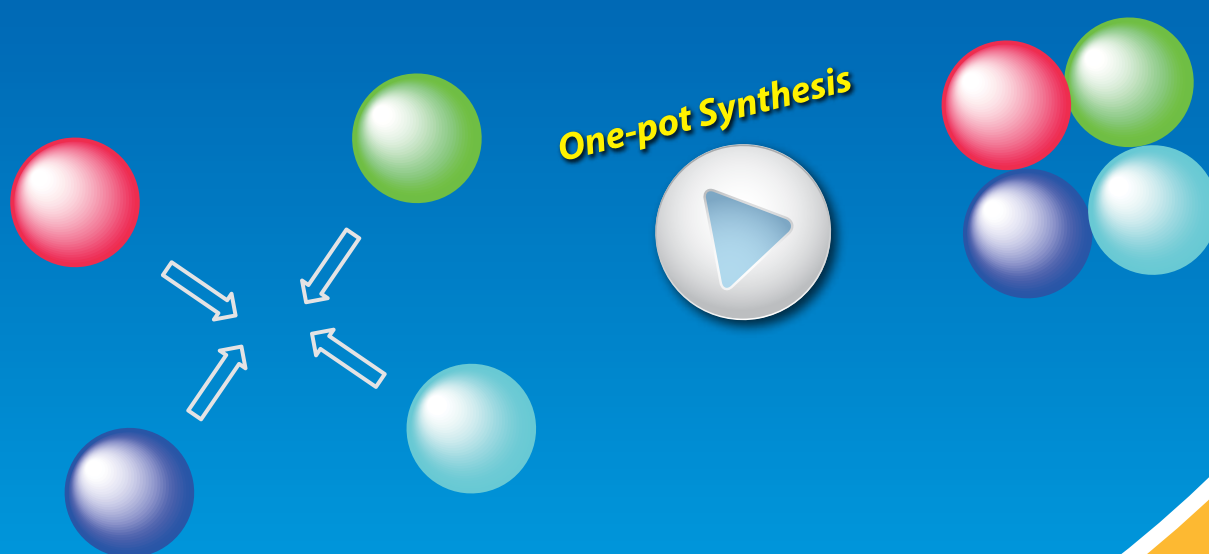


Multicomponent Reaction (MCR)



Aldehydes

Amines

Carboxylic Acids

β -Keto Esters

Isonitriles

Ureas

Thioureas

Dialkyl Phosphites

Benzyne Precursors

Lewis Acids

Ionic Liquids

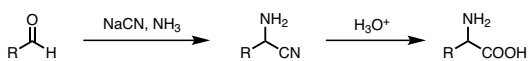
Multicomponent Reactions (MCR)

Multicomponent reaction (MCR) is a synthetic methodology in which three or more reactants come together in a single reaction vessel to form a new product. The characteristic aspect of MCRs is that the final products contain almost all portions of substrates, generating almost no by-products. That makes MCRs an extremely ideal and eco-friendly reaction system. Target compounds can be obtained in one pot with much fewer steps. Therefore, MCRs have been paid much attention in various research fields, such as discovery of lead compounds in medicinal chemistry, or combinatorial chemistry.

There have been a number of reports on MCRs so far, and typical examples are described as below.

1. Strecker reaction (Three-component reaction: 3CR)

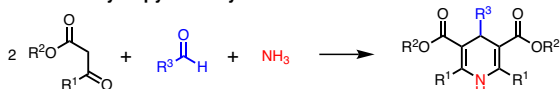
Strecker Reaction (Amino Acid Synthesis)



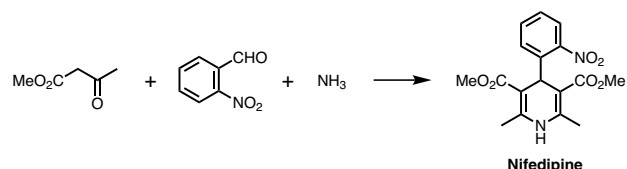
This reaction was reported by A. Strecker in 1850, and is extremely famous as the synthesis of α -amino acids. This reaction is an MCR which comprises three components, aldehydes, hydrogen cyanide, and ammonia as substrates, and is recognized as the world's first MCR.¹⁾

2. Hantzsch dihydropyridine synthesis (3CR)

Hantzsch Dihydropyridine Synthesis

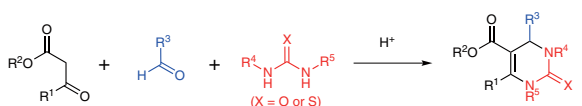


This reaction was reported by A. R. Hantzsch in 1881, and is the best-known three-component MCR, which affords 1,4-dihydropyridine derivatives using β -keto esters, aldehydes, and ammonia.²⁾ For an example, a calcium channel blocker, "Nifedipine", is also synthesized by this reaction.³⁾



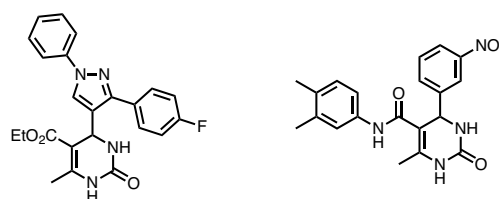
3. Biginelli reaction (3CR)

Biginelli reaction



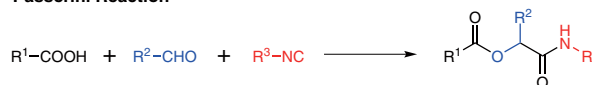
In 1891, an Italian chemist, P. Biginelli has reported the three-component MCR using β -keto esters such as ethyl acetoacetate [A0649], aromatic aldehydes such as benzaldehyde [B2379], and ureas (or thioureas) in the presence of acid catalyst (Brønsted or Lewis acids), affording dihydropyrimidinone derivatives.⁴⁾ Dihydropyrimidinones have been paid much attention because of their various bioactivities such as anti-inflammatory or anti-bacterial activities. For an example of pharmaceuticals developed by using the reaction, several anti-tubercular agents have been reported as below.⁵⁾

Examples of Anti-tubercular Agents using Biginelli Reaction

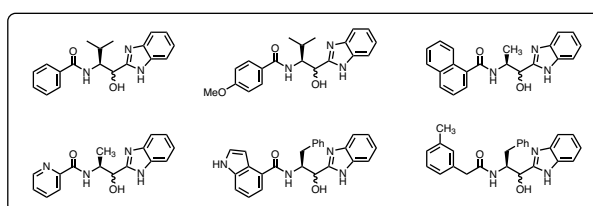
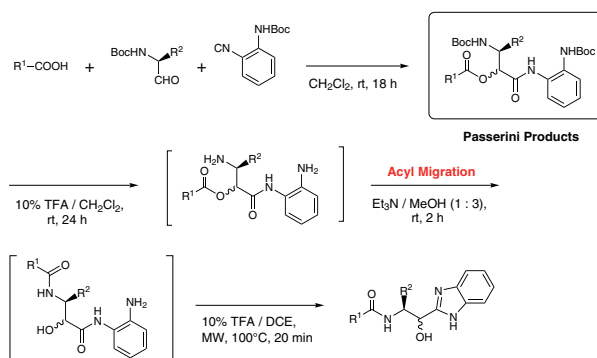


