidine HCl

\[ \text{H}_2\text{N} - \text{NH} \]

Benzamidine

156.61 Inhibitor of tryp ticlike serine proteases.


Benzene

\[ \text{H}_2\text{N} \text{NH}_2 \]

Benzene 78.11 Solvent; a xenobiotic.


Benzidine

\[ \text{H}_2\text{N} - \text{NH}_2 \]

\( p \)-benzidine

184.24 Precursor for azo dyes; mutagenic agent; forensic analysis for bloodstains based on reactivity with hemoglobin.


**Biuret**

\[ \text{Biuret} \]

\[
\begin{align*}
\text{O} & \quad \text{O} \\
\text{H}_2\text{N} & \quad \text{C} \\
\text{N} & \quad \text{C} \\
\text{O} & \quad \text{NH}_2
\end{align*}
\]

Prepared by heating urea, reaction with cupric ions in base yields red-purple (the biuret reaction); nonprotein nitrogen (NPN) nutritional source.

**Urea**

\[ \text{Urea} \]

\[
\begin{align*}
\text{H}_2\text{N} & \quad \text{C} \\
\text{ClH} & \quad \text{NH}_2
\end{align*}
\]


**Blue Tetrazolium**

\[ \text{Tetrazolium Blue} \]

\[
\begin{align*}
\text{N} & \quad \text{N} \\
\text{N} & \quad \text{N} \\
\text{N} & \quad \text{N} \\
\text{N} & \quad \text{N} \\
\text{ClH} & \quad \text{H}_2\text{N}
\end{align*}
\]

Stain for cytotoxicity based on change to formazan on reduction. See nitro blue tetrazolium, which has similar chemistry and higher use.

Boric Acid

Boric Acid (B) is a white, odorless, hygroscopic solid that is soluble in water. It is a trihydroxide of boron, B(OH)3, which reacts with water to form boric acid, B(OH)4−. This reaction is shown below:

\[ \text{B(OH)}_3 + 2\text{H}_2\text{O} \rightarrow \text{B(OH)}_4^- + \text{H}_3\text{O}^+ \]

Boric acid is used in a variety of applications, including as a solvent, a fire retardant, and a preservative.

Boric Acid Properties:
- Chemical formula: B(OH)3
- Color: White
- Odor: Odorless
- Appearance: Hygroscopic solid
- Solubility: Soluble in water

Biochemistry and Molecular Biology Compendium
BPNS-Skatole

\[
\begin{align*}
\text{H}_2\text{C} & \quad \text{Br} \\
\text{N} & \quad \text{S} \\
\text{NO}_2 & \quad \text{Br}
\end{align*}
\]

(2-[2′-nitrophenylsulfenyl]-3-methyl-3′-bromoindolenine) 363.23

Tryptophan modification, peptide-bond cleavage; derived from skatole, which is also known as boar taint.


Bromoacetic Acid 138.95

Alkylating agent; reacts with various nucleophiles.


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262 Biochemistry and Molecular Biology Compendium

*p*-Bromophenacyl Bromide

![Structure of p-Bromophenacyl Bromide](image)

- 2-bromo-1-(4-bromophenyl)ethanone
- 4-bromophenacyl Bromide
- 277.04
- Modification of various residues in proteins; reagent for identification of carboxylic acids; phospholipase A2 inhibitor.


Bromophenol Blue

![Structure of Bromophenol Blue](image)

- 669.97
- pH indicator;
- conformational probe for proteins; histochemical staining for basic proteins; some use as a vital stain.


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Chemicals Commonly Used in Biochemistry and Molecular Biology and Their Properties


**Cacodylic Acid**

| Dimethylarsinic Acid | 138.10 | Buffer salt in neutral pH range; largely replaced because of toxicity. |


**Calcium Chloride**

| Hydrates | 110.98 | Anhydrous form as drying agent for organic solvents, variety of manufacturing uses; meat quality enhancement; therapeutic use in electrolyte replacement and bone cements; source of calcium ions for biological assays. |


**Cetyl Pyridinium Chloride**


**CHAPS**


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Chloroform

Trichloromethane 177.38 Used for extraction of lipids, usually in combination with methanol.


Cholesterol

386.66 The most common sterol in man and other higher animals. Cholesterol is essential for the synthesis of a variety of compounds including estrogens and vitamin D; also membrane component.


