

The Misuse and Analysis of Synthetic Cathinone Compounds



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Overview



- Background
- Drug Scheduling
- Designer Drugs
- Misuse
- Experiences
- Analysis
- Acknowledgements
- References



Khat

The leaf of the
Catha edulis plant.

Primarily grown in
East Africa and the
Arabian Peninsula.

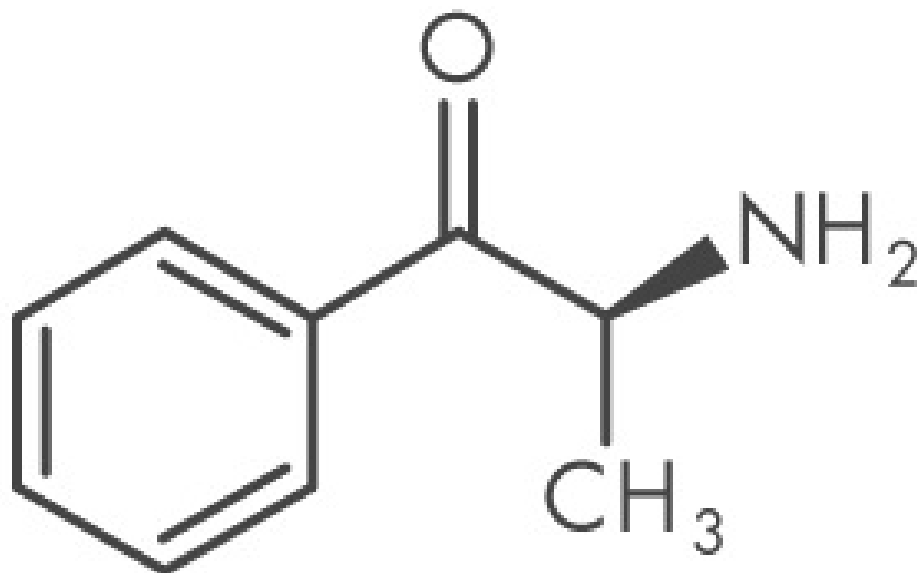
Leaves originally
chewed or brewed
as tea.



Cathinone

Cathinone is a naturally occurring stimulant found in khat.

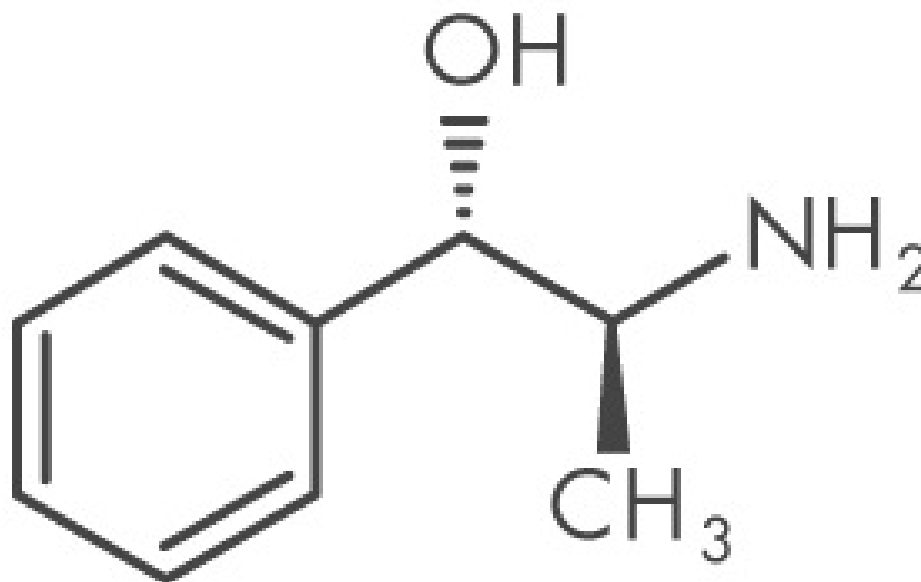
Synonymous with β -ketone amphetamines.



Cathine

As the leaves dry, cathinone is converted to cathine.

The stimulatory properties are significantly reduced.