4. Passerini reaction (3CR)

Passerini Reaction

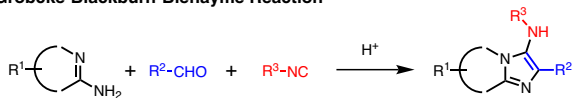


In 1921, an Italian chemist, M. Passerini *et al.* have reported the three-component reaction using carboxylic acids, aldehydes, and isonitriles, affording α -acyloxy amides.⁶⁾ The Passerini reaction also has been applied into pharmaceutical research, for example, Hulme *et al.* have reported the library synthesis of novel norstatine derivatives bearing benzimidazole moieties.⁷⁾

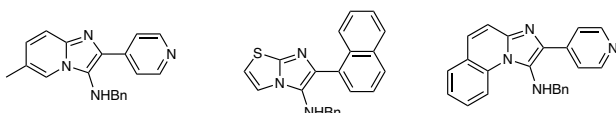


5. Gröbcke-Blackburn-Bienaymé reaction⁸⁾ (3CR)

Gröbcke-Blackburn-Bienaymé Reaction

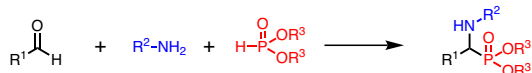


This reaction is a three-component MCR using aldehydes, isonitriles, and α -aminoazines such as 2-aminoimidazole or 2-aminopyridine in the presence of acid catalyst. The reaction is applicable for the synthesis of fused nitrogen-containing aromatic compounds as below.



6. Kabachnik-Fields reaction (3CR)

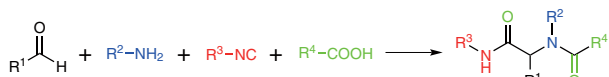
Kabachnik-Fields Reaction



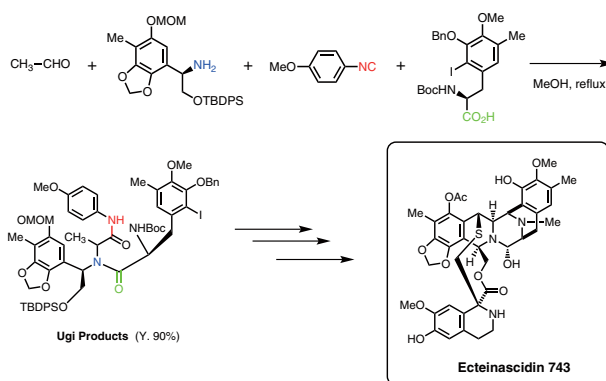
In 1952, M. I. Kabachnik *et al.* have reported the three-component MCR using aldehydes, amines, and dialkyl phosphites in the presence of acid catalyst (Brønsted or Lewis acids), affording α -aminophosphonates.⁹⁾ In recent years, much attention has been paid to α -aminophosphonates since they can be considered as structural analogues of the corresponding α -amino acids and transition state mimics of peptide hydrolysis. Thus, α -aminophosphonates have been applied into several research areas, such as development of renin inhibitors or HIV protease inhibitors.¹⁰⁾

7. Ugi reaction (4CR)

Ugi Reaction



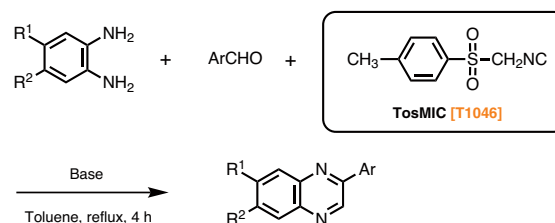
This reaction is the four-component MCR reported by I. K. Ugi *et al.* in 1962 for the first time.¹¹⁾ It enables one-pot condensation of four components (aldehydes, amines, isonitriles, and carboxylic acids), thus, it can be said that the Ugi reaction is the most versatile among MCRs. For an example of applications using this reaction, Fukuyama *et al.* have reported the synthesis of a marine tunicate, Ecteinascidin 743, which has extremely potent antitumor activity, using the Ugi reaction as a key step below.¹²⁾



Other examples of MCR

● MCR using *p*-toluenesulfonylmethyl isocyanide (TosMIC) (3CR)

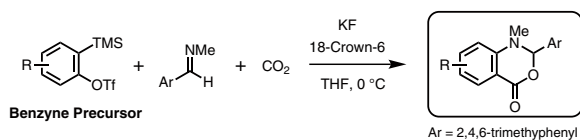
p-Toluenesulfonylmethyl isocyanide (TosMIC) [T1046] is a synthetic reagent, developed by Leusen *et al.*, and has both an isonitrile group and a tosyl group (leaving group) in one molecule.¹³⁾ Different from other isonitrile compounds with odor character, TosMIC is an odorless and solid compound. Because of its easy-handling property, TosMIC has been widely used for the synthesis of nitrogen-containing aromatic heterocyclic compounds, such as oxazoles.¹⁴⁾ TosMIC also has been used for MCRs, for example, Tsoleridis *et al.* have reported the synthesis of quinoxaline derivatives via the three-component condensation of *o*-phenylenediamines, aromatic aldehydes and TosMIC.¹⁵⁾



Entry	R ¹	R ²	Ar	Base	Quinoxaline (Y. %)
1	H	H	phenyl	DABCO	91
2	H	H	2,4-dimethylphenyl	DABCO	81
3	H	H	4-chlorophenyl	DABCO	84
4	Me	Me	phenyl	DBU	86
5	Me	Me	2-methylphenyl	DBU	85

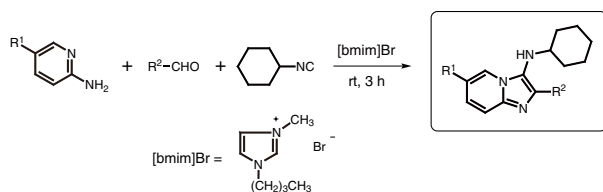
● MCR using benzyne (3CR)

Recently, there also have been several reports on MCRs using benzyne. For example, Yoshida *et al.* have reported the three-component MCR using *in situ* generated benzyne, imines, and carbon dioxide, affording benzoxadiones.¹⁶⁾ Recently, much attention has been paid on organic synthesis using carbon dioxide as a carbon source from the ecological point of view, thus, the reaction above is an extremely useful and eco-friendly MCR.



Benzyne Precursor	Reaction time (h)	Product
	15	 (Y. 82%)
	63	 (Y. 63%, 4 : 1)
	46	 (Y. 73%)
	60	 (Y. 44%)

Thus, MCR is a strong synthetic methodology to enable condensation of various substrates in one pot, however, in some cases, reactions require long times for completion or result in undesired side reactions even after optimization of reaction conditions such as solvents or Lewis acid catalysts. For resolving these problems, there have been some successful reports on accelerating MCRs. For example, Shaabani *et al.* have reported the ionic liquid promoted Gröbcke-Blackburn-Bienaymé reaction.¹⁷⁾ As indicated in the table below, in the case of using ionic liquids as solvents, reactions proceed smoothly to afford the desired products in excellent yields. On the other hand, the yield of product is poor even in the prolonged reaction time (Entry 2'). Moreover, as indicated in Entry 1, the ionic liquid can be reused for the same reactions, maintaining the high yields.



Entry	R ¹	R ²	Yield (%)
1	Br	Ph	98 (95, 92, 90, 85) ^a
2	Me	Ph	98
2' ^b	Me	Ph	25
3	Me	4-CH ₃ C ₆ H ₄	99
4	Me	4-O ₂ NC ₆ H ₄	92
5	Me	4-Pyridyl	97

^a The same ionic liquid is used for each of the five runs.

