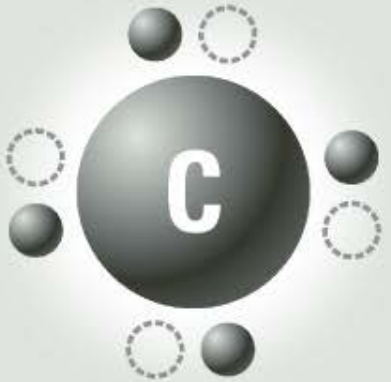
Organic Chemistry Is the Study of Compounds Containing Carbon

Carbon

C

- Needs 4 electrons
- Typical number of bonds: 4



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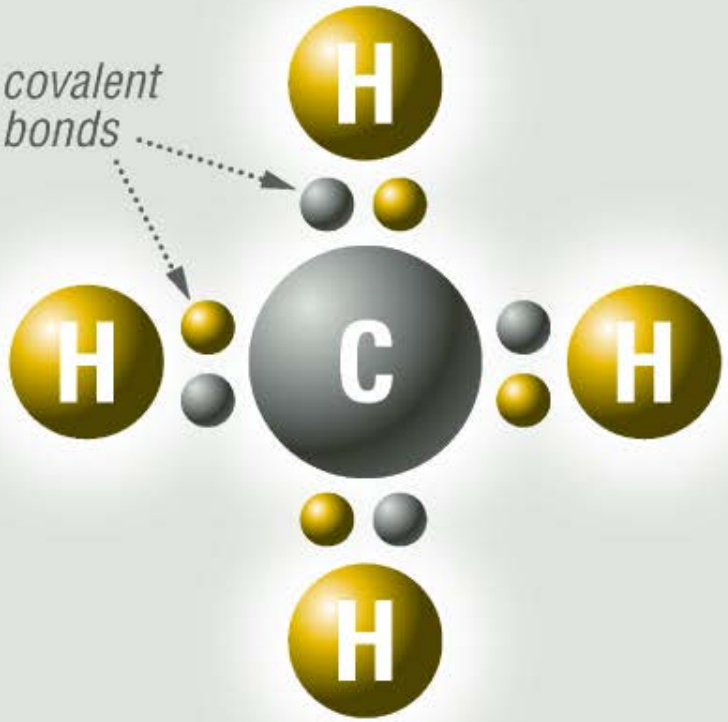
Add:

Hydrogen

H

- Needs 1 electron
- Typical number of bonds: 1



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Carbon

C

- Needs 4 electrons
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Add:

Hydrogen

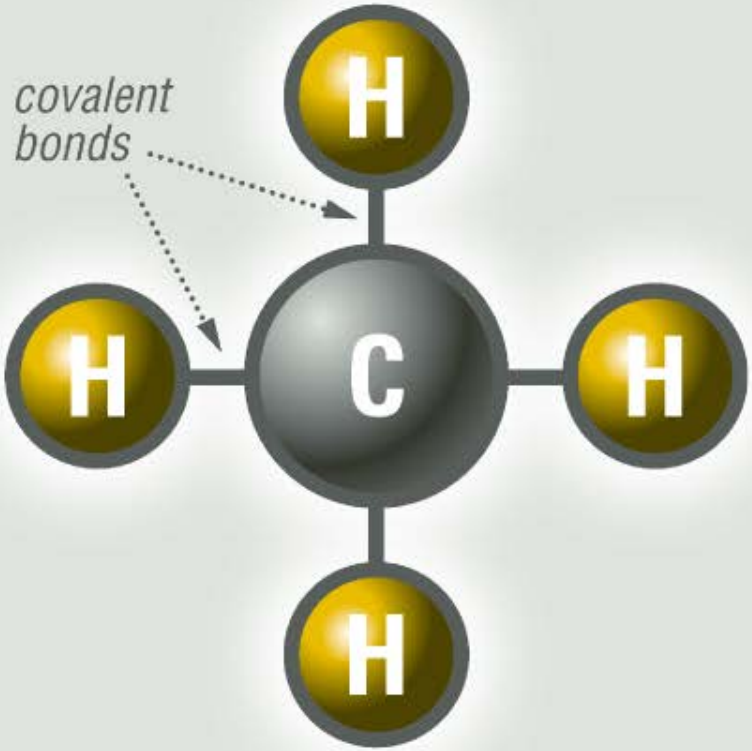
H

- Needs 1 electron
- Typical number of bonds: 1

Methane

CH_4

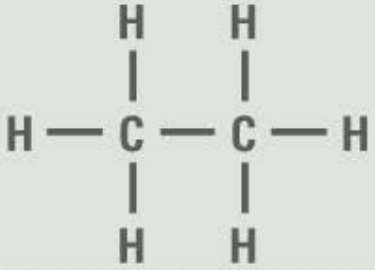
- Chemical bonds are represented by lines.



Examples of Organic Molecules

Methane CH_4

Ethane C_2H_6



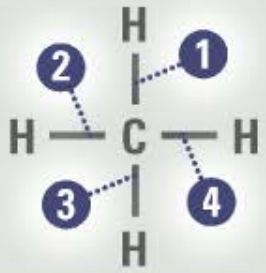
Ethylene C_2H_4

Acetylene C_2H_2

Construction of Ethanol (Ethyl Alcohol)

Methane

CH_4

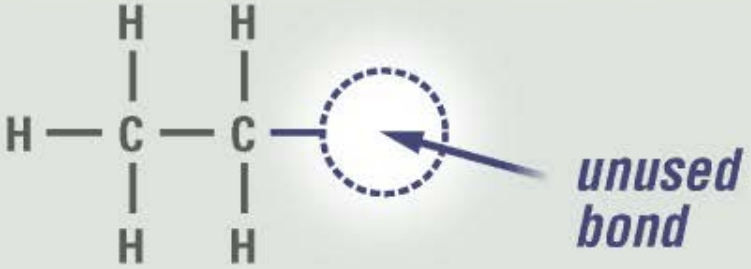


Methyl Group

CH_3-

Ethyl Group

CH_3CH_2-



Ethanol

(Ethyl Alcohol)

CH_3CH_2OH

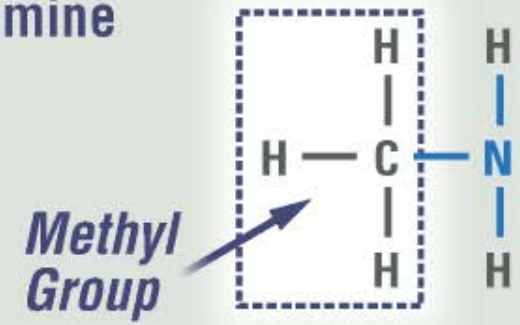
Nitrogen Derivative Compounds

Ammonia

NH_3

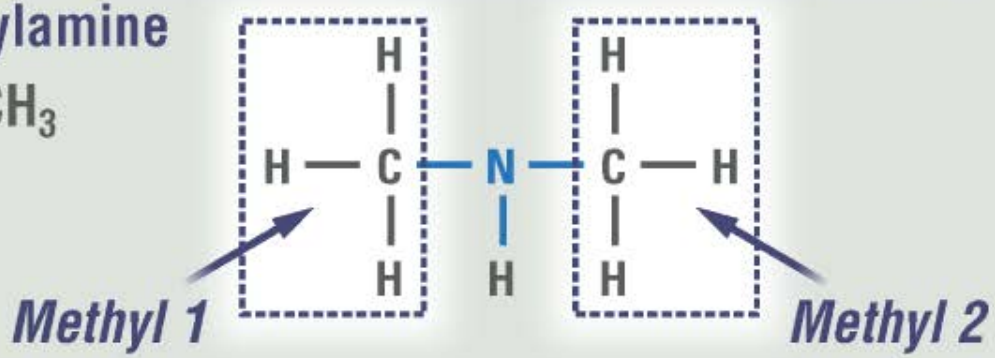
Methylamine

CH_3NH_2



Dimethylamine

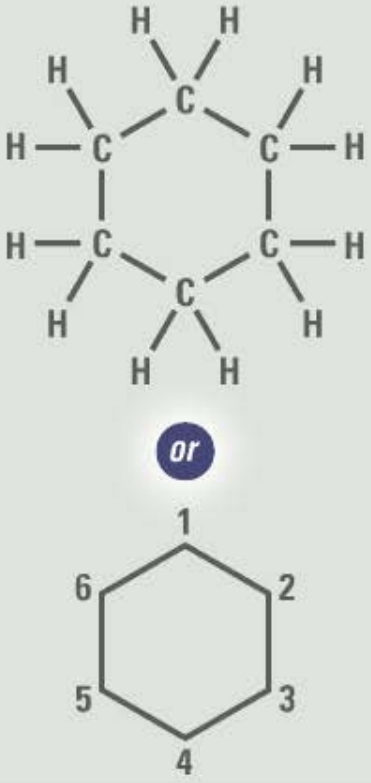
CH_3NHCH_3



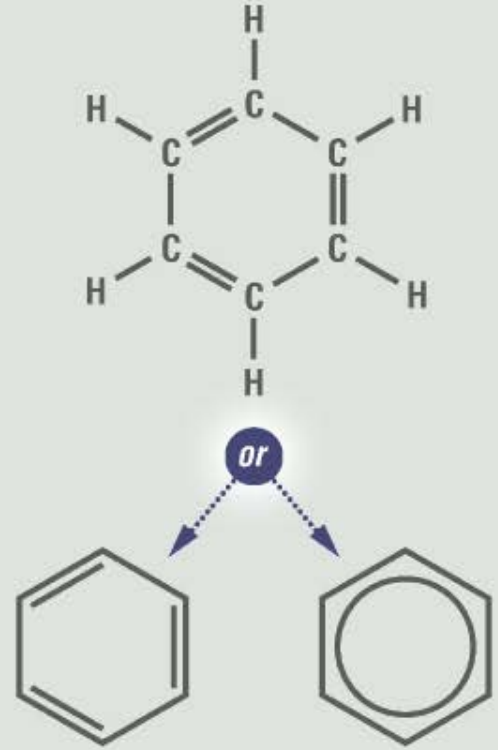
Carbon Atoms Can Bond to Each Other to Form Rings