Criteria for Drug Scheduling



- Its actual or relative potential for abuse
- Scientific evidence of its pharmacological effect
- The state of current scientific knowledge regarding the drug
- Its history and current pattern of abuse
- The scope, duration, and significance of abuse
- What, if any, risk to public health
- Psychological or physiological dependence liability
- Whether the substance is an immediate precursor of a substance already controlled

Schedules I-V



- Schedule I
 - Very high potential for abuse
 - DO NOT have a currently accepted medical use
- Schedule II
 - Same potential for abuse as Schedule I
 - DO have an accepted medical use
- Schedules III through V
 - Accepted medical use
 - Potential for abuse decreases with each subsequent class

Scheduling



- Cathinone is a Schedule I drug
 - Reduced to cathine, which is Schedule IV, when dried



Temporary Scheduling



- Pull a drug from the streets for a given period of time
- Pay close attention to the types of drugs that rise because of the restriction
- Most restrictions are of a general core structure
 - Drug chemists are able to manipulate the substituents to avoid the restriction

What's next?



- MDPV and Mephedrone
 - Schedule I in 2011
- Methylone
 - Schedule I in 2013
- Pentedrone and alpha-PVP
 - Schedule I in 2014

Designer Drugs

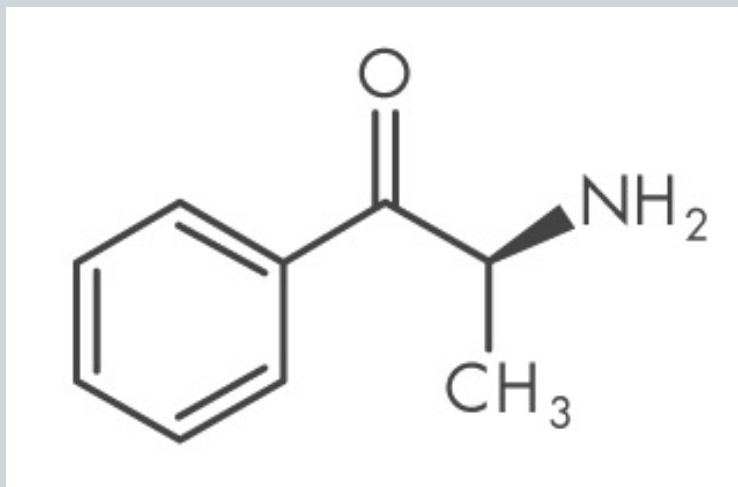


- Term coined by Gary Henderson in 1975
- Criteria
 - Synthesized with readily available chemicals in clandestine lab
 - Exempt from DEA control based on unique structure
 - Sold under attractive names
- Synthetic cannabinoids and synthetic cathinones

Synthetic Cathinones



- Core cathinone structure
 - Addition of different substituents creates new compounds



- Effects of functional groups depend on where they are added to the structure

The Effects of Cathinones



- Act as central nervous system stimulants with similar effects to amphetamine and ecstasy
- Desired effects
 - euphoria, empathy, and increased alertness
- Negative effects
 - anxiety, paranoia, and reduced inhibitions
 - overstimulation of the cardiovascular and nervous systems