^b Ionic liquid is not used. Reaction time is 12 h.

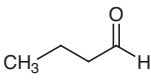
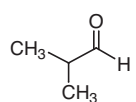
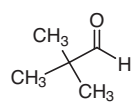
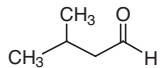
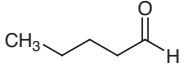
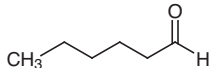
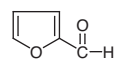
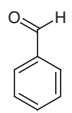
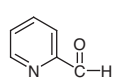
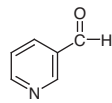
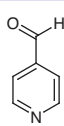
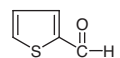
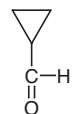
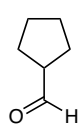
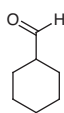
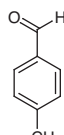
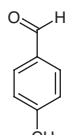
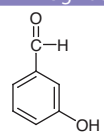
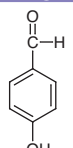
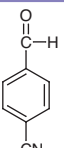
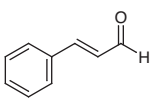
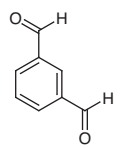
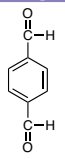
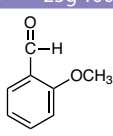
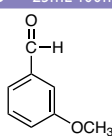
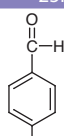
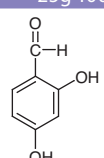
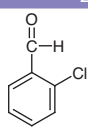
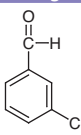
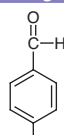
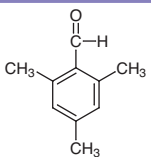
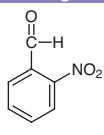
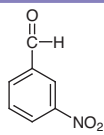
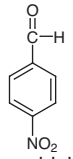
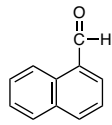
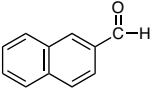
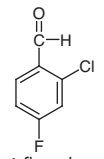
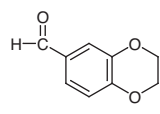
Ionic liquids can be generally recovered and recycled, which can help to reduce the waste of traditional solvents which are rarely reused. In addition, ionic liquids have attracted much attention as excellent solvents due to their low volatility. Judging from these points, this reaction can be regarded as a more eco-friendly reaction example.

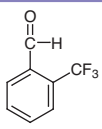
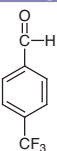
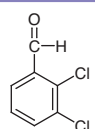
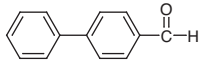
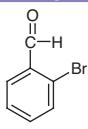
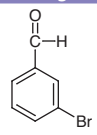
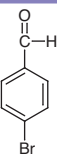
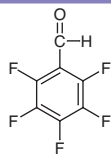
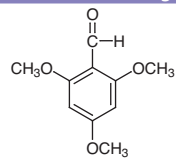
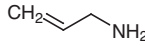
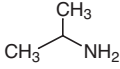
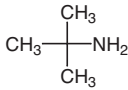
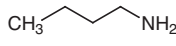
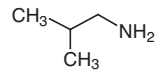
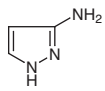
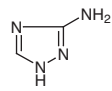

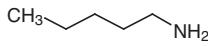

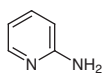
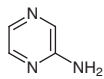

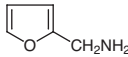

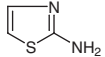
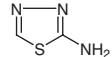

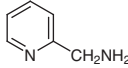
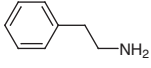
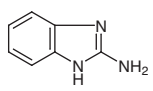


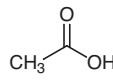
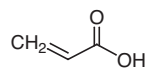
TCl offers a variety of aldehyde, amine, carboxylic acid, β -keto ester, urea & thiourea, and dialkyl phosphite compounds readily available in MCRs. For aldehyde, amine, and carboxylic acid compounds, typical products selected are listed judging from reports on MCRs so far. In addition, benzyne precursors, Lewis acids, and ionic liquids used in MCRs are also listed in this brochure.

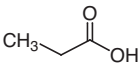
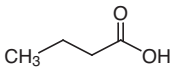
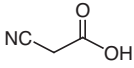
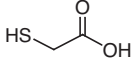
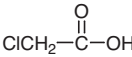
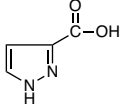
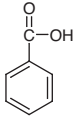

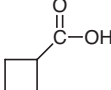
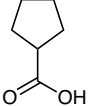
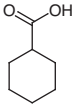
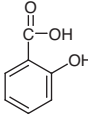
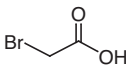
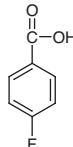
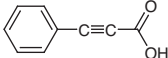
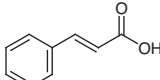
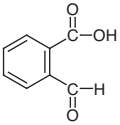
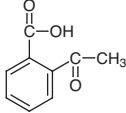
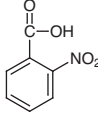
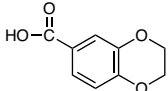
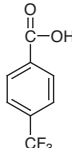
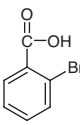
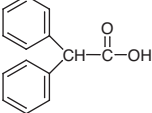
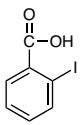
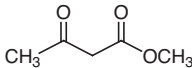
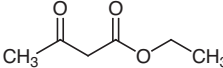
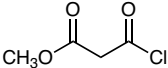
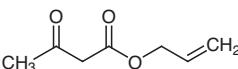
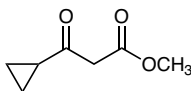
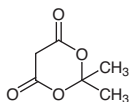
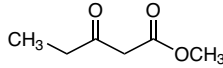
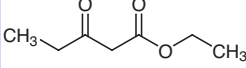
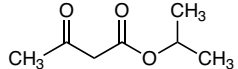
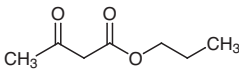
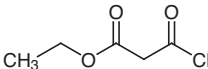
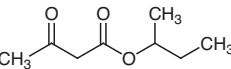
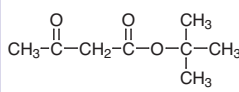
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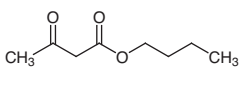
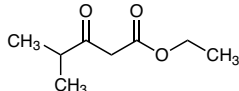
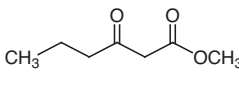
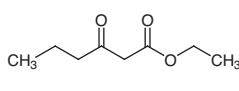
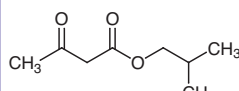
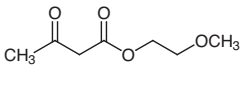
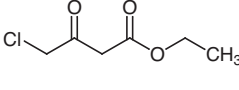
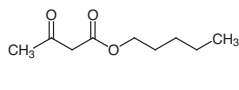
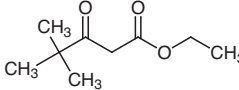
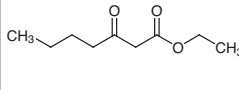
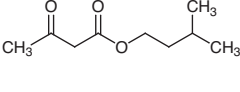
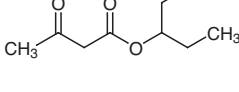
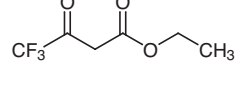
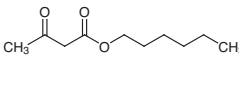
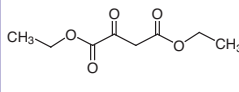
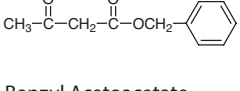
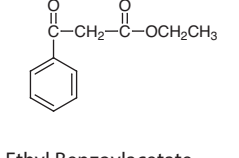
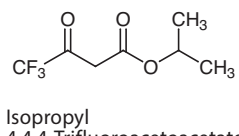
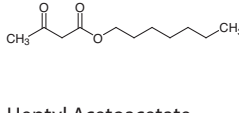
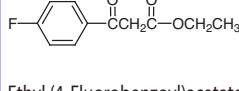
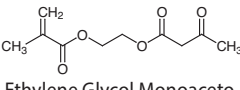
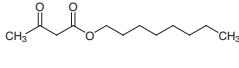
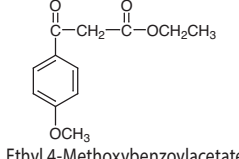
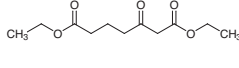
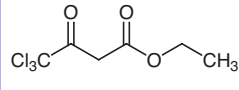
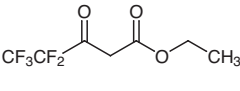
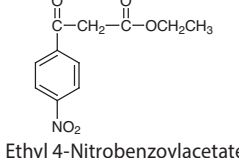
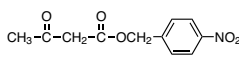
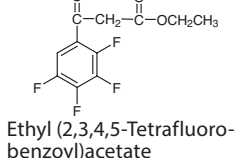
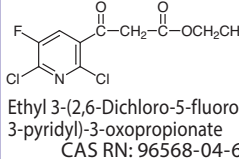
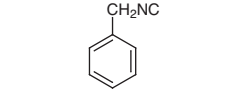
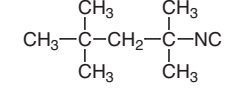
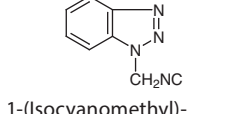
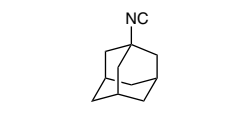
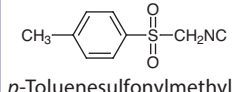
Aldehydes