SIX MEMBERED CARBON RINGS

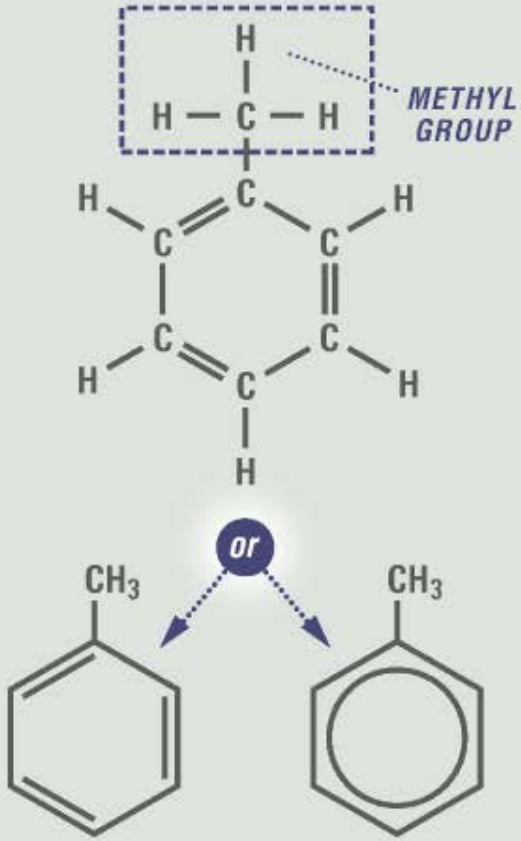
Cyclohexane C_6H_{12}



Benzene C_6H_6



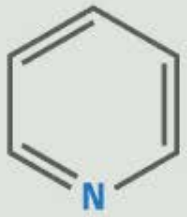
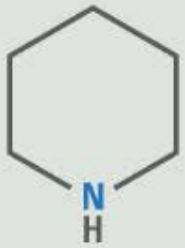
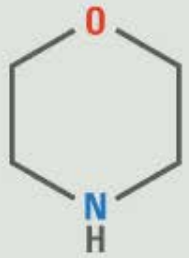
Methylbenzene $C_6H_5CH_3$ (Toluene)



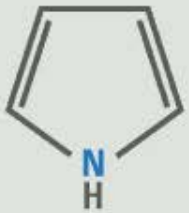
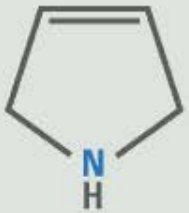
Heterocycle Rings:

Some Atom Other than Carbon Is Present as One of the Ring Atoms

SIX MEMBERED CARBON RINGS

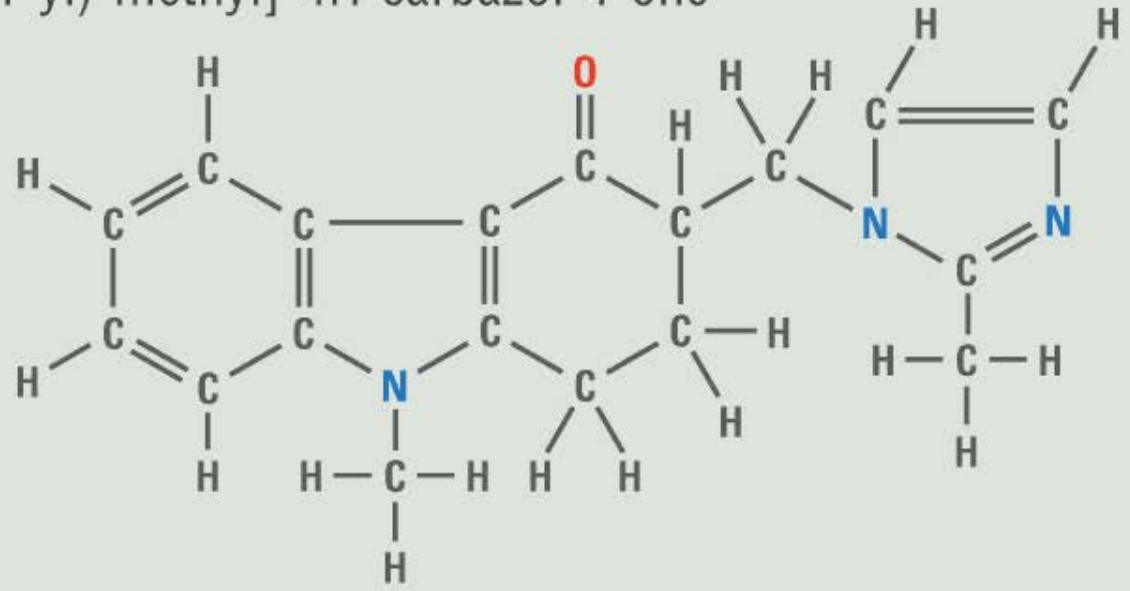
Pyridine C_5H_5N	Piperidine C_5H_6N	Morpholine C_4H_6ON
		

FIVE MEMBERED CARBON RINGS

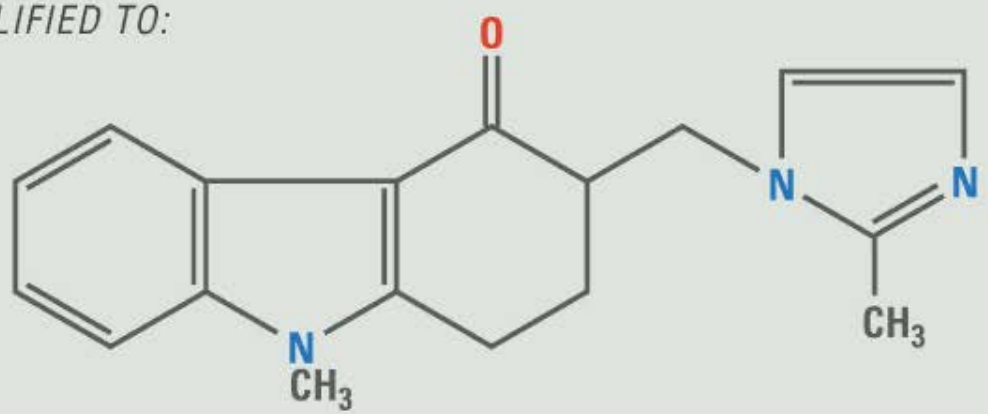
Pyrrole C_4H_5N	Pyrroline C_4H_7N	Imidazole $C_3H_4N_2$
		

The Ondansetron Molecule

1,2,3,9-tetrahydro-9-methyl-3-[(2-methyl-1H-imidazol-1-yl)-methyl]-4H-carbazol-4-one

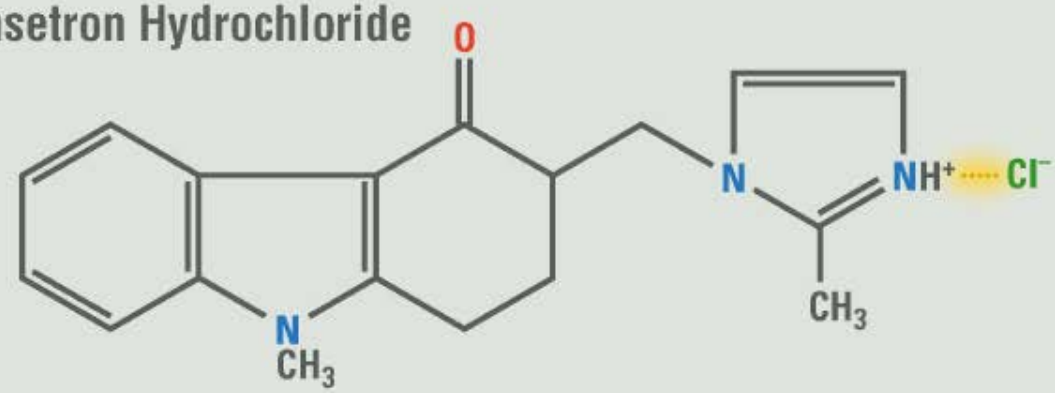


SIMPLIFIED TO:

