

Gas Chromatography/  
Mass Spectrometry

## Author

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## Drugs of Abuse Confirmation by GC/MS



Solid dosage forms are the backbone of the drug section in the Forensic Laboratory. Gas Chromatography/Mass Spectrometry is the main instrument for positive identification of these controlled substances.

The following pages show selected controlled substances in about a 10 minute screening method with another injection made every 12 minutes. Faster analysis is quite easy over the full temperature range making another injection every 6 minutes or less.

Fast sample throughput is improved by using a short, thin film column, fast flow rate of 2-3 mL/min into the mass spectrometer, rapid cooling oven to cool from 300 °C to 100 °C in 1 minute, autosampler pre-rinsing during oven cool-down.

Hydrogen as the carrier gas will also be beneficial to show improvements in throughput but was not utilized in these examples.

**Gas Chromatograph:** PerkinElmer® Clarus® 680 GC

Injector: Capillary injector split mode, 250 °C Split ratio: 50:1.

Injection port liner: Siltek™ with wool (Cat. No. N6502010).

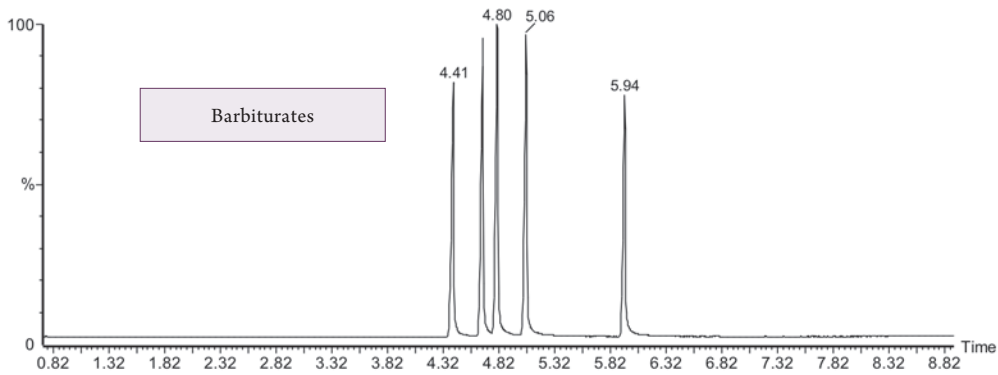
GC Column: Elite-5 (5%Phenyl/95% Methyl Silicone) –  
12 m x .200 mm x 0.33 µm (Cat. No. N9316110).

Helium carrier – 2mL/min.

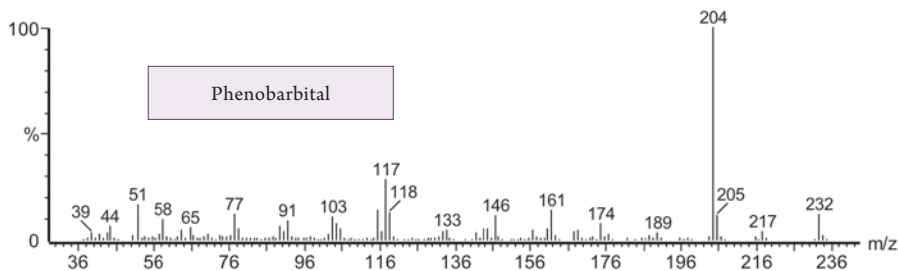
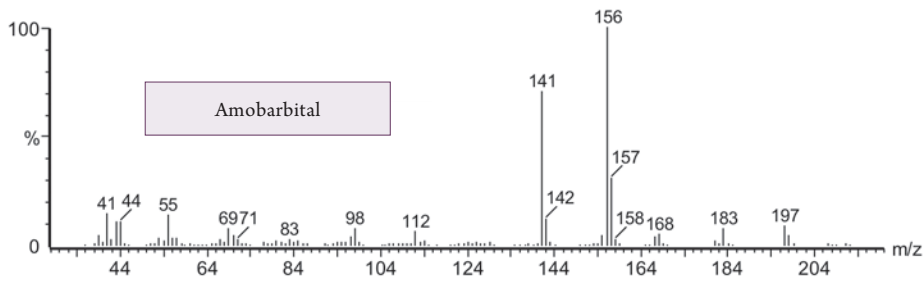
GC oven: Start temperature 100 °C hold for 0.5 min, then  
40 °C min to 300 °C = 10 min.

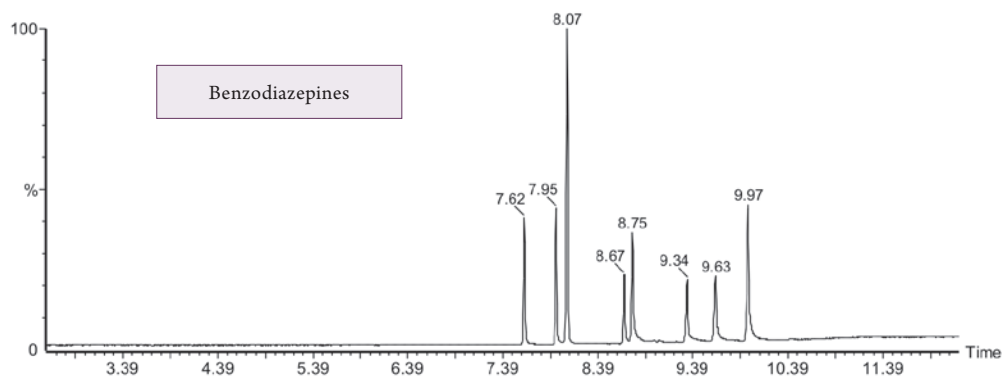
**Mass Spectrometer:** PerkinElmer Clarus SQ 8 GC/MS

255 L/sec turbomolecular pump, EI mode, Scan range:  
35-500 da, 0.25 sec/cycle.



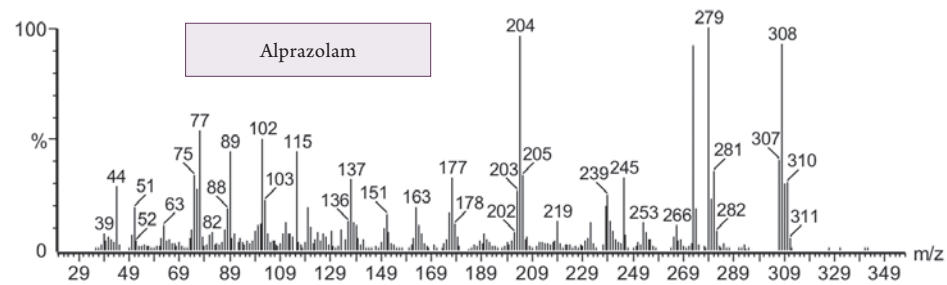