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I0192 25mL 100mL 500mL  Isovaleraldehyde CAS RN: 590-86-3	V0001 25mL 500mL  Valeraldehyde CAS RN: 110-62-3	H0133 25mL 100mL 500mL  Hexanal CAS RN: 66-25-1	F0073 25g 500g  Furfural CAS RN: 98-01-1	B2379 500g  Benzaldehyde CAS RN: 100-52-7
P0425 25g 100g 500g  2-Pyridinecarboxaldehyde CAS RN: 1121-60-4	N0090 25mL 100mL 500mL  3-Pyridinecarboxaldehyde CAS RN: 500-22-1	I0143 25mL 500mL  4-Pyridinecarboxaldehyde CAS RN: 872-85-5	T0725 25mL 100mL 500mL  2-Thiophenecarboxaldehyde (stabilized with HQ) CAS RN: 98-03-3	C1707 1g 5g  Cyclopropanecarboxaldehyde (stabilized with HQ) CAS RN: 1489-69-6
C3019 1mL 5mL  Cyclopentanecarboxaldehyde (stabilized with HQ) CAS RN: 872-53-7	C0880 25mL 100mL  Cyclohexanecarboxaldehyde CAS RN: 2043-61-0	T1073 25mL 500mL  <i>p</i> -Tolualdehyde CAS RN: 104-87-0	T0259 25mL 100mL 500mL  <i>p</i> -Tolualdehyde CAS RN: 104-87-0	H0197 25g 100g 500g  3-Hydroxybenzaldehyde CAS RN: 100-83-4
H0198 25g 100g 500g  4-Hydroxybenzaldehyde CAS RN: 123-08-0	C0443 5g 25g  4-Cyanobenzaldehyde CAS RN: 105-07-7	C0352 25mL 500mL  <i>trans</i> -Cinnamaldehyde CAS RN: 14371-10-9	I0153 25g 250g  Isophthalaldehyde CAS RN: 626-19-7	T0010 25g 100g 500g  Terephthalaldehyde CAS RN: 623-27-8
A0479 25g 100g 500g  <i>o</i> -Anisaldehyde CAS RN: 135-02-4	A0478 25mL 100mL 500mL  <i>m</i> -Anisaldehyde CAS RN: 591-31-1	A0480 25mL 500mL  <i>p</i> -Anisaldehyde CAS RN: 123-11-5	D0564 25g 100g 500g  2,4-Dihydroxybenzaldehyde CAS RN: 95-01-2	C0561 25g 500g  2-Chlorobenzaldehyde CAS RN: 89-98-5
C0124 25g 100g 500g  3-Chlorobenzaldehyde CAS RN: 587-04-2	C0125 25g 100g 500g  4-Chlorobenzaldehyde CAS RN: 104-88-1	T1368 25mL  2,4,6-Trimethylbenzaldehyde CAS RN: 487-68-3	N0130 25g 100g 500g  2-Nitrobenzaldehyde CAS RN: 552-89-6	N0129 25g 500g  3-Nitrobenzaldehyde CAS RN: 99-61-6
N0559 25g 100g 500g  4-Nitrobenzaldehyde CAS RN: 555-16-8	N0002 25mL 100mL 500mL  1-Naphthaldehyde CAS RN: 66-77-3	N0003 5g 25g  2-Naphthaldehyde CAS RN: 66-99-9	C1465 1g 5g  2-Chloro-4-fluorobenzaldehyde CAS RN: 84194-36-5	B2019 1g 5g  3,4-Ethylenedioxybenzaldehyde CAS RN: 29668-44-8