Cholic Acid

408.57 Component of bile; detergent.

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**Citraconic Anhydride**

Methylmaleic Anhydride 112.1 Reversible modification of amino groups.


**Congo Red**

CI Direct Red 28; 696.68 pH indicator, histological stain for collagen, amyloid, elastin.

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Coomassie Brilliant Blue G-250

CI Acid Blue 90  854  Most often used for the colorimetric determination of protein.

Coomassie brilliant blue R210


Coomassie Brilliant Blue R-250

CI Acid Blue 83  826  Most often used for the detection of proteins on solid matrices such as polyacrylamide gels.

Coomassie brilliant blue R210

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**Coomassie Brilliant Blue RL**

<table>
<thead>
<tr>
<th>CI Acid Blue 92; 695.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anazolene Sodium</td>
</tr>
</tbody>
</table>

**Cy2**

Fluorescent label used in proteomics and gene expression; use for internal standard.

Cy 3 911.0  Fluorescent label used in proteomics and gene expression; in combination with Cy 5 is used for FRET-based assays.


Cy 5 937.1  Fluorescent label used in proteomics and gene expression; also used in histochemistry.


**Cyanine Dye**

(See glossary)

Cy 2, Cy 3, and Cy 5 are cyanine dye derivatives.

**α-Cyano-4-hydroxycinnamic Acid**

4-HCCA; 189.2 Used as matrix substance for MALDI; transport inhibitor and enzyme inhibitor.

Alpha-cyano-4-hydroxycinnamic acid

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Cyanogen

C$_2$N$_2$; Ethanedinitrile 53.03 Protein crosslinking at salt bridges.


Cyanogen Bromide

CNBr; Bromide 105.9 Protein modification; cleavage of peptide bonds; coupled nucleophiles to polyhydroxyl matrices; environmental toxicant derived from monobromamine and cyanide.


**Cyanuric Chloride**

\[
\begin{array}{c}
\text{Cyanuric chloride} \\
\end{array}
\]


**1,2-Cyclohexylene-dinitrilotetraacetic Acid**

\[
\begin{array}{c}
\text{CDTA} \\
\end{array}
\]

Chelating agent suggested to have specificity for manganese ions; weaker for other metal ions such as ferric.


**Dansyl Chloride**

\[
\begin{array}{c}
\text{5-(dimethylamino)-} \\
\text{1-naphthalene-sulfonyl Chloride} \\
\end{array}
\]

Fluorescent label for proteins; amino acid analysis.

Chemicals Commonly Used in Biochemistry and Molecular Biology and Their Properties


**DCC**

\[ N,N'\text{-dicyclohexylcarbodiimide} \]

206.33 Activates carboxyl groups to react with hydroxyl groups to form esters and with amines to form an amide bond; used to modify ion-transporting ATPases. Lack of water solubility has presented challenges.


**Deoxycholic Acid**

Desoxycholic Acid 392.57 Detergent, nanoparticles.


**Deuterium Oxide**

“Heavy Water” 20.03 Structural studies in proteins, enzyme kinetics; *in vivo* studies of metabolic flux.


DFP

![DFP structure](image)

Diisopropylphosphorofluoridate; Isofluorophate

184.15 Classic cholinesterase inhibitor; inhibitor of serine proteases, some nonspecific reaction tyrosine.


Dichloromethane

![Dichloromethane structure](image)

Lipid solvent; isolation of sterols, frequently used in combination with methanol.

Methylene Chloride

84.9 Lipid solvent; isolation of sterols, frequently used in combination with methanol.

Diethyldithiocarbamate

![Chemical structure](image)

Diethyldithiocarbamate, sodium diithiocarb


Diethylpyrocarbonate (DEPC)

![Chemical structure](image)

Diethylpyrocarbonate (DEPC) Ethoxyformic Anhydride

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**Dimedone**

5,5-dimethyl-1,3-cyclohexanedione

Originally described as reagent for assay of aldehydes; used as a specific modifier of sulfenic acid.


**Dimethylformamide (DMF)**

*N,N*-dimethylformamide

Solvent.

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**Dimethyl Suberimidate (DMS)**

Crosslinking agent.

Dimethyl Sulfate

126.1 Methylating agent; methylation of nucleic acids; used for a process called footprinting to identify sites of protein–nucleic acid interaction.