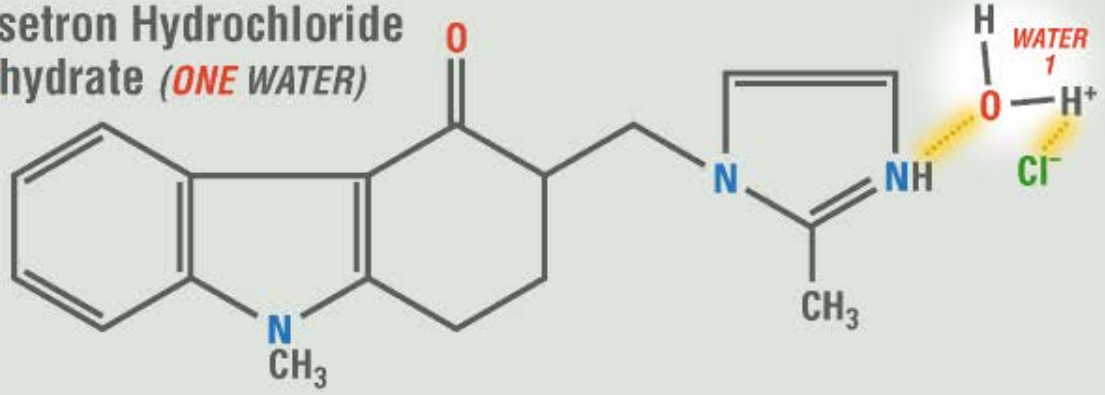


Ondansetron Hydrochloride Monohydrate and Dihydrate

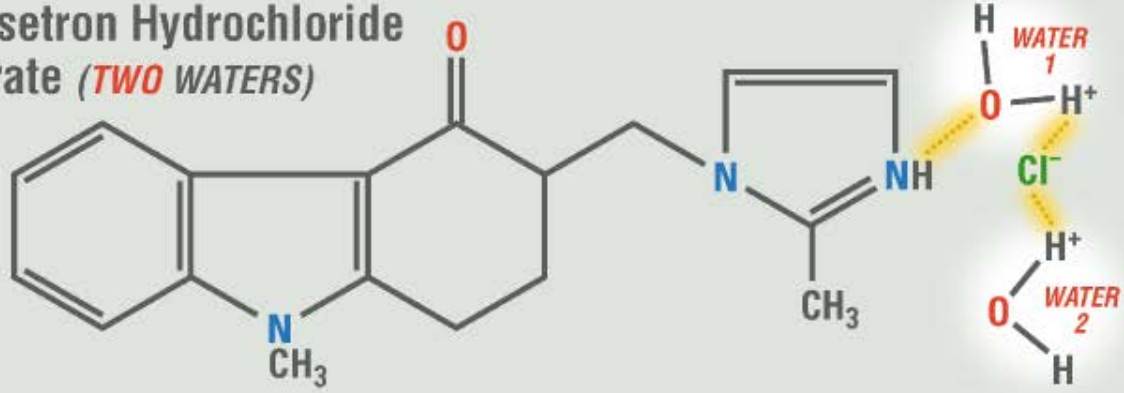
Ondansetron Hydrochloride



Ondansetron Hydrochloride *MONO*hydrate *(ONE WATER)*



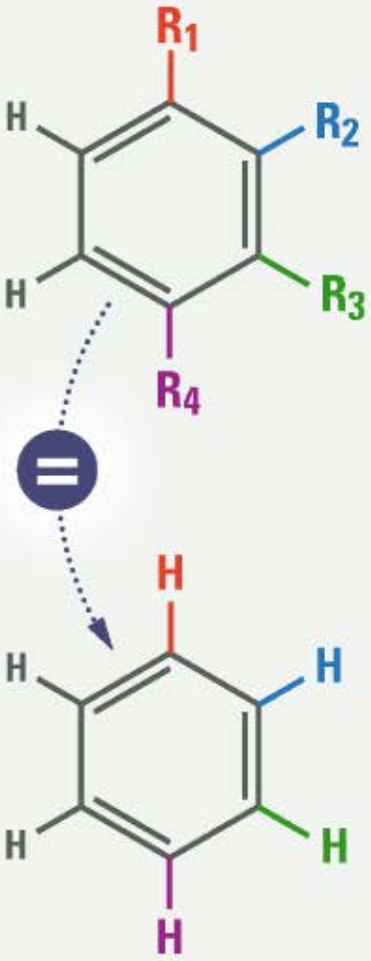
Ondansetron Hydrochloride *DI*hydrate *(TWO WATERS)*



Benzene and Its Derivatives: "R" Substitutions

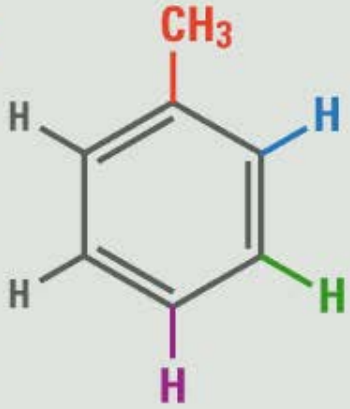
Benzene

$R_1 = H$
$R_2 = H$
$R_3 = H$
$R_4 = H$



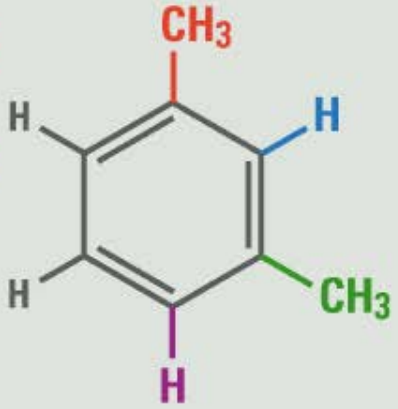
Toluene

$R_1 = CH_3$
$R_2 = H$
$R_3 = H$
$R_4 = H$



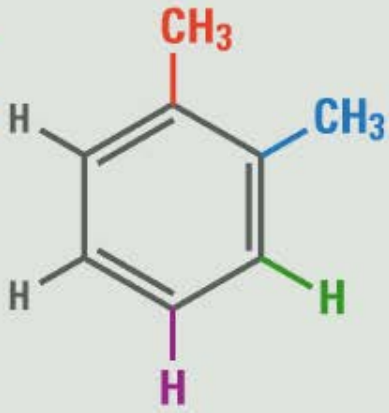
Meta-xylene

$R_1 = CH_3$
$R_2 = H$
$R_3 = CH_3$
$R_4 = H$



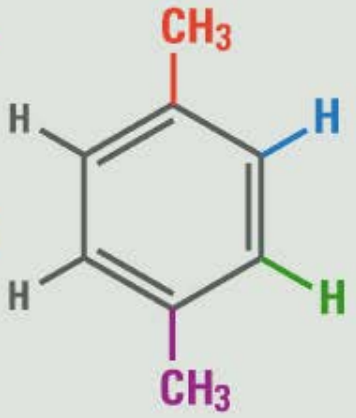
Ortho-xylene

$R_1 = CH_3$
$R_2 = CH_3$
$R_3 = H$
$R_4 = H$



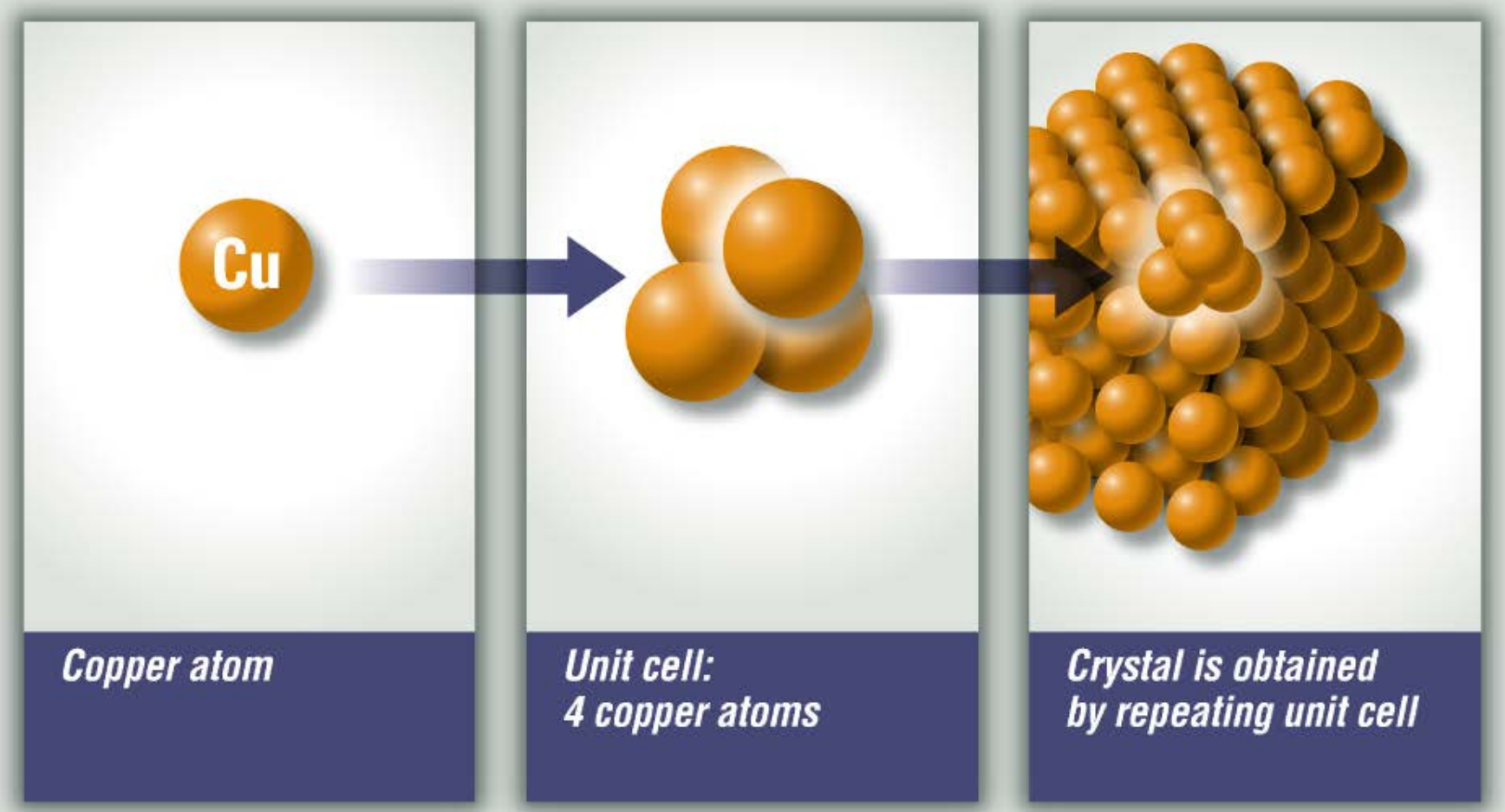
Para-xylene

$R_1 = CH_3$
$R_2 = H$
$R_3 = H$
$R_4 = CH_3$



What Is a Crystal?

A solid made up of an orderly, repeating arrangement of molecules or atoms



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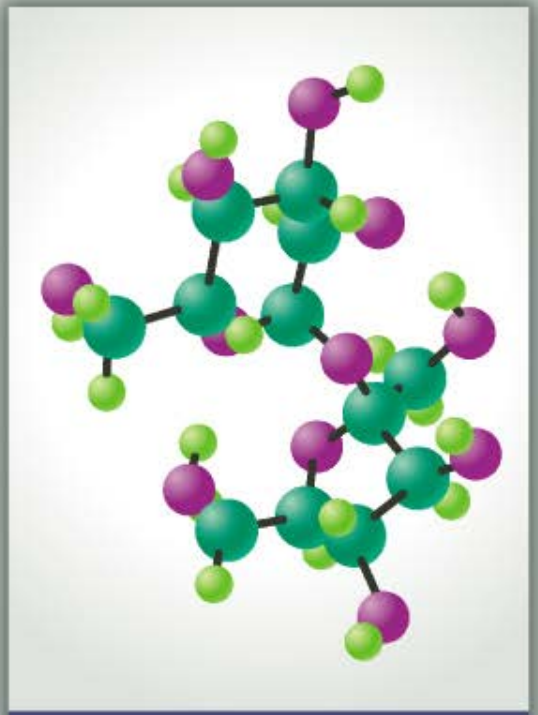
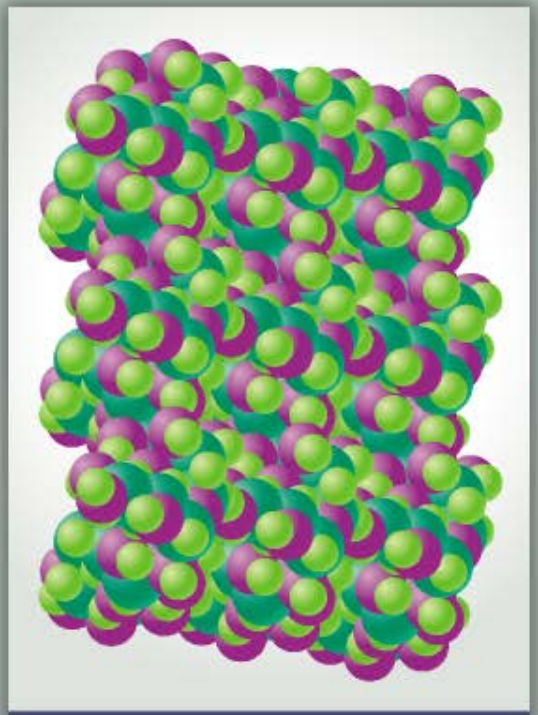