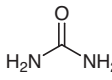
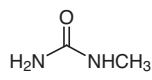
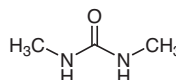
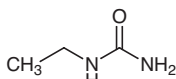
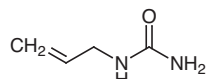
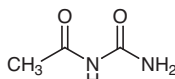
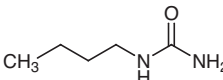
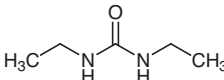
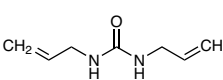
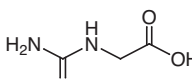
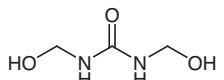
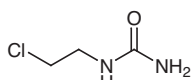
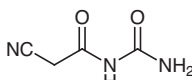
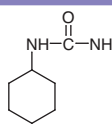
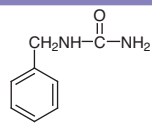
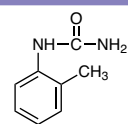
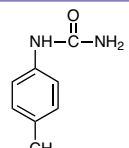
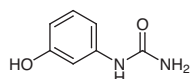
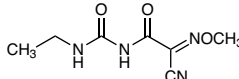
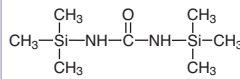
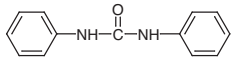
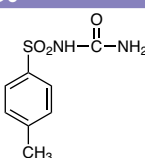
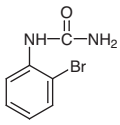
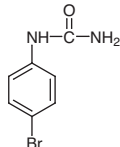
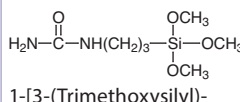
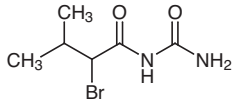
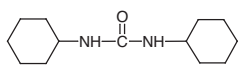
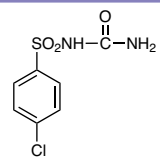
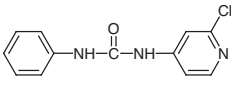
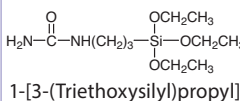
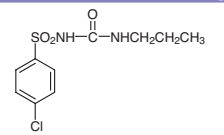
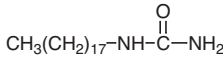
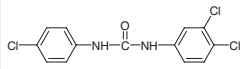
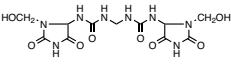
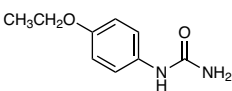
<p>T1281 25g</p>  <p>2-(Trifluoromethyl)benzaldehyde CAS RN: 447-61-0</p>	<p>T1091 5g 25g 250g</p>  <p>4-(Trifluoromethyl)benzaldehyde CAS RN: 455-19-6</p>	<p>D1666 25g 500g</p>  <p>2,3-Dichlorobenzaldehyde CAS RN: 6334-18-5</p>	<p>B0242 5g 25g 250g</p>  <p>4-Phenylbenzaldehyde CAS RN: 3218-36-8</p>	<p>B0836 25g 100g 500g</p>  <p>2-Bromobenzaldehyde CAS RN: 6630-33-7</p>
<p>B0548 25g 100g 500g</p>  <p>3-Bromobenzaldehyde CAS RN: 3132-99-8</p>	<p>B0549 25g 250g</p>  <p>4-Bromobenzaldehyde CAS RN: 1122-91-4</p>	<p>P0746 5g 25g</p>  <p>Pentafluorobenzaldehyde CAS RN: 653-37-2</p>	<p>T2651 5g 25g</p>  <p>2,4,6-Trimethoxybenzaldehyde CAS RN: 830-79-5</p>	
<h2>Amines</h2>				
		<p>P0911 5mL 25mL</p> <p><chem>HC#CCN</chem></p> <p>Propargylamine CAS RN: 2450-71-7</p>	<p>A0219 25mL 500mL</p>  <p>Allylamine CAS RN: 107-11-9</p>	<p>I0165 25mL 500mL</p>  <p>Isopropylamine CAS RN: 75-31-0</p>
<p>B0709 25mL 100mL 500mL</p>  <p>tert-Butylamine CAS RN: 75-64-9</p>	<p>B0707 25mL 500mL</p>  <p>Butylamine CAS RN: 109-73-9</p>	<p>I0095 25mL 500mL</p>  <p>Isobutylamine CAS RN: 78-81-9</p>	<p>A1859 5g 25g</p>  <p>3-Aminopyrazole CAS RN: 1820-80-0</p>	<p>A0432 25g 100g 500g</p>  <p>3-Amino-1,2,4-triazole CAS RN: 61-82-5</p>
<p>C0887 25mL 500mL</p>  <p>Cyclopentylamine CAS RN: 1003-03-8</p>	<p>A0445 25mL 100mL 500mL</p>  <p>Amylamine CAS RN: 110-58-7</p>	<p>A0463 500g</p>  <p>Aniline CAS RN: 62-53-3</p>	<p>A0411 25g 100g 500g</p>  <p>2-Aminopyridine CAS RN: 504-29-0</p>	<p>A0989 5g 25g</p>  <p>2-Aminopyrazine CAS RN: 5049-61-6</p>
<p>A0412 25g 500g</p>  <p>2-Aminopyrimidine CAS RN: 109-12-6</p>	<p>F0091 25mL 100mL 500mL</p>  <p>Furfurylamine CAS RN: 617-89-0</p>	<p>C0494 25mL 500mL</p>  <p>Cyclohexylamine CAS RN: 108-91-8</p>	<p>A0633 25g 100g 500g</p>  <p>2-Aminothiazole CAS RN: 96-50-4</p>	<p>A1060 5g 25g</p>  <p>2-Amino-1,3,4-thiadiazole CAS RN: 4005-51-0</p>
<p>B0406 25mL 500mL</p>  <p>Benzylamine CAS RN: 100-46-9</p>	<p>A1161 25g 250g</p>  <p>2-Picolylamine CAS RN: 3731-51-9</p>	<p>P0085 25mL 100mL 500mL</p>  <p>2-Phenylethylamine CAS RN: 64-04-0</p>	<p>A0850 5g 25g</p>  <p>2-Aminobenzimidazole CAS RN: 934-32-7</p>	<p>B0541 25g 250g</p>  <p>2-Bromoaniline CAS RN: 615-36-1</p>
<h2>Carboxylic Acids</h2>				
		<p>F0513 300mL</p>  <p>Formic Acid CAS RN: 64-18-6</p>	<p>A2035 300mL</p>  <p>Acetic Acid CAS RN: 64-19-7</p>	<p>A0141 25g 500g</p>  <p>Acrylic Acid (stabilized with MEHQ) CAS RN: 79-10-7</p>

P0500 25mL 500mL  Propionic Acid CAS RN: 79-09-4	B0754 25mL 500mL  Butyric Acid CAS RN: 107-92-6	C0439 25g 500g  Cyanoacetic Acid CAS RN: 372-09-8	M0052 25g 500g  Thioglycolic Acid CAS RN: 68-11-1	C2123 25g 500g  Chloroacetic Acid CAS RN: 79-11-8
P1862 1g 5g  Pyrazole-3-carboxylic Acid CAS RN: 1621-91-6	B2635 25g 500g  Benzoic Acid CAS RN: 65-85-0	C0387 25mL 100mL 500mL  Cyclopropanecarboxylic Acid CAS RN: 1759-53-1	C0888 10g 25g  Cyclobutanecarboxylic Acid CAS RN: 3721-95-7	C0512 5g 25g  Cyclopentanecarboxylic Acid CAS RN: 3400-45-1
C0470 25g 500g  Cyclohexanecarboxylic Acid CAS RN: 98-89-5	H0206 25g 500g  2-Hydroxybenzoic Acid CAS RN: 69-72-7	B0531 25g 500g  Bromoacetic Acid CAS RN: 79-08-3	F0112 25g 250g  4-Fluorobenzoic Acid CAS RN: 456-22-4	P0610 5g 25g  Phenylpropionic Acid CAS RN: 637-44-5
C0353 25g 100g 500g  <i>trans</i> -Cinnamic Acid CAS RN: 140-10-3	P0281 25g 100g 500g  Phthalaldehydic Acid CAS RN: 119-67-5	A1075 5g 25g  2-Acetylbenzoic Acid CAS RN: 577-56-0	N0155 25g 500g  2-Nitrobenzoic Acid CAS RN: 552-16-9	B3764 5g 25g  1,4-Benzodioxane-6-carboxylic Acid CAS RN: 4442-54-0
T1145 5g 25g  4-(Trifluoromethyl)benzoic Acid CAS RN: 455-24-3	B0552 25g 100g 500g  2-Bromobenzoic Acid CAS RN: 88-65-3	D0869 25g 100g 500g  Diphenylacetic Acid CAS RN: 117-34-0	I0053 25g 100g 500g  2-Iodobenzoic Acid CAS RN: 88-67-5	
<h2 style="margin: 0;">β-Keto Esters</h2>				
		A0650 25g 500g  Methyl Acetoacetate CAS RN: 105-45-3	A0649 25g 500g  Ethyl Acetoacetate CAS RN: 141-97-9	M2315 5g 25g  Methyl Malonyl Chloride CAS RN: 37517-81-0
A1981 25g 500g  Allyl Acetoacetate CAS RN: 1118-84-9	M2277 5g 25g  Methyl 3-Cyclopropyl-3-oxopropionate CAS RN: 32249-35-7	M0799 25g 100g 500g  Meldrum's Acid (=2,2-Dimethyl-1,3-dioxane-4,6-dione) CAS RN: 2033-24-1	K0035 25g 100g 500g  Methyl 3-Oxovalerate CAS RN: 30414-53-0	K0031 5g 25g  Ethyl 3-Oxovalerate CAS RN: 4949-44-4
I0826 25g 500g  Isopropyl Acetoacetate CAS RN: 542-08-5	A0817 25mL 500mL  Propyl Acetoacetate CAS RN: 1779-60-8	E0484 5g 25g  Ethyl Malonyl Chloride CAS RN: 36239-09-5	A0815 25mL  <i>sec</i> -Butyl Acetoacetate CAS RN: 13562-76-0	A0816 25mL 100mL 500mL  <i>tert</i> -Butyl Acetoacetate CAS RN: 1694-31-1