Dioxane

1,4-diethylene dioxide

88.1 Solvent.


DMSO

[Chemical structure of dimethylsulfoxide]

Dimethylsulfoxide 78.13 Solvent; suggested therapeutic use; effect on cellular function; cytoprotective.


**EDC**

1-ethyl-(3-dimethylamino propyl)-carbodiimide; 

N-(3-dimethylamino-propyl)-N'-ethyl-carbodiimide

191.7 Water-soluble carbodiimide for the modification of carboxyl groups in proteins; zero-length crosslinking proteins; activation of carboxyl groups for amidation reactions, as for the coupling of amino-nucleotides to matrices for DNA microarrays.


**EDTA**

292.24 Chelating agent; some metal ion-EDTA complexes (i.e., Fe$^{3+}$-EDTA) function as chemical nucleases.

**Ellman’s Reagent**

5,5′-dithiobis-[2-nitrobenzoic] Acid

Reagent for determination of sulfydryl groups/ disulfide bonds.


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Ethanolamine


Ethidium Bromide


Ethyl Alcohol

Ethanol

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**Ethylene Glycol**

1,2-ethanediol 62.07 Solvent/cosolvent; increases viscosity (visogenic osmolyte); perturbant; cryopreservative.


**Ethyleneimine**

Aziridine 43.07 Modification of sulfhydryl groups to produce amine functions; alkylating agent; reacts with carboxyl groups at acid pH; monomer unit for polyethylene amine, a versatile polymer.

**Ethylene Oxide**

![Ethylene oxide structure](image)

**Oxirane**

44.05

Sterilizing agent; starting material for ethylene glycol and other products such as nonionic surfactants.


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Chemicals Commonly Used in Biochemistry and Molecular Biology and Their Properties 285

N-Ethylmaleimide

1-ethyl-1H-pyrrole-2,5-dione

Modification of sulfhydryl groups; basic building block for a number of reagents. Mechanism different from alkylating agent in that reaction involves a Michael addition.


Fluorescein

332.31 Fluorescent dye that can be combined with a reactive function group such as fluorescein isothiocyanate (FITC); used for fluorescent angiography with emphasis on ophthalmology.

**Formaldehyde**

\[
\text{H}_2\text{C}=\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{C}(\text{OH})_2
\]

"Paraformaldehyde"

And higher polymers

**Methanal**

\[
\text{CH}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{CH}_2\text{OH} + \text{H}_2\text{O}
\]

30.03

Tissue fixation; protein modification; zero-length crosslinking; protein–nucleic acid interactions.


**Glutathione**

![Glutathione structure](image)

γ-GluCysGly 307.32 Reducing agent; intermediate in phase II detoxification of xenobiotes.


**Glycine**

![Glycine structure](image)

Aminoacetic Acid 75.07 Buffer component; protein-precipitating agent, excipient for pharmaceutical formulation.

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Glyoxal

![Glyoxal](image)

Ethanedial 58.04 Modification of proteins and nucleic acids; model for glycation reaction; fluorescent derivatives formed with tryptophan.


Guanidine

Aminomethan

midine 59.07 Chaothropic agents; guanidine hydrochloride use for study of protein denaturation; GTIC is considered to be more effective than GuCl; GTIC used for nucleic acid extraction.

Guanidine Hydrochloride (GuCl)

Guanidine Thiocyanate (GTIC)

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HEPES; 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid

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Hydrazine

\( \text{N}_2 \text{H}_4 \quad 32.05 \) Reducing agent; modification of aldehydes and carbohydrates; hydrazinolysis used for release of carbohydrates from protein; derivatives such as dinitrophenyl-hydrazine used for analysis of carbonyl groups in oxidized proteins; detection of acetyl and formyl groups in proteins.


Hydrogen Peroxide

\( \text{H}_2 \text{O}_2 \quad 34.02 \) Oxidizing agent; bacteriocidal agent.

Hydroxylamine

\( \text{H}_3 \text{NO} \quad 33.03 \)

8-Hydroxyquinoline

\[ 8\text{-quinolinol} \quad 145.16 \] Metal chelator.

Imidazole

\[ 1,3\text{-diazole} \quad 69.08 \] Buffer component.