Atoms combine to form a sucrose molecule



Sucrose molecules pack together to form a crystal

Sucrose crystal (sugar)

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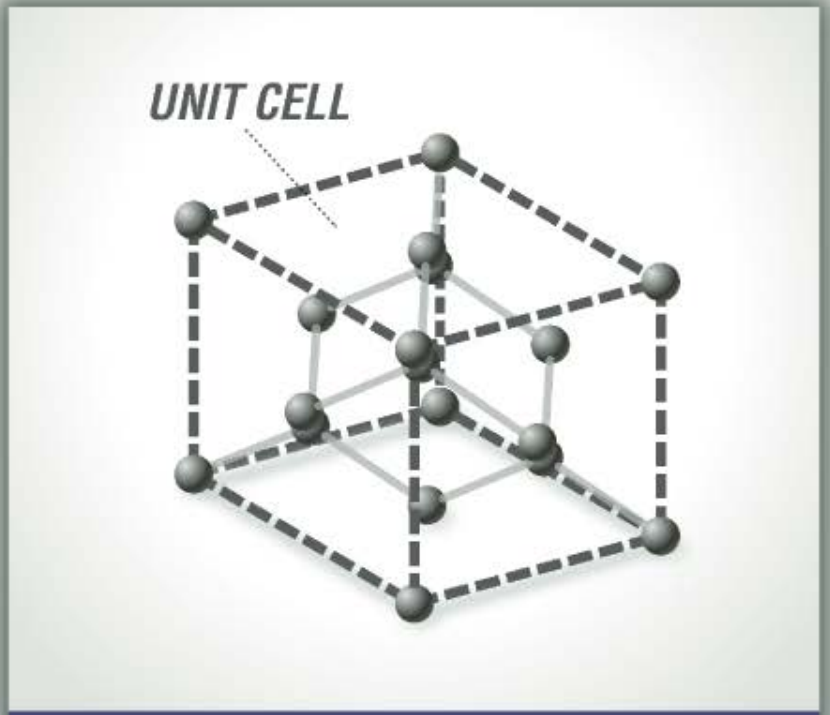
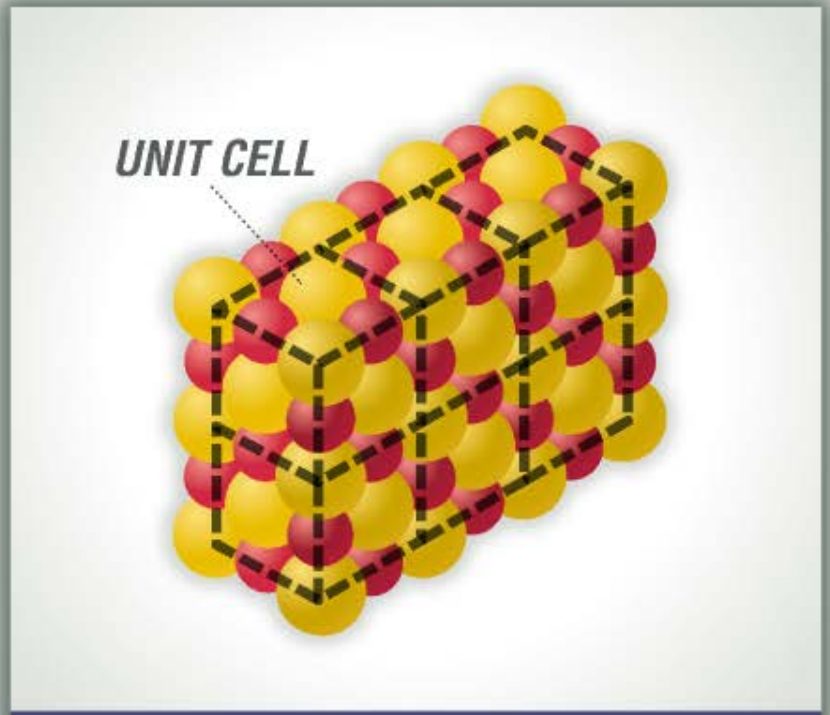
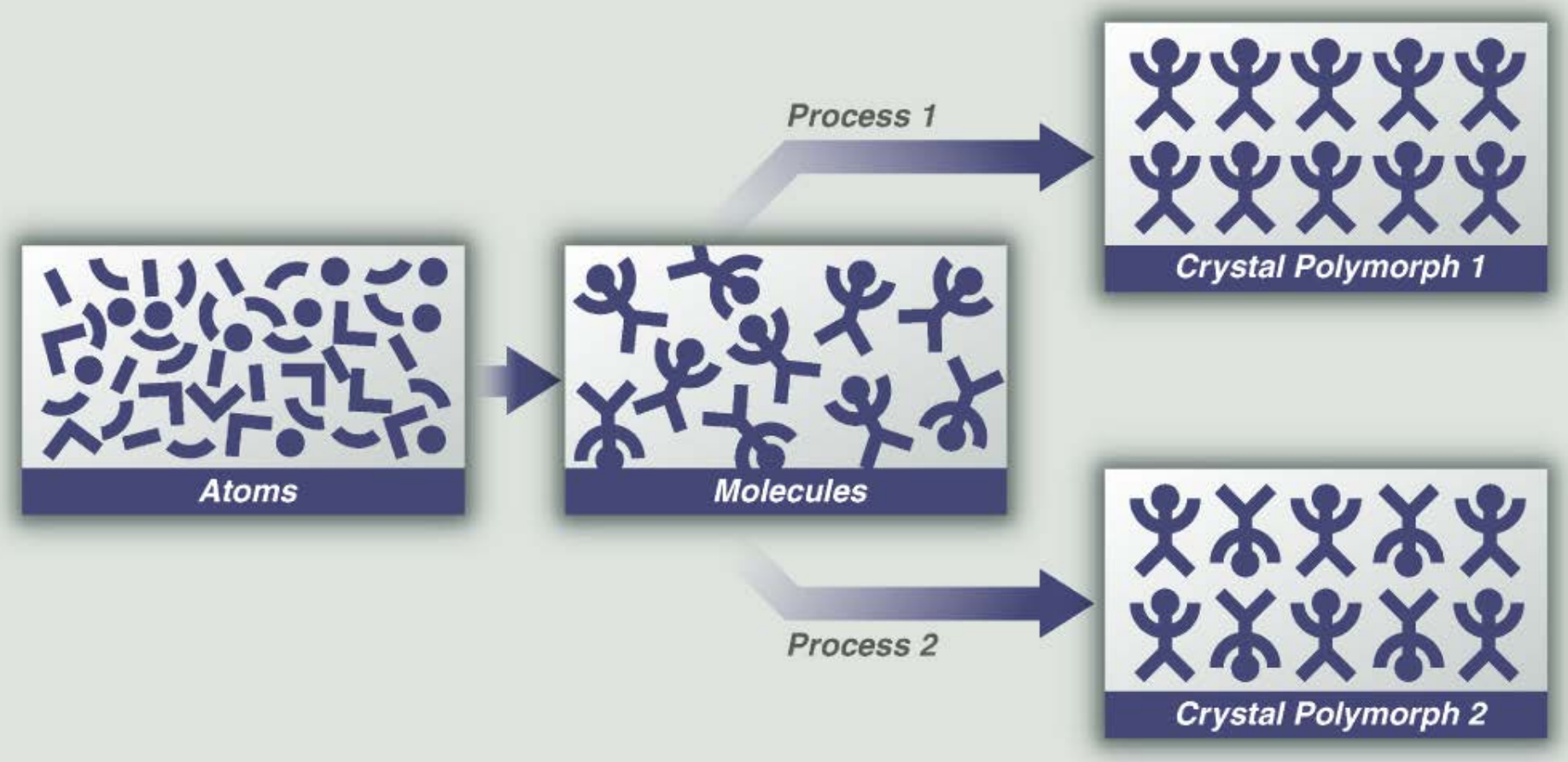