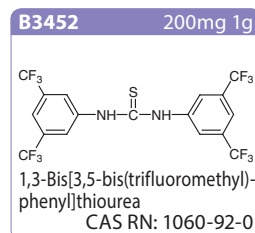
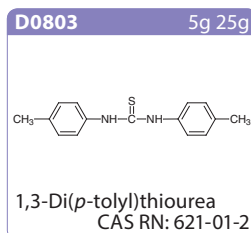
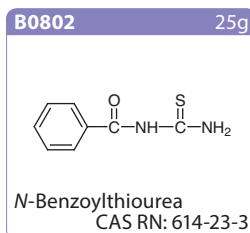
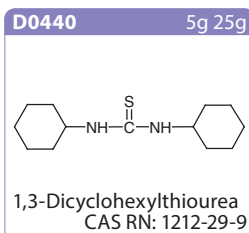
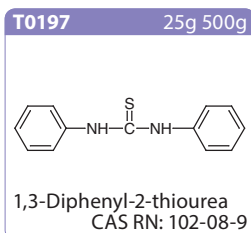
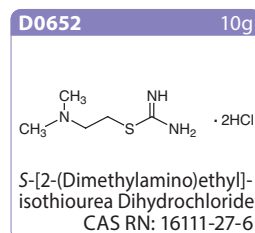
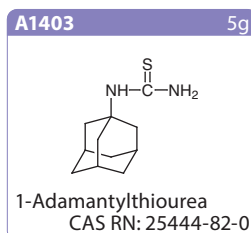
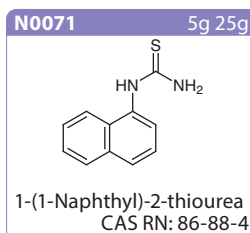
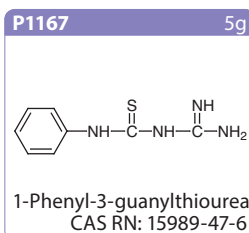
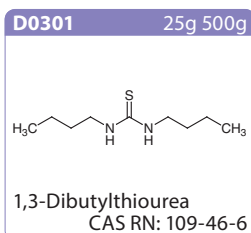
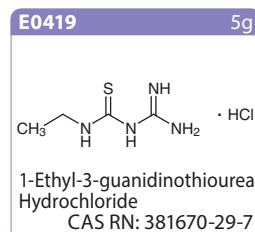
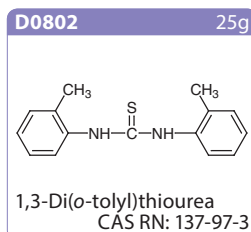
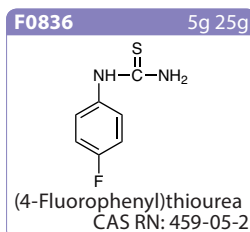
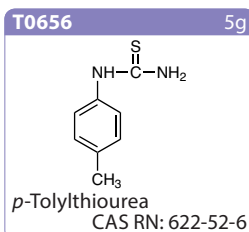
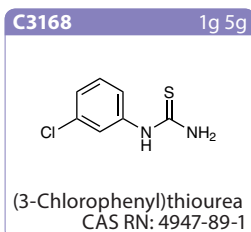
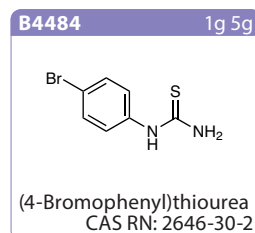
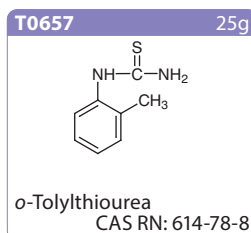
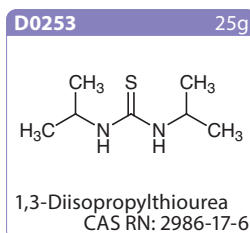
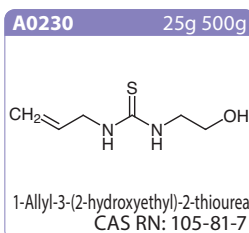
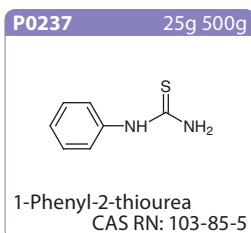
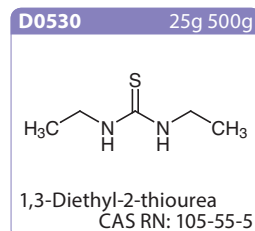
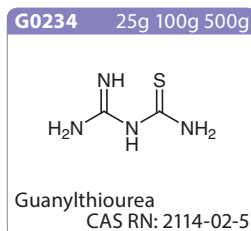
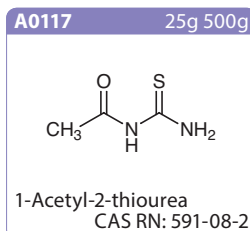
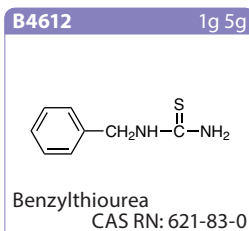
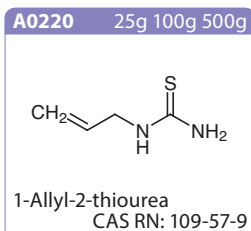
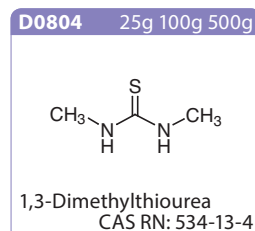
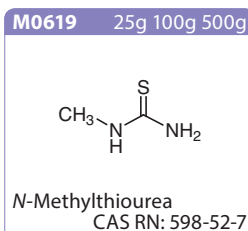
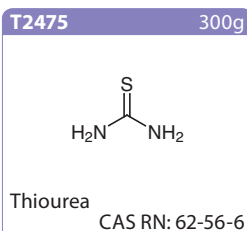
Multicomponent reaction (MCR)