Indole

\[ 2,3\text{-benzopyrrole} \quad 117.15 \]
Indole-3-acetic Acid

Indoleacetic Acid; 175.19 Plant growth regulator. Heteroauxin


Iodoacetamide

Iodoacetic Acid


2-Iminothiolane


**Isatoic Anhydride**

```
O
N
O
```

Isatoic anhydride

<table>
<thead>
<tr>
<th>Compound</th>
<th>Molecular Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,1-benzoxazine-2,4(H)-dione</td>
<td>163.13</td>
<td>Fluorescent reagents for amines and sulfhydryl groups; amine scavenger.</td>
</tr>
</tbody>
</table>


**Isoamyl Alcohol**

```
H3C
CH
OH
```

Isoamyl alcohol

<table>
<thead>
<tr>
<th>Compound</th>
<th>Molecular Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-methyl-1-butanol</td>
<td>88.15</td>
<td>Solvent.</td>
</tr>
</tbody>
</table>

**Isopropyl Alcohol**

```
H3C
CH
OH
```

Isopropyl alcohol

<table>
<thead>
<tr>
<th>Compound</th>
<th>Molecular Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-propanol</td>
<td>60.10</td>
<td>Solvent; precipitation agent for purification of plasmid DNA; reagent in stability test for identification of abnormal hemoglobins.</td>
</tr>
</tbody>
</table>

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**Isopropyl-β-D-thiogalactoside**

![Isopropyl-β-D-thiogalactopyranoside](image)

IPTG, Isopropyl-β-D-thiogalactopyranoside; IPTG


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Maleic Anhydride

2,5-furandione 98.06

Modification of amino groups in proteins. The dimethyl derivative (dimethylmaleic anhydride) is used for ribosome dissociation; monomer for polymer.


2-Mercaptoethanol

β-mercaptoethanol 78.13

Reducing agent; used frequently in the reduction and alkylation of proteins for structural analysis and for preservation of oxidation-sensitive enzymes.


(3-Mercaptopropyl)trimethoxysilane


**MES**


**Methanesulfonic Acid**

Methanesulfonic acid is used for protein hydrolysis in amino acid analysis, deprotection during peptide synthesis, and for the hydrolysis of protein substituents such as fatty acids.

Methyl Alcohol

Solvent.

**Methylethyl Ketone (MEK)**

2-butanal; 2-butanone

Solvent; with acid for cleavage of heme moiety of hemeproteins for preparation of apoproteins.

Methylglyoxal

Pyruvaldehyde; 2-oxo-propanal

72.06

Derived from oxidative modification of triose phosphate during glucose metabolism; model for glycation of proteins; reacts with amino groups in proteins and nucleic acids; involved in advanced glycation endproducts.

Methyl Methane-thiosulfonate (MMTS)

Modification of sulfhydryl groups.

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**N-Methylpyrrolidone**

![N-Methylpyrrolidone](image)

1-methyl-2-pyrrolidone 99.13 Polar solvent; transdermal transport of drugs.

MOPS

\[
\begin{align*}
\text{H}_3\text{C} & \quad \text{H}_2\text{C} \\
\text{N} & \quad \text{C}_2 \quad \text{C}_2 \\
\text{OH} & \quad \text{O} \quad \text{O} \\
\text{CH}_3 & \quad \text{O} \\
\text{H}_2\text{C} & \quad \text{N} \\
\text{H}_2 & \quad \text{C}_2 \\
\text{C}_2 & \quad \text{C}_2 \\
\text{C}_2 & \quad \text{C}_2 \\
\text{N} & \quad \text{N} \\
\text{H}_2 & \quad \text{N} \\
\text{H}_2 & \quad \text{N} \\
\text{N} & \quad \text{N} \\
\text{H}_2 & \quad \text{N} \\
\text{H}_2 & \quad \text{N} \\
\text{N} & \quad \text{N} \\
\end{align*}
\]

3-(N-morpholino)propanesulfonic acid; 4-morpholinepropanesulfonic acid

A “Good” buffer.