Diamond
Carbon atoms

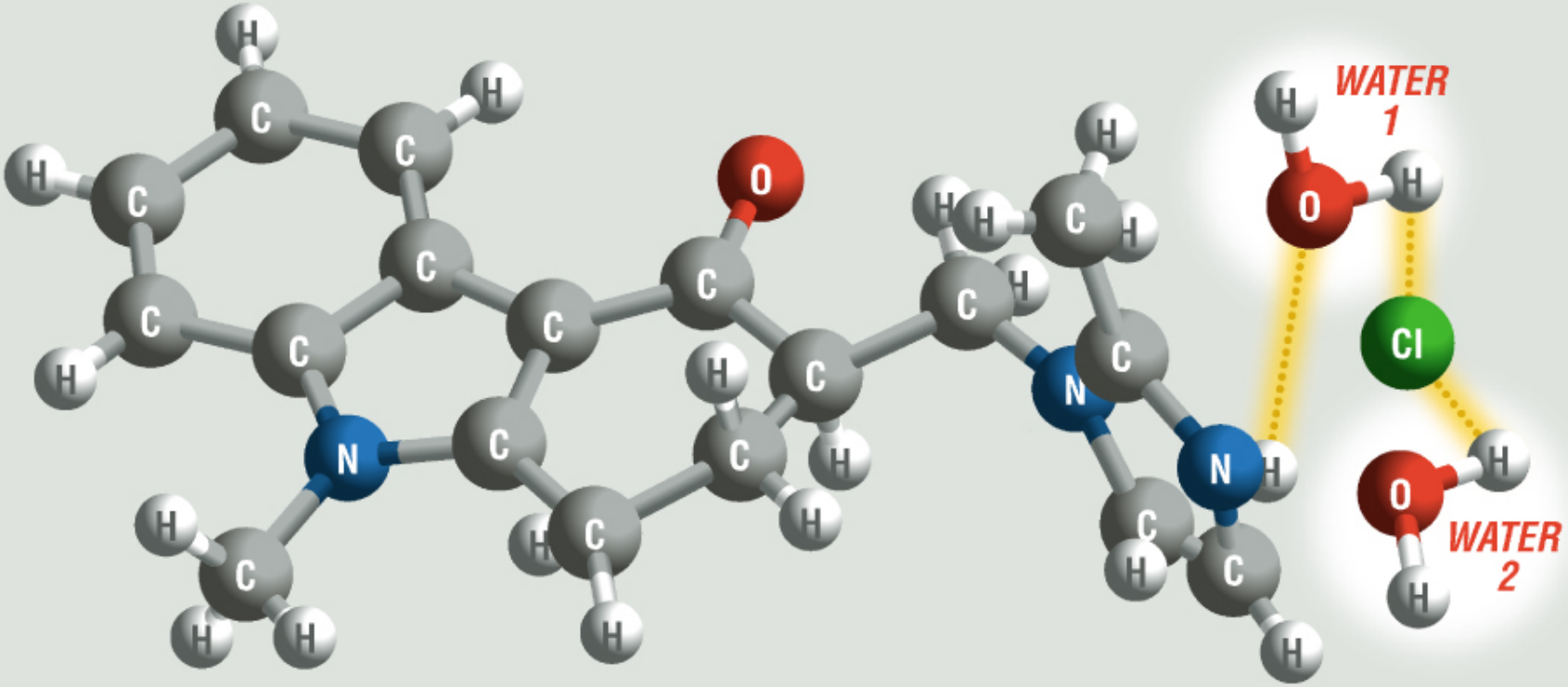


Sodium Chloride
NaCl molecules

How Crystals are Formed

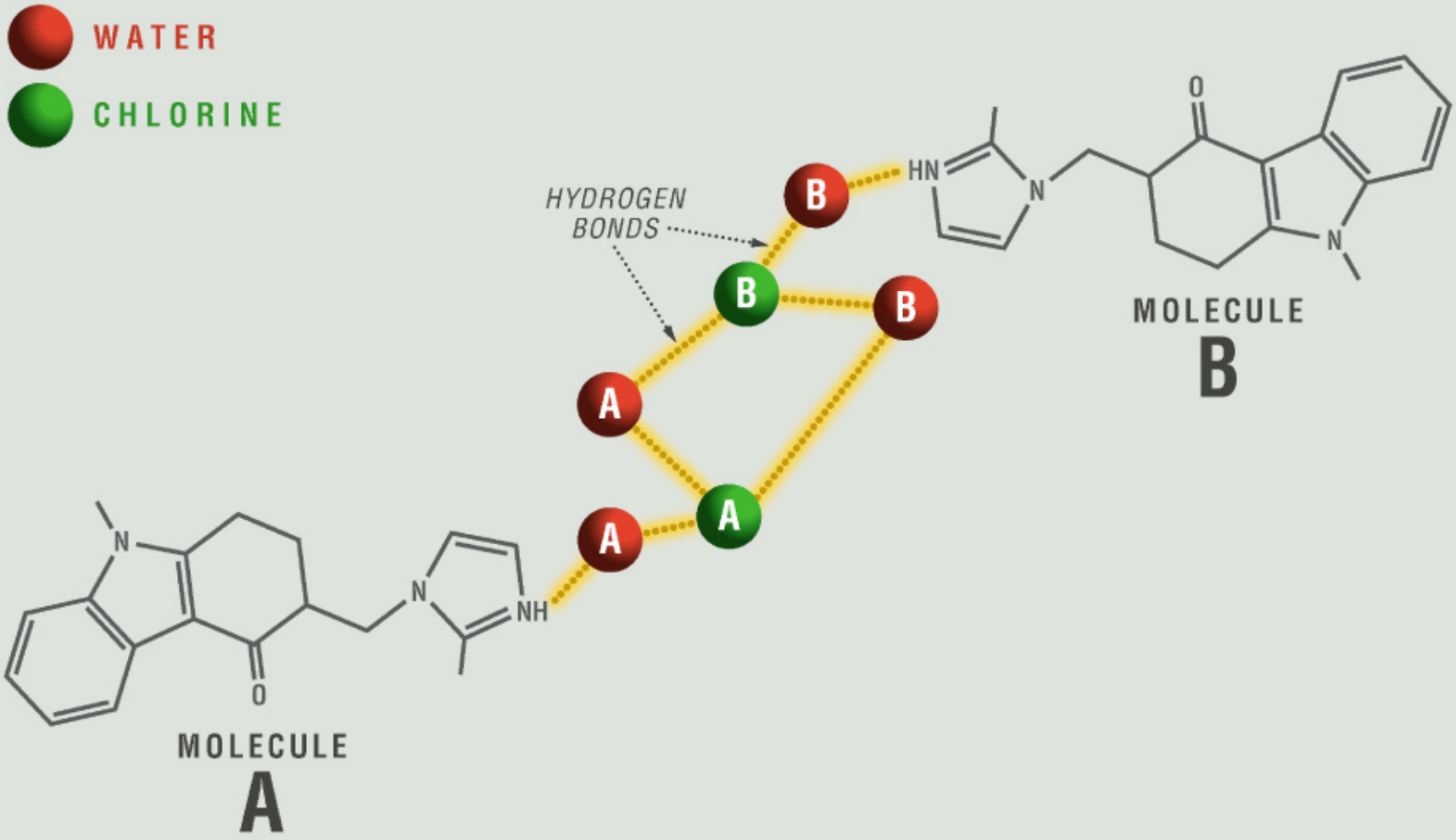


Ondansetron Hydrochloride Dihydrate



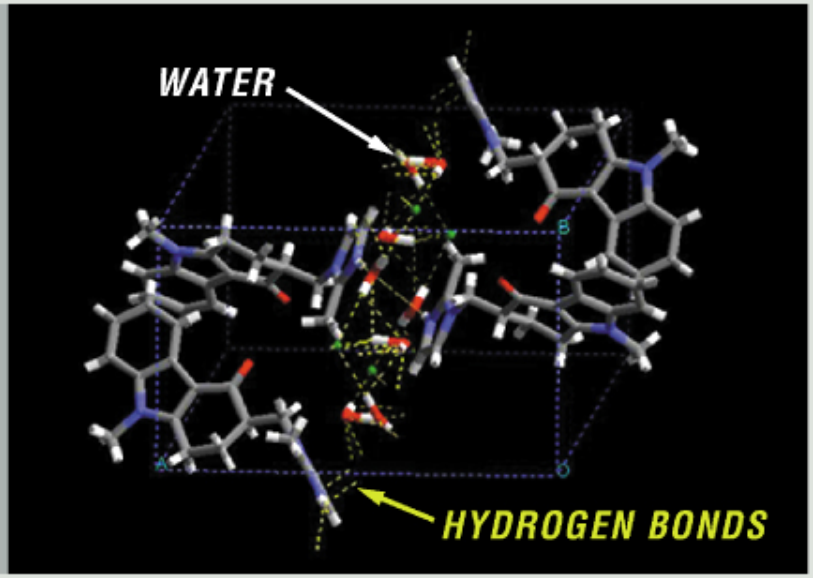
$C_{18}H_{20}N_3O \cdot Cl \cdot 2\,H_2O$