A0795 25mL  Butyl Acetoacetate CAS RN: 591-60-6	E0882 5g 25g  Ethyl Isobutyrylacetate CAS RN: 7152-15-0	K0037 25mL 500mL  Methyl 3-Oxohexanoate CAS RN: 30414-54-1	K0030 25mL 500mL  Ethyl 3-Oxohexanoate CAS RN: 3249-68-1	A0814 25mL 500mL  Isobutyl Acetoacetate CAS RN: 7779-75-1
A1583 25g 500g  2-Methoxyethyl Acetoacetate CAS RN: 22502-03-0	C0911 25g 500g  Ethyl 4-Chloroacetoacetate CAS RN: 638-07-3	A0811 25mL 500mL  Amyl Acetoacetate CAS RN: 6624-84-6	D1891 5mL 25mL  Ethyl 4,4-Dimethyl-3-oxovalerate CAS RN: 17094-34-7	O0216 10g 25g  Ethyl 3-Oxoheptanoate CAS RN: 7737-62-4
A0812 25mL 500mL  Isoamyl Acetoacetate CAS RN: 2308-18-1	A0813 25mL  3-Pentyl Acetoacetate CAS RN: 13562-81-7	T0810 25g 100g 500g  Ethyl 4,4,4-Trifluoroacetoacetate CAS RN: 372-31-6	A0913 25mL  Hexyl Acetoacetate CAS RN: 13562-84-0	O0073 5g 25g  Diethyl Oxalacetate CAS RN: 108-56-5
A1080 25mL 100mL 500mL  Benzyl Acetoacetate CAS RN: 5396-89-4	B0097 25g 100g 500g  Ethyl Benzoylacetate CAS RN: 94-02-0	T1530 25g  Isopropyl 4,4,4-Trifluoroacetoacetate CAS RN: 175230-50-9	A0916 25mL  Heptyl Acetoacetate CAS RN: 42598-96-9	F0435 1g 5g 25g  Ethyl (4-Fluorobenzoyl)acetate CAS RN: 1999-00-4
E0489 25g 500g  Ethylene Glycol Monoacetoacetate Monomethacrylate (stabilized with BHT) CAS RN: 21282-97-3	A0915 25mL  n-Octyl Acetoacetate CAS RN: 16436-00-3	M1380 5g 25g  Ethyl 4-Methoxybenzoylacetate CAS RN: 2881-83-6	O0229 1g 5g  Diethyl 3-Oxopimelate CAS RN: 40420-22-2	T1285 10g 25g  Ethyl 4,4,4-Trichloroacetoacetate CAS RN: 3702-98-5
P1062 5g  Ethyl 4,4,5,5,5-Pentafluoro-3-oxovalerate CAS RN: 663-35-4	N0513 5g 25g  Ethyl 4-Nitrobenzoylacetate CAS RN: 838-57-3	N0875 5g 25g  4-Nitrobenzyl Acetoacetate CAS RN: 61312-84-3	E0759 25g  Ethyl (2,3,4,5-Tetrafluorobenzoyl)acetate CAS RN: 94695-50-8	E0811 5g 25g  Ethyl 3-(2,6-Dichloro-5-fluoro-3-pyridyl)-3-oxopropionate CAS RN: 96568-04-6
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B2185 1g 5g  Benzyl Isocyanide CAS RN: 10340-91-7	T1054 1mL 5mL  1,1,3,3-Tetramethylbutyl Isocyanide CAS RN: 14542-93-9	I0455 1g 5g  1-(Isocyanomethyl)-1H-benzotriazole CAS RN: 87022-42-2	I0824 1g 5g  1-Isocyanoadamantane CAS RN: 22110-53-8	T1046 5g 25g  p-Toluenesulfonylmethyl Isocyanide (= TosMIC) CAS RN: 36635-61-7

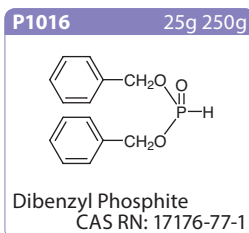
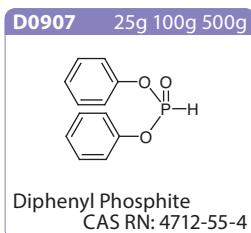
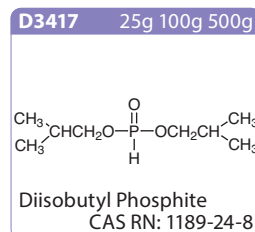
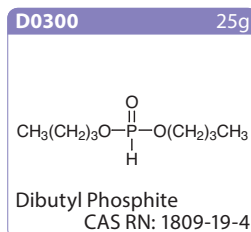
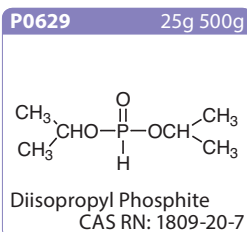
Ureas

Ureas		U0073 300g  Urea CAS RN: 57-13-6	M0455 25g 500g  1-Methylurea CAS RN: 598-50-5	D0289 25g 500g  1,3-Dimethylurea CAS RN: 96-31-1
		E0192 25g 500g  Ethylurea CAS RN: 625-52-5	A0237 25g 250g  Allylurea CAS RN: 557-11-9	A0124 25g  Acetylurea CAS RN: 591-07-1
B1831 25g  Butylurea CAS RN: 592-31-4	D0534 25g 500g  1,3-Diethylurea CAS RN: 623-76-7	D5170 1g 5g  1,3-Diallylurea CAS RN: 1801-72-5	H0655 25g  Hydantoic Acid CAS RN: 462-60-2	D0767 25g 500g  1,3-Bis(hydroxymethyl)urea CAS RN: 140-95-4
C0173 25g  2-Chloroethylurea CAS RN: 6296-42-0	C1101 25g 250g  Cyanoacetylurea CAS RN: 1448-98-2	C2034 25g  Cyclohexylurea CAS RN: 698-90-8	B0449 25g  Benzylurea CAS RN: 538-32-9	T0802 25g  o-Tolylurea CAS RN: 614-77-7
T0328 25g  p-Tolylurea CAS RN: 622-51-5	H0438 25g  3-Hydroxyphenylurea CAS RN: 701-82-6	C2657 5g 25g  Cymoxanil CAS RN: 57966-95-7	B1103 25g  N,N'-Bis(trimethylsilyl)urea CAS RN: 18297-63-7	C0031 25g 100g 500g  1,3-Diphenylurea CAS RN: 102-07-8
T2890 5g  p-Toluenesulfonylurea CAS RN: 1694-06-0	B2833 5g  (2-Bromophenyl)urea CAS RN: 13114-90-4	B2834 5g 25g  (4-Bromophenyl)urea CAS RN: 1967-25-5	T1915 25g 250g  1-[3-(Trimethoxysilyl)propyl]urea CAS RN: 23843-64-3	B2842 25g  1-(2-Bromoisovaleryl)urea CAS RN: 496-67-3
D0441 25g 100g 500g  1,3-Dicyclohexylurea CAS RN: 2387-23-7	C2266 5g  (4-Chlorophenylsulfonyl)urea CAS RN: 22663-37-2	C0926 5g 25g  1-(2-Chloro-4-pyridyl)-3-phenylurea CAS RN: 68157-60-8	U0048 25mL 500mL  1-[3-(Triethoxysilyl)propyl]urea (40-52% in Methanol) CAS RN: 23779-32-0	C1220 25g  1-(4-Chlorophenylsulfonyl)-3-propylurea CAS RN: 94-20-2
O0209 10g  N-Octadecylurea CAS RN: 2158-08-9	T1015 25g 500g  3,4,4'-Trichlorocarbanilide CAS RN: 101-20-2	I0665 25g 250g  Imidazolidinyl Urea CAS RN: 39236-46-9	E1171 200mg 1g  (4-Ethoxyphenyl)urea CAS RN: 150-69-6	