Betaine

1-Carboxy-N,N,N-trimethylamino inner salt

3-(1-Pyridino)-1-[propanesulfonate]

MOPS

3-(N-morpholino)propanesulfonate


NBS

\[
\begin{align*}
\text{H}_2\text{N} & \quad \text{O} \\
\text{H}_3\text{C} & \quad \text{H}_2\text{C} \\
\text{N} & \quad \text{C}_2 \quad \text{C}_2 \\
\text{OH} & \quad \text{O} \quad \text{O} \\
\text{Be} & \quad \text{O} \\
\text{H}_2\text{N} & \quad \text{O} \\
\text{H}_3\text{C} & \quad \text{H}_2\text{C} \\
\text{N} & \quad \text{C}_2 \quad \text{C}_2 \\
\text{OH} & \quad \text{O} \quad \text{O} \\
\text{3-(1-Pyridino)-1-[propanesulfonate]} & \quad \text{O} \\
\end{align*}
\]

Tryptophan

N-bromosuccinimide; 1-bromo-2,5-pyrrolidinedione

Protein modification reagent; bromination of olefins; analysis of a variety of other compounds.

Neutral Red

\[
\text{Neutral red dye} \\
N^8,N^8\text{-trimethyl-2,8-phenazinediamine} \\
\text{monohydrochloride; CI 50040}
\]

Chemicals Commonly Used in Biochemistry and Molecular Biology and Their Properties


---

Ninhydrin

1-H-indene-1,2,3-trione Monohydrate 178.14 Reagent for amino acid analysis; reagent for modification of arginine residues in proteins; reaction with amino groups and other nucleophiles such as sulphhydryl groups.

Nitric Acid

\[ \text{HNO}_3 \] 63.01

Strong acid.

**p-Nitroaniline (PNA)**

\[
\begin{align*}
\text{p-nitrophenol} & \quad \text{4-nitroaniline} \\
\text{p-nitroaniline} & \quad \text{138.13} \\
\text{Signal from cleavage of} & \quad \text{chromogenic substrate.}
\end{align*}
\]

2-Nitrobenzylsulfenyl Chloride

\[
\begin{align*}
\text{o-nitrophenyl-sulfenyl Chloride} & \quad \text{189.6} \\
\text{Modification of tryptophan} & \quad \text{in proteins.}
\end{align*}
\]


**p-Nitrophenol**

\[
\begin{align*}
\text{4-nitrophenol} & \quad \text{139.11} \\
\text{Popular signal from} & \quad \text{indicator enzymes such as} \\
\text{alkaline phosphatase.}
\end{align*}
\]
Nitro Tetrazolium Blue

NBI, Nitro BT 817.7 Cytotoxicity determination based on intracellular reduction to formazan.


\[
\text{Nitro tetrazolium blue}
\]

\[
\begin{align*}
\text{Nitro tetrazolium blue} & \quad \text{NBI, Nitro BT 817.7 Cytotoxicity determination based on intracellular reduction to formazan.} \\
\end{align*}
\]

\[
\text{n-Octanol}
\]

\[
\begin{align*}
\text{1-octanol; Caprylic Alcohol} & \quad 130.23 \\
\text{Partitioning between octanol and water is used to determine lipophilicity; a factor in QSAR studies.}
\end{align*}
\]

\[
\text{1-Octanoic acid}
\]

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Octoxynol

![Octoxynol](image)

Octoxynol, \( n = 5–15 \)

Triton X-100™; Igepal CA-630™
Nonionic detergent; surfactant.

Peroxynitrite

Petroleum Ether
Mixture of Pentanes and Hexanes
N/A

Perchloric Acid

\( \text{HClO}_4 \)
100.5
Oxidizing agent.

1,10-Phenanthroline Monohydrate

\( o \)-phenanthroline
198.21
Chelating agent; inhibitor for metalloproteinas; use in design of synthetic nuclease and proteases.


Phenol


Phenoxyethanol

2-phenoxyethanol 138.16 Biochemical preservative; preservative in personal care products.

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**Phenylglyoxal**

![Phenylglyoxal reaction with arginine]


**Phosgene**

![Phosgene structure]


**Picric Acid**

<table>
<thead>
<tr>
<th>2,4,6-trinitrophenol</th>
<th>229.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical reagent.</td>
<td></td>
</tr>
</tbody>
</table>


**Polysorbate**

<table>
<thead>
<tr>
<th>Tween 20</th>
<th>Nonionic detergent; surfactant.</th>
</tr>
</thead>
</table>

**Polyvinylpyrrolidone (PVP)**

<table>
<thead>
<tr>
<th>Povidone</th>
<th>N/A</th>
<th>Pharmaceutical; excipient; phosphate analysis.</th>
</tr>
</thead>
</table>

**Pyridine**  
![Pyridine](image)

Azine 79.10 Solvent.