Hydrogen Bonds between Molecules of Ondansetron Hydrochloride

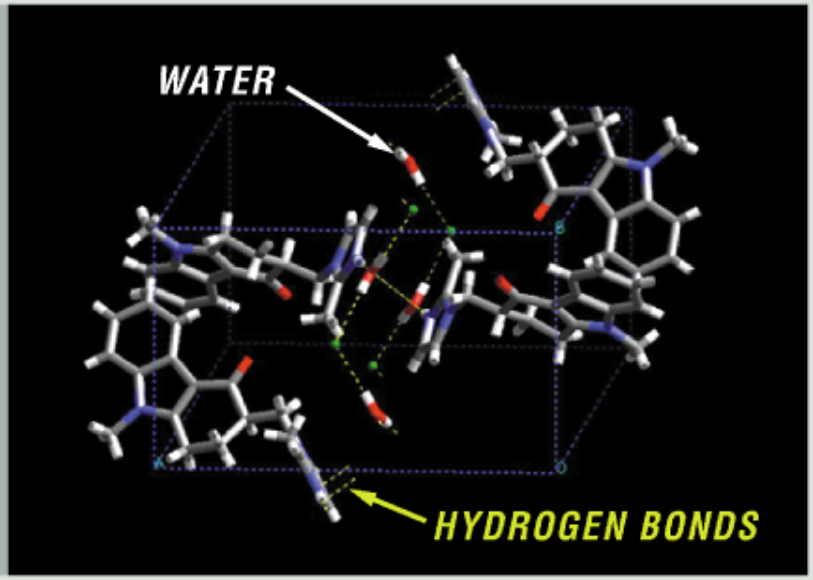


Water (Hydration) Forms Hydrogen Bonds between Ondansetron Molecules

Unit cell of Ondansetron Hydrochloride Dihydrate

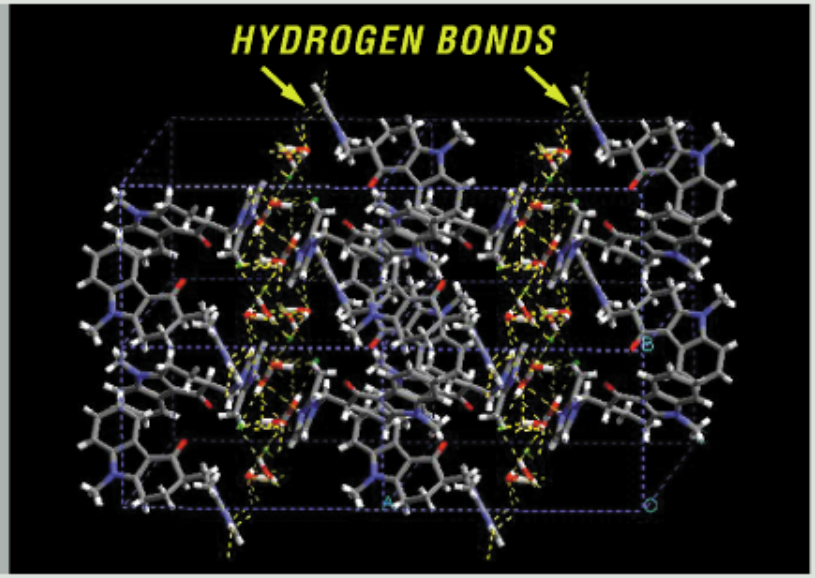


Unit cell of Desolvated Ondansetron Hydrochloride

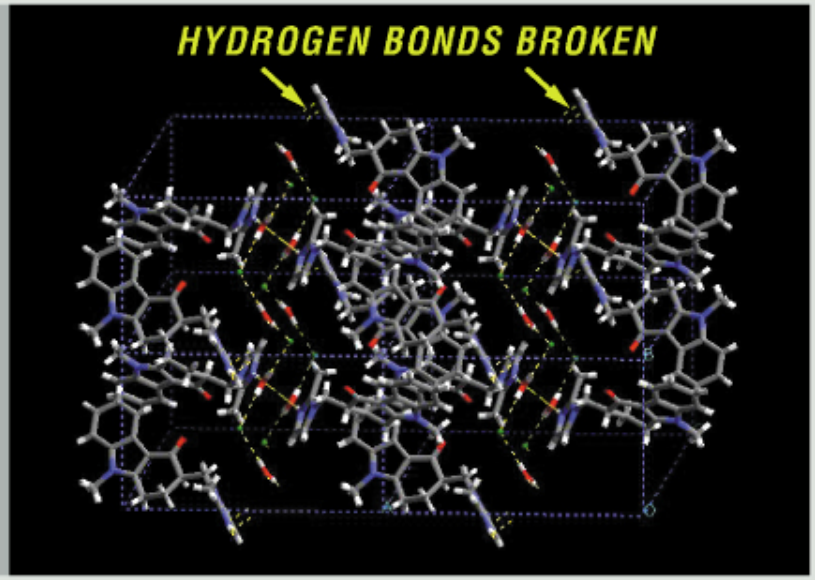


Effect of Desolvation on Ondansetron Hydrochloride Crystals

Ondansetron Hydrochloride Dihydrate

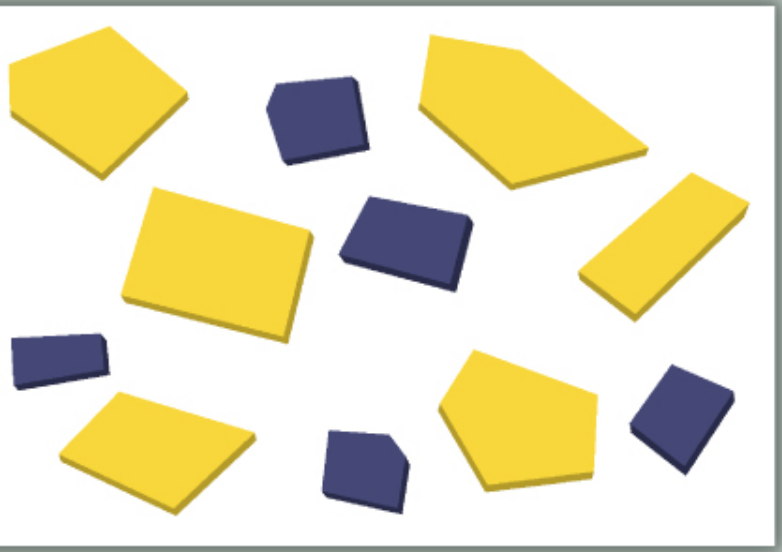


Desolvation of Ondansetron Hydrochloride

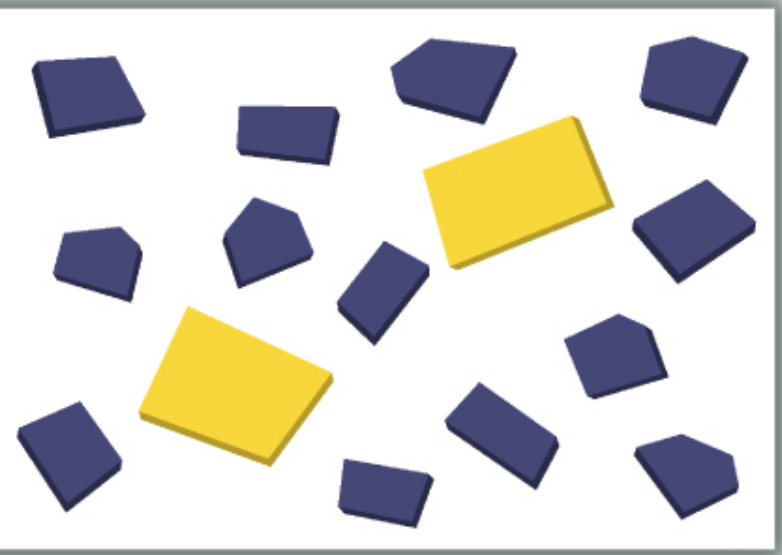


The Amount of Crystal Particles that Are Too Big Determines the Amount of Water that Must Be Removed to Obtain Content Uniformity

More oversized particles:
REMOVE MORE WATER



Fewer oversized particles:
REMOVE LESS WATER



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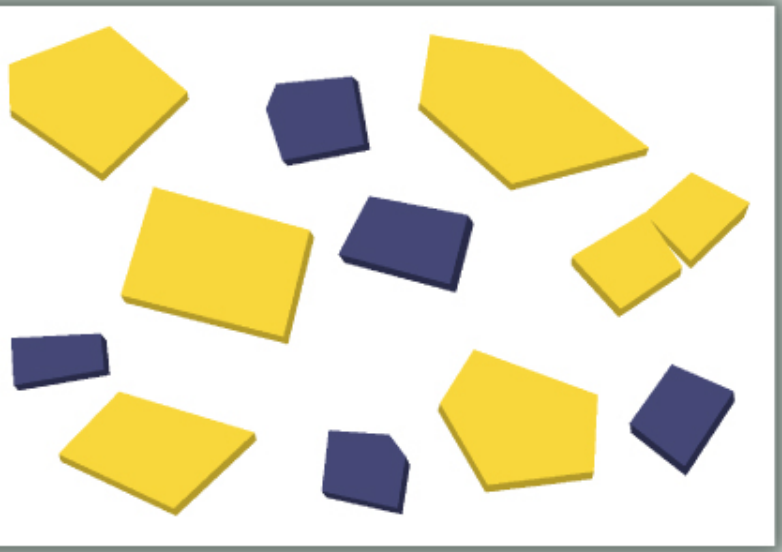

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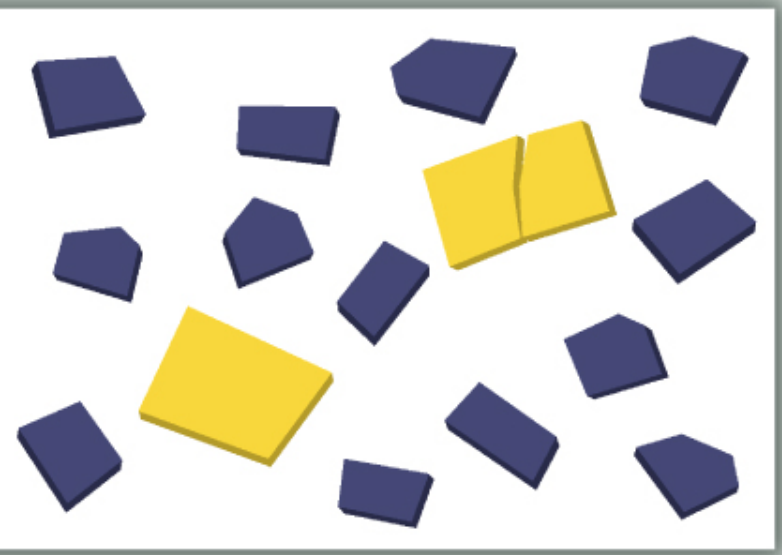

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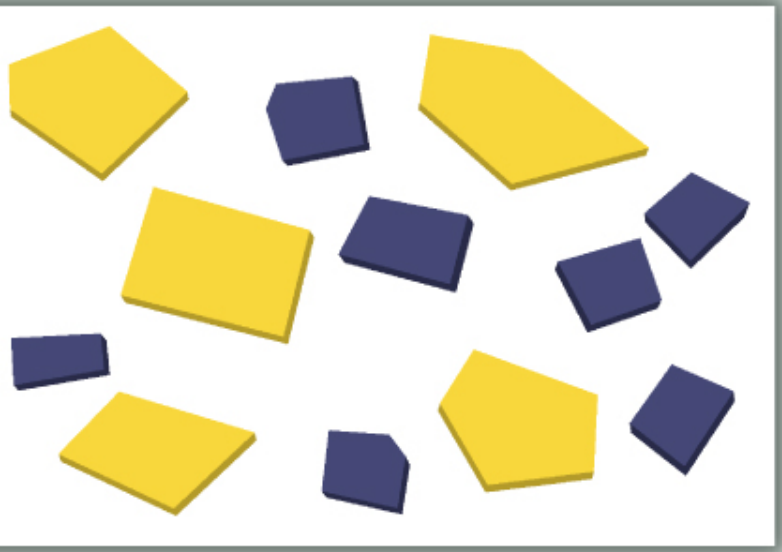

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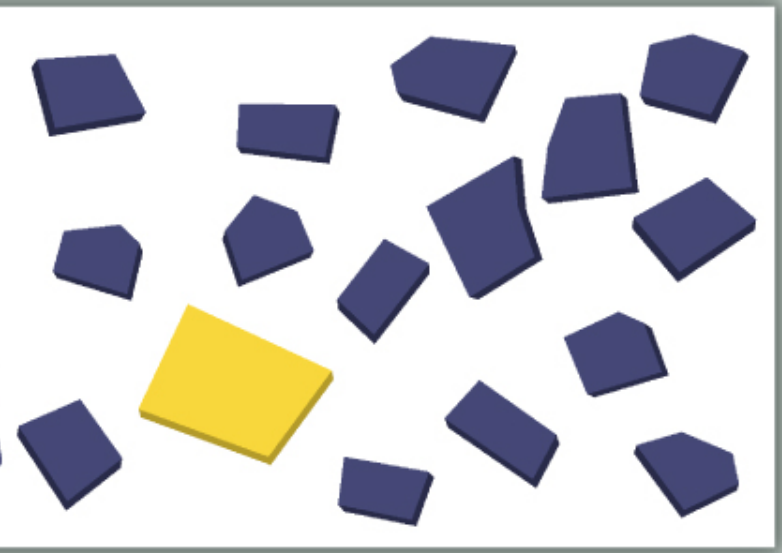
SUITABLE