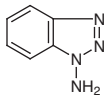
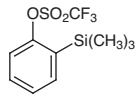
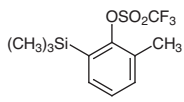
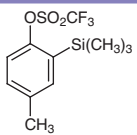
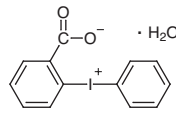
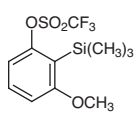
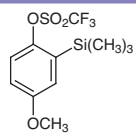
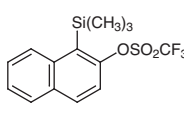
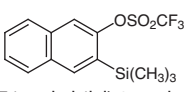
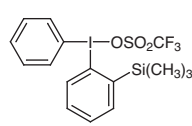
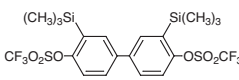
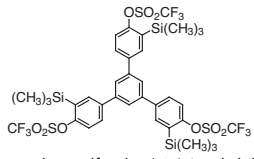
Thioureas



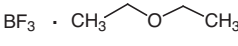
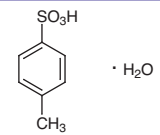
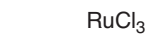
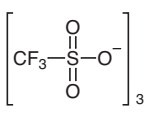

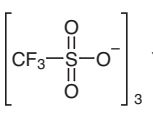

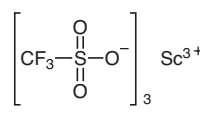
Dialkyl Phosphites



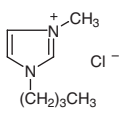
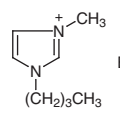
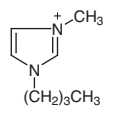
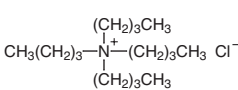
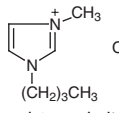
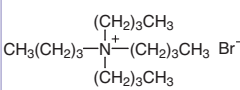
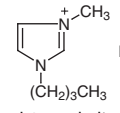
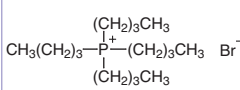
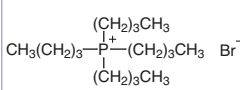
Benzyne Precursors

A1464 1g 5g		T2089 1g 5g 25g		M1883 1g 5g	
1-Aminobenzotriazole CAS RN: 1614-12-6		2-(Trimethylsilyl)phenyl Trifluoromethanesulfonate CAS RN: 88284-48-4		2-Methyl-6-(trimethylsilyl)phenyl Trifluoromethanesulfonate CAS RN: 556812-44-3	
M1882 1g 5g		D2503 5g 25g		M1884 1g 5g	
4-Methyl-2-(trimethylsilyl)phenyl Trifluoromethanesulfonate CAS RN: 262373-15-9		Diphenyliodonium- 2-carboxylate Monohydrate CAS RN: 96195-89-0		3-Methoxy-2-(trimethylsilyl)phenyl Trifluoromethanesulfonate CAS RN: 217813-03-1	
M1885 1g 5g		T2465 1g 5g		T2466 1g 5g	
4-Methoxy-2-(trimethylsilyl)phenyl Trifluoromethanesulfonate CAS RN: 556812-41-0		1-(Trimethylsilyl)-2-naphthyl Trifluoromethanesulfonate CAS RN: 252054-88-9		3-(Trimethylsilyl)-2-naphthyl Trifluoromethanesulfonate CAS RN: 780820-43-1	
P1620 1g 5g		B3047 1g		T2467 1g	
Phenyl[2-(trimethylsilyl)phenyl]- iodonium Trifluoromethanesulfonate CAS RN: 164594-13-2		3,3'-Bis(trimethylsilyl)biphenyl-4,4'- diyl Bis(trifluoromethanesulfonate) CAS RN: 828282-80-0		1,3,5-Tris[4-(trifluoromethanesulfonyloxy)-3-(trimethylsilyl)phenyl]benzene CAS RN: 847925-63-7	

Lewis Acids

L0210 25g 100g 500g	LiBr	N0850 25g 500g	NiCl ₂	Z0014 25g 300g	ZnCl ₂
Lithium Bromide CAS RN: 7550-35-8		Nickel(II) Chloride Anhydrous CAS RN: 7718-54-9		Zinc Chloride CAS RN: 7646-85-7	
B0527 25mL 100mL 500mL		T0267 25g 500g		T2052 100mL 500mL	TiCl ₄
Boron Trifluoride - Ethyl Ether Complex CAS RN: 109-63-7		p-Toluenesulfonic Acid Monohydrate CAS RN: 6192-52-5		Titanium(IV) Chloride (14% in Dichloromethane, ca. 1.0mol/L) CAS RN: 7550-45-0	
R0074 1g 5g		T1293 5g 25g		R0074 1g 5g	RuCl ₃
Ruthenium(III) Chloride CAS RN: 10049-08-8		Lanthanum(III) Trifluoromethanesulfonate CAS RN: 52093-26-2		Ytterbium(III) Trifluoromethanesulfonate Hydrate CAS RN: 54761-04-5	
I0778 5g 25g		T1610 5g 25g		I0778 5g 25g	Indium(III) Chloride Anhydrous CAS RN: 10025-82-8
Indium(III) Chloride Anhydrous CAS RN: 10025-82-8		Ytterbium(III) Trifluoromethanesulfonate Hydrate CAS RN: 54761-04-5			
B3546 25g 250g		T1663 1g 5g		B3546 25g 250g	BiCl ₃
Bismuth(III) Chloride Anhydrous CAS RN: 7787-60-2		Scandium(III) Trifluoromethanesulfonate CAS RN: 144026-79-9			

Ionic Liquids

B2194 5g 25g 100g		B2193 5g		B2195 5g 25g 100g	
1-Butyl-3-methylimidazolium Chloride CAS RN: 79917-90-1		1-Butyl-3-methylimidazolium Bromide CAS RN: 85100-77-2		1-Butyl-3-methylimidazolium Tetrafluoroborate CAS RN: 174501-65-6	
T0055 5g 25g 100g		B2337 5g 25g		T0054 25g 100g 500g	
Tetrabutylammonium Chloride CAS RN: 1112-67-0		1-Butyl-3-methylimidazolium Trifluoromethanesulfonate CAS RN: 174899-66-2		Tetrabutylammonium Bromide CAS RN: 1643-19-2	
B2320 5g 25g		T1124 25g 100g 500g		T1124 25g 100g 500g	
1-Butyl-3-methylimidazolium Hexafluorophosphate CAS RN: 174501-64-5		Tetrabutylphosphonium Bromide CAS RN: 3115-68-2		Tetrabutylphosphonium Bromide CAS RN: 3115-68-2	

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