The Market for Cathinones

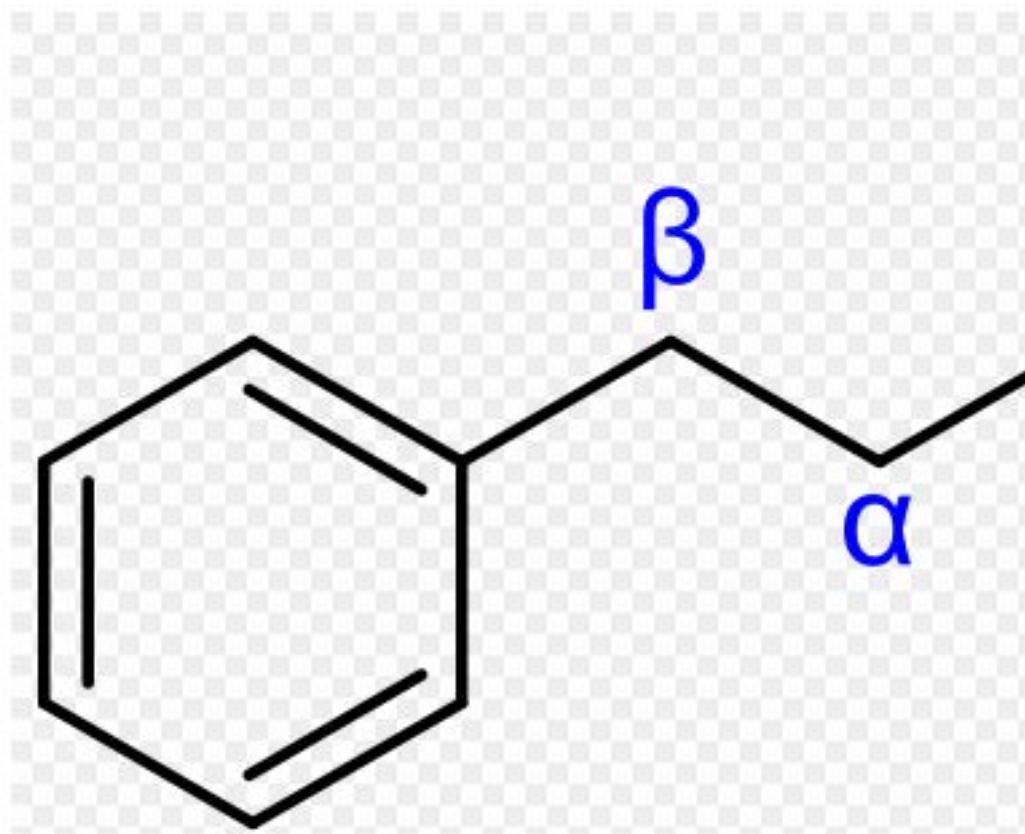


- Advertised as “legal highs”
- Labeled “not for human consumption”
- Contained in products sold as “bath salts”
 - Alternatively sold as potpourri, herbal incense and plant food
 - Also called Bliss, White Lightning, and Ivory Wave



β -ketone Synthetic Cathinones

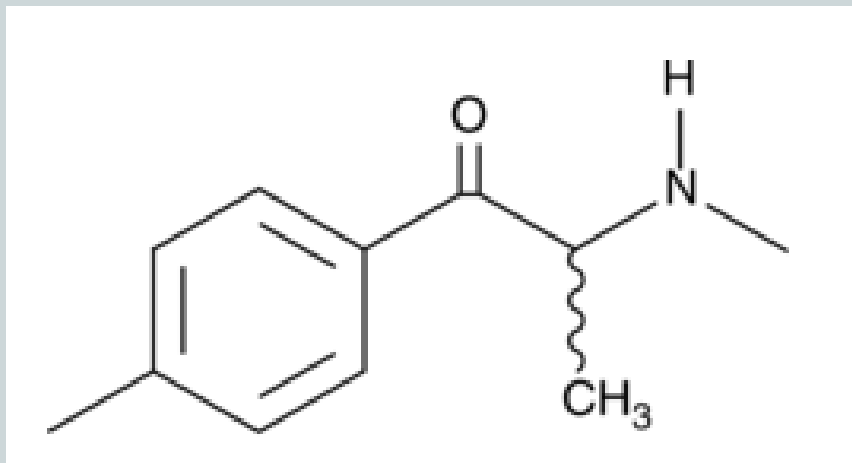
The designer drugs presented here all have a ketone in the beta position