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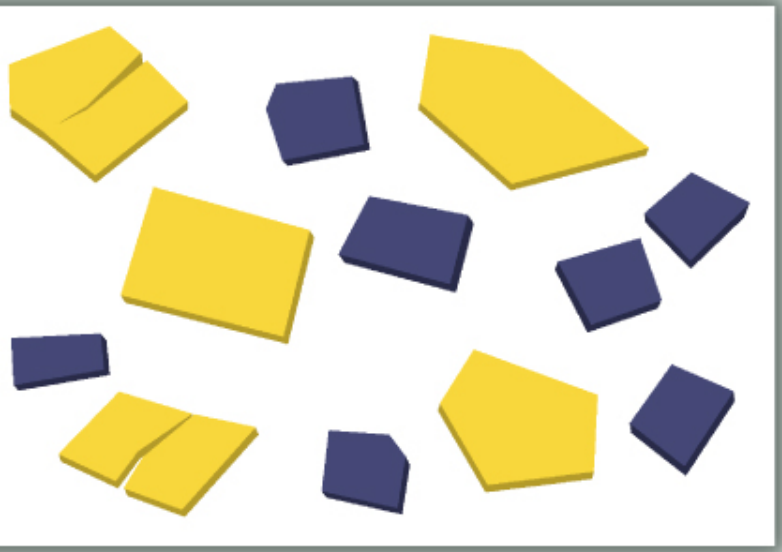

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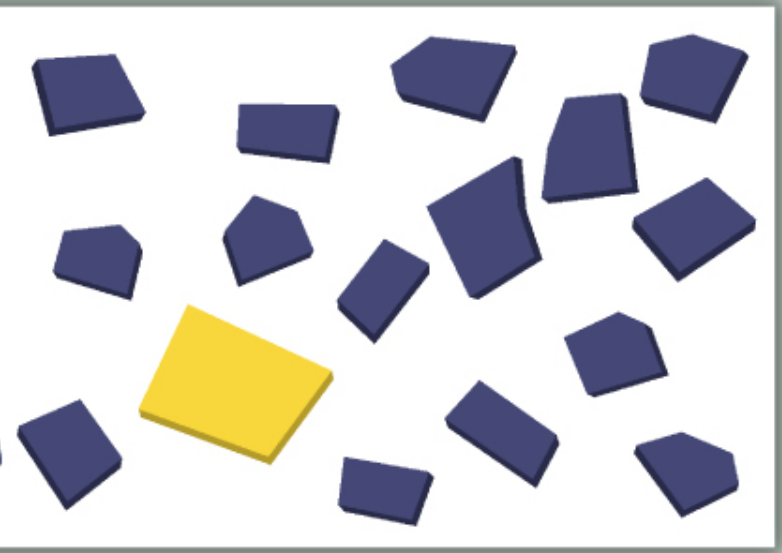

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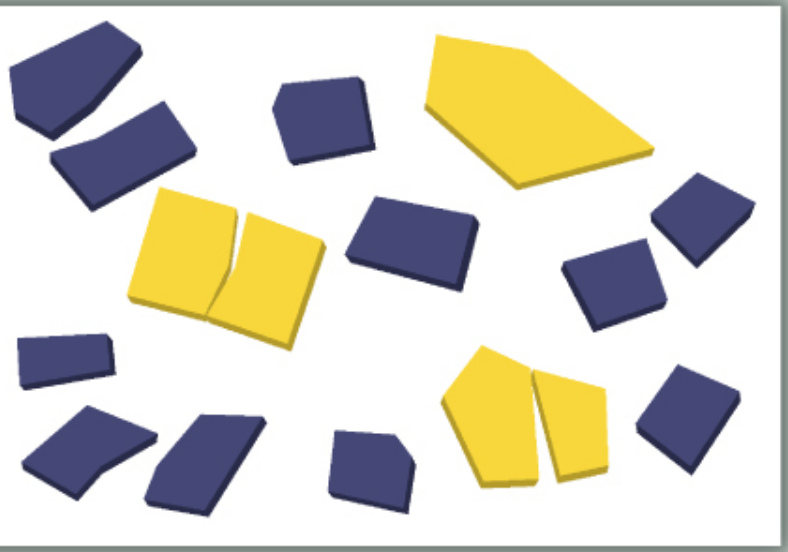

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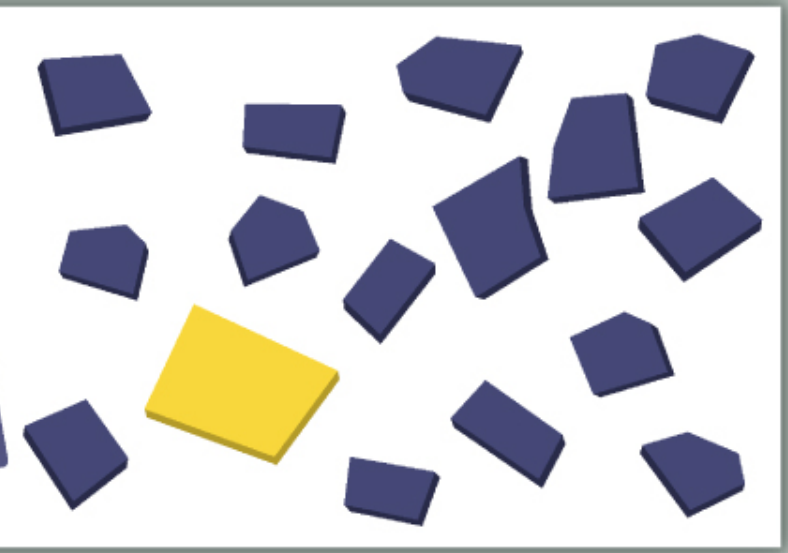
SUITABLE



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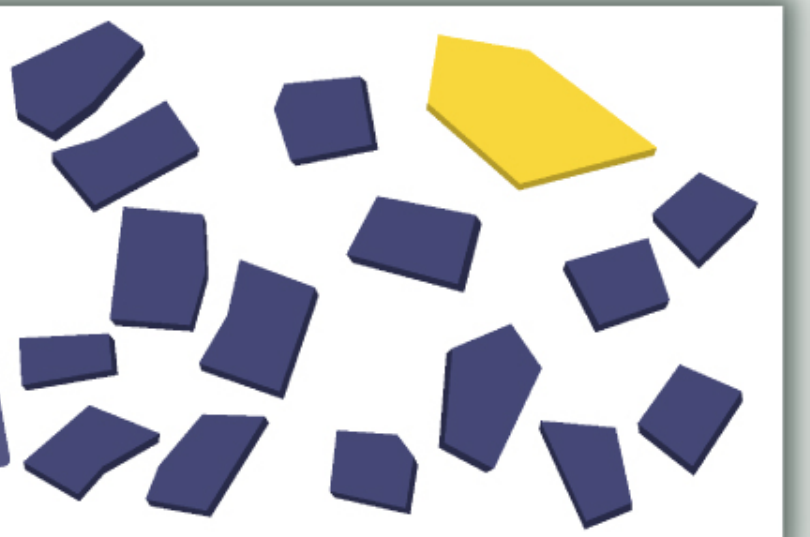

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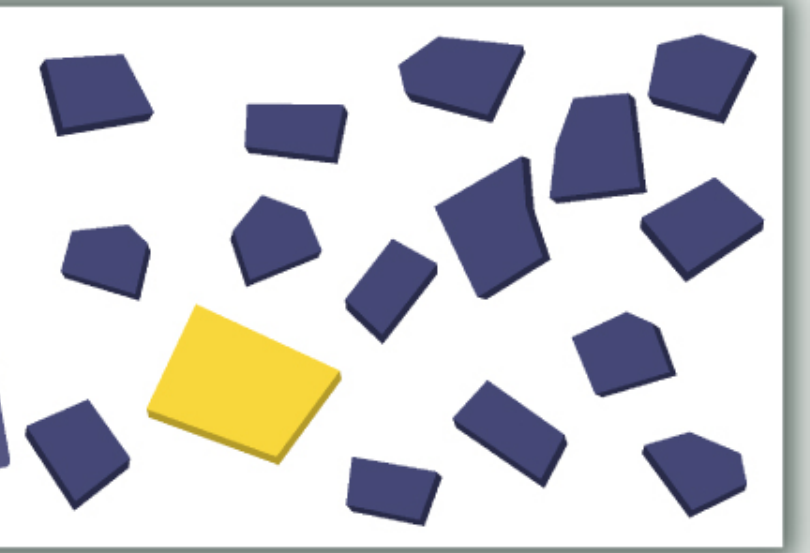
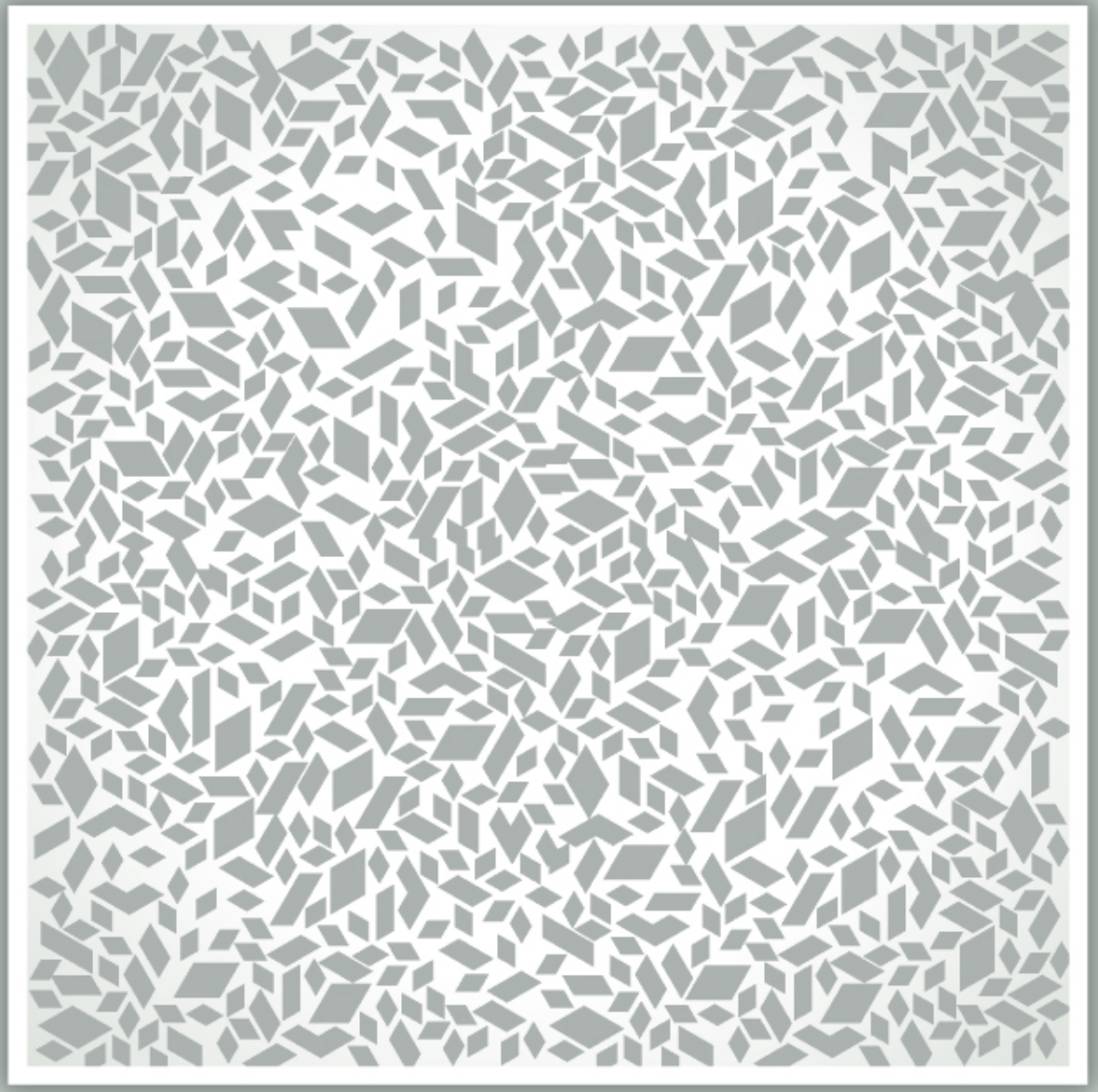