**Pyridoxal-5-phosphate (PLP)**  
![Pyridoxal-5-phosphate](image)

**Pyridoxal-5-(dihydrogen phosphate)**  
247.14 Selective modification of amino groups in proteins; affinity label for certain sites based on phosphate group.
Chemicals Commonly Used in Biochemistry and Molecular Biology and Their Properties


**Sodium Borohydride**

NaBH₄ \[\text{37.83}\] Reducing agent for Schiff bases; reduction of aldehydes; other chemical reductions.


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**Sodium Chloride**  
Salt; NaCl 58.44 Ionic strength; physiological saline.

**Sodium Cholate**  
430.55 Detergent.


**Sodium Cyanoborohydride**  
NaBH₄(CN) 62.84 Reducing agent; considered more selective than NaBH₄.


**Sodium Deoxycholate**  
Desoxycholic Acid, Sodium Salt 414.55 Detergent; potential therapeutic use with adipose tissue.


**Sodium Dodecylsulfate**


**Sodium Metabisulfite**

Sodium Bisulfite 190.1 Mild reducing agent; converts unmethylated cytosine residues to uracil residues (DNA methylation).


**Succinic Anhydride**

Butanediolic Anhydride; 2,5-diketotetrahydrofuran

100.1 Protein modification; dissociation of protein complexes.

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**Sucrose**


**Sulfuric Acid**


Tetrabutylammonium Chloride 277.9 Ion-pair reagent for extraction and HPLC.


Tetrahydrofuran 72.1 Solvent; template for combinatorial chemistry.


**Tetraphenylphosphonium Bromide**


**Thioflavin T**


Thionyl Chloride

Sulfurous 118.97 Preparation of acyl Oxochloride chlorides.


Thiophosgene

CSCl2 115

Thiourea

Thiocarbamide 76.12 Chaotropic agent; useful for membrane proteins; will react with haloacetyl derivatives such as iodoacetamide; protease inhibitor.

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**TNBS**

![TNBS Diagram](image)

**Trinitrobenzene Sulfonic Acid**

293.2

Reagent for the determination of amino groups in proteins; also reacts with sulfhydryl groups and hydrazides; used to induce animal model of colitis.

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**TNM**  
Tetranitromethane 196.03 Modification of tyrosine residues in proteins; crosslinking a side reaction as a reaction with cysteine; antibacterial and antiviral agent.

Chemicals Commonly Used in Biochemistry and Molecular Biology and Their Properties


### Trehalose

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Structure</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>α-D-glucopyranosyl-1,1-α-D-glucopyranoside; Mycose</td>
<td><img src="image1" alt="Structure" /></td>
<td>A nonreducing sugar that is found in a variety of organisms where it is thought to protect against stress such as dehydration; there is considerable interest in the use of trehalose as a stabilizer in biopharmaceutical proteins.</td>
</tr>
</tbody>
</table>


### Trichloroacetic Acid

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Structure</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2" alt="Structure" /></td>
<td><img src="image3" alt="Structure" /></td>
<td>Protein precipitant.</td>
</tr>
</tbody>
</table>


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**Triethylamine**

\[
\text{CH}_3\text{CH}_2\text{N}^+\text{CH}_2\text{CH}_3
\]

\(N,N\)-diethylethamanine


**Trifluoroacetic Acid**

\(1H_4O_2C\)

Buffer; transdermal transfer reagent.

**Triethanolamine**

\[
\text{HO}-\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}
\]

**Triethanolamine hydrochloride**

\[
\text{HO}-\text{CH}_2\text{CH}_2\text{CH}_2\text{N}^+\text{Cl}–
\]

\(pK_a\) approx. 9.5

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**Tris**

![Tris](image1)

**Triethanolamine**

![Triethanolamine](image2)

**Triethanolamine hydrochloride**

![Triethanolamine hydrochloride](image3)


Tris-(2-carboxyethyl) phosphate

![Diagram](image)


**Urea**

Carbamide 60.1 Chaotropic agent.


![Vinyl Pyridine](image)

**Vinyl Pyridine**

4-vinylpyridine 105.1 Modification of cysteine residues in protein.

![Water](image)

**Water**

Hydrogen Oxide 18.0 Solvent.