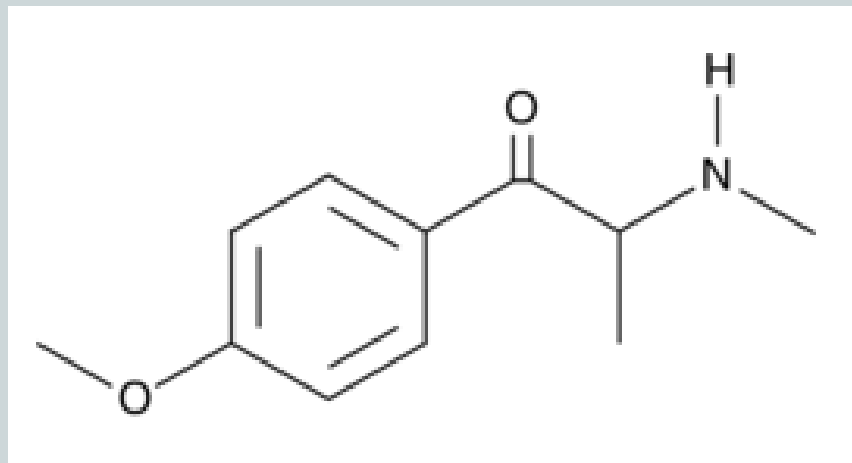
β -Ketone Synthetic Cathinones



Mephedrone



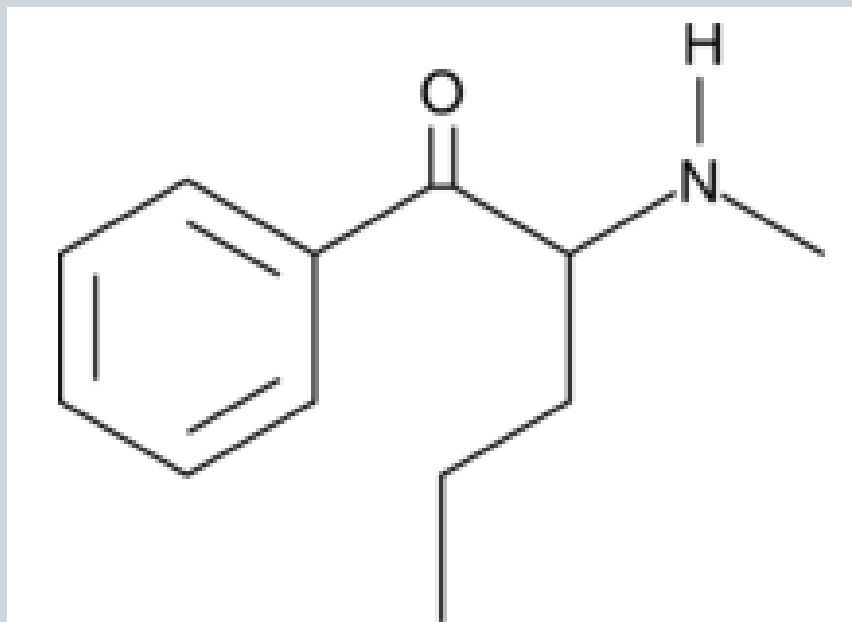
Methedrone



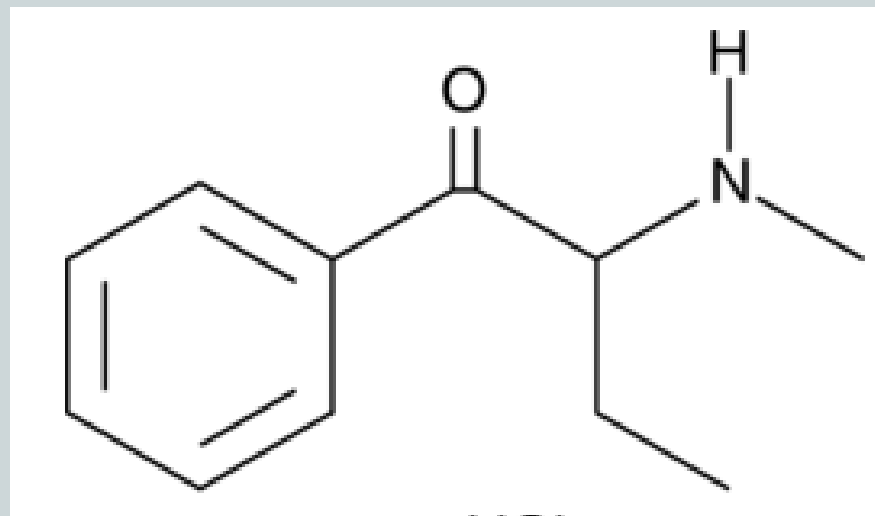
β -Ketone Synthetic Cathinones



Pentedrone



Buphedrone



Mephedrone



- 4-methylmethcathinone
- Street names
 - Meow Meow
 - Bubbles
 - Drone
- Typically a white to off-white powder that can be snorted or 'bombed'
- Also available as pills and capsules



Effects of Mephedrone



- Onset
 - Generally 15-45 minutes
- Duration
 - 2-4 hours when taken orally
 - Additional period of restlessness for 1-4 hours

Problems with Mephedrone



- Nausea
- Teeth-clenching
- Tingling/numbness in extremities
- Impaired short-term memory

More Problems



- Compulsive redosing
 - Typically 45 minutes to 2 hours after initial ingestion
- Skin discoloration
 - Vasoconstriction associated with high doses
 - ✦ Bluening of the skin

User Experience



- “SWIM has noticed that it’s rather acidic on the body. It makes his lungs, throat, and stomach hurt. It also flushes his face. He feels a little bummed out after it subsides, oddly speedy and sleepy. After it initially runs out of steam, he gets real irritated and feels vacant headed (little concentration, forgetful), and restless for 30 minutes.”

● - VELLOCET VIA DRUGS-FORUM.COM

User Experience



- “Blue face, blue lips, blue palms and knees. After using mephedrone [at 2g] per day for 3 [days]. The person who died from mephedrone in Europe turned blue and so did [I] last night. DO NOT TAKE THIS SEEMINLY HARMLESS DRUG! [The] day after [I had] painful kidneys, stiff neck, cold like symptoms and lack of appetite. [Aching all over], MASSIVE chesty cough AND MOST WORRYING I TURNED BLUE LIKE THE KID WHO DIED.”

● -RECREATIONAL VIA DRUGS-FORUM.COM

User Experience



- “My group of friends have been taking mephedrone for over 12 weeks, every weekend...about .2-.3g on a sat or fri, either insufflated or bombed...normally asleep by 6am...NOT ONE NEGATIVE SIDE EFFECT!”

- FLIPFLOP VIA DRUGS-FORUM.COM

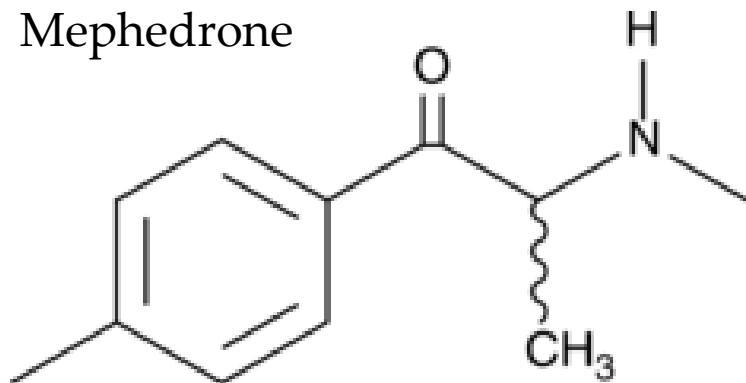
Analysis



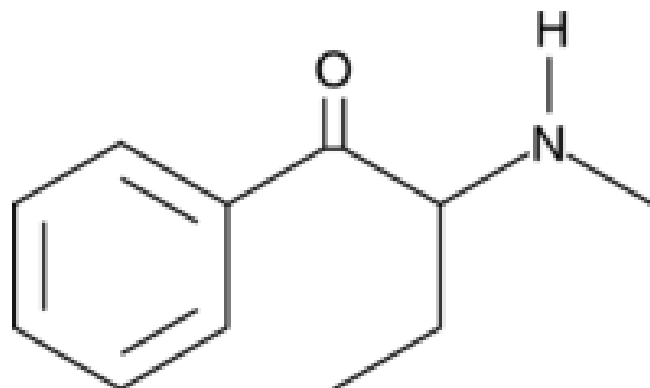
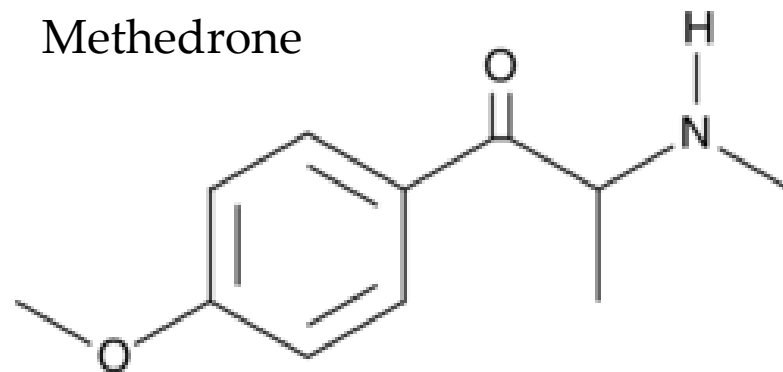
- Most current analytical techniques focus on mephedrone
 - Due to increased popularity
- Research surrounding other β -ketones is lacking
- Structural similarities between mephedrone and other β -ketone amphetamines allow for the generalization of analytical techniques
 - PROBLEM: extensive instrumentation is needed for differentiation

Structural Similarities

Mephedrone

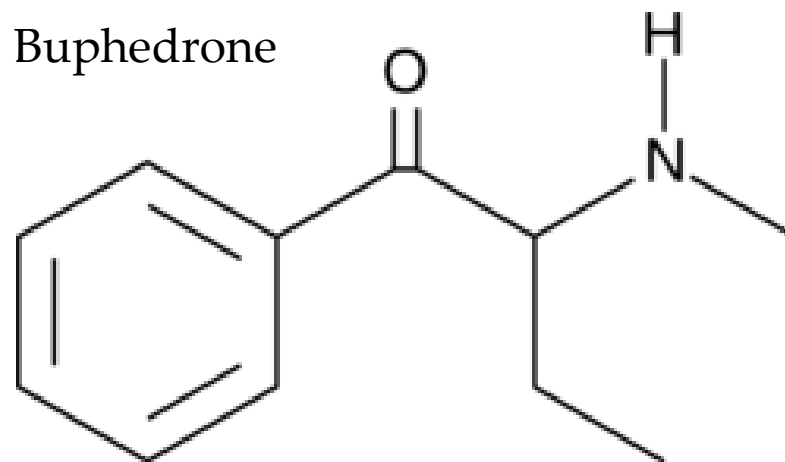


Methedrone



Pentedrone

Buphedrone



Analysis



- Currently no screening methods available for these drugs
 - Likelihood of producing immunoassays to detect each of these drugs in a timely manner is unlikely
- Many compounds are currently available
 - New compounds released all the time
- Difficult to keep up with the changes in structure to make sure the methods are accurate and precise

Analysis



- Most types of analysis require 'relatively pure' samples
- Identification requires access to standards
 - Expensive
 - Developed after the drug is already on the streets
 - Methods are not capable of differentiation without reference samples

Analysis

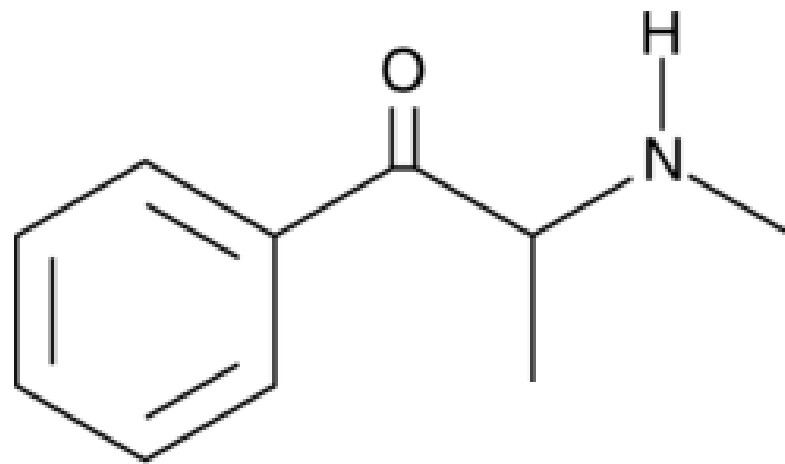
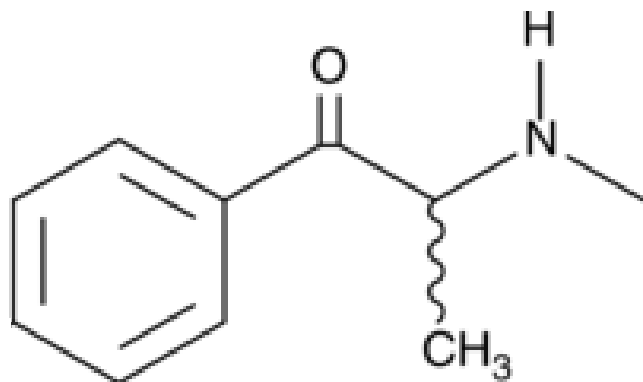


- Gas Chromatography Mass Spectrometry (GCMS)
 - Most labs already equipped with this technology
 - Experience is already established
 - Separates the molecules (GC) and then identifies them (MS)

MS Problems



- Not particularly helpful with designer drugs
 - Buphedrone and Mephedrone
 - ✦ $C_{11}H_{15}NO \rightarrow 213.7\text{g/mol}$



Analysis



- Tandem Mass Spectrometry
 - More expensive
 - Not as common in labs as GCMS
 - Leads to very high specificity
 - Better for designer drugs

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Questions?



HEY, I JUST MET YOU, AND THIS IS CRAZY,

BUT HERE'S MY BATH SALTS, YOUR FACE IS TASTY.