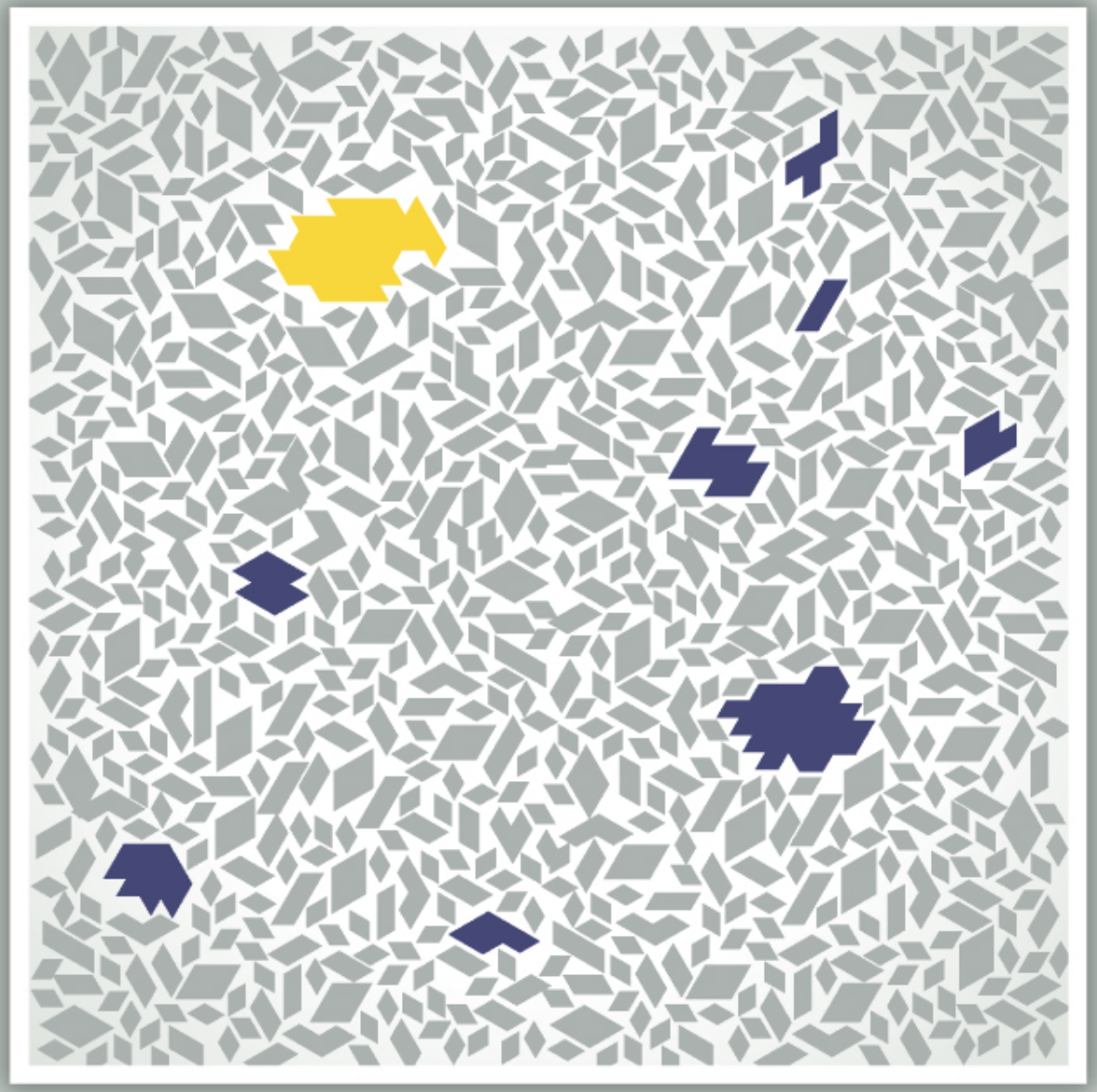
Achieving Content Uniformity

→ *Excipients:*



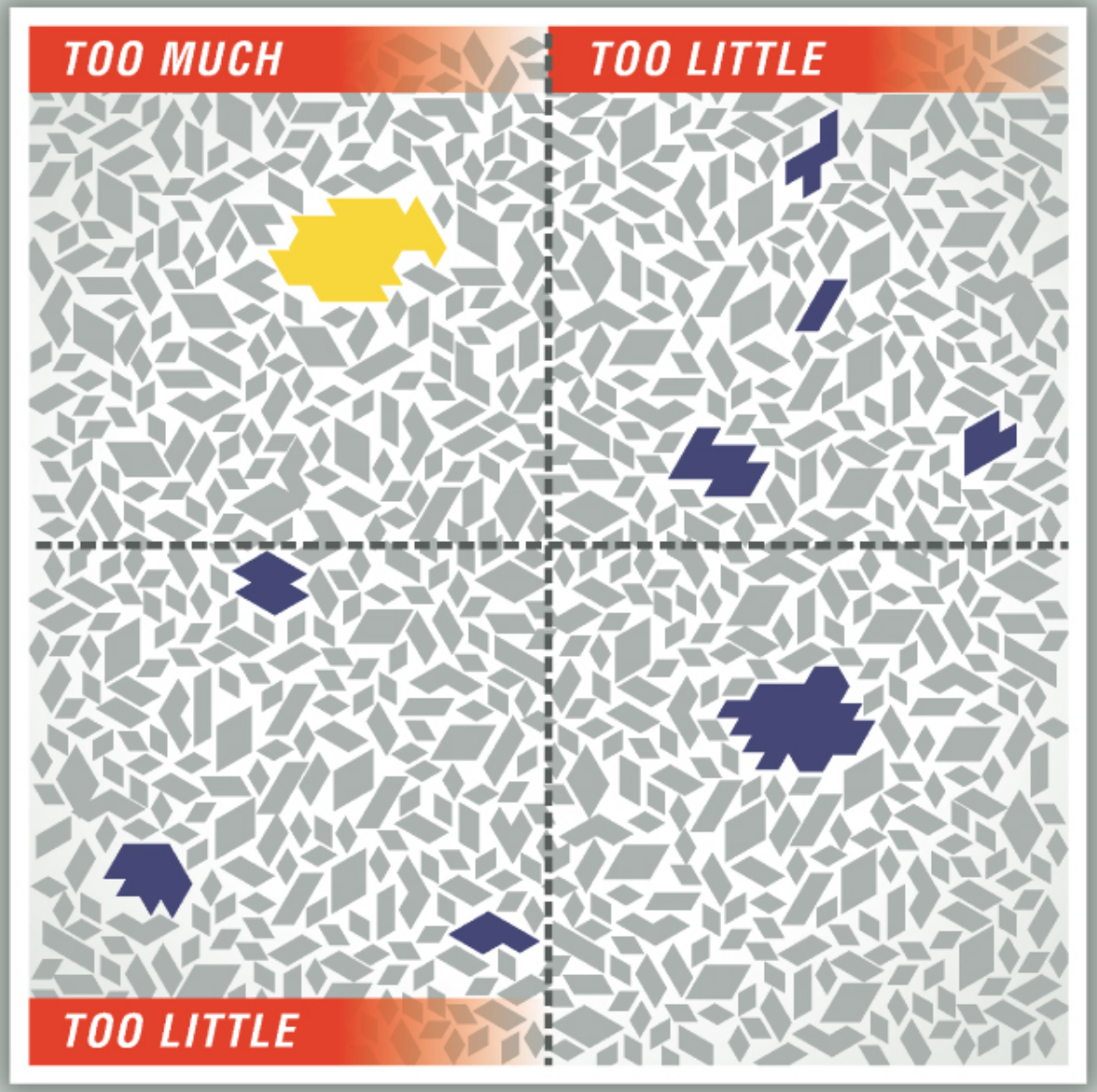
Achieving Content Uniformity

→ *Active is added:*



Achieving Content Uniformity

→ Punch FOUR tablets:



Achieving Content Uniformity

→ *Dry to reduce particle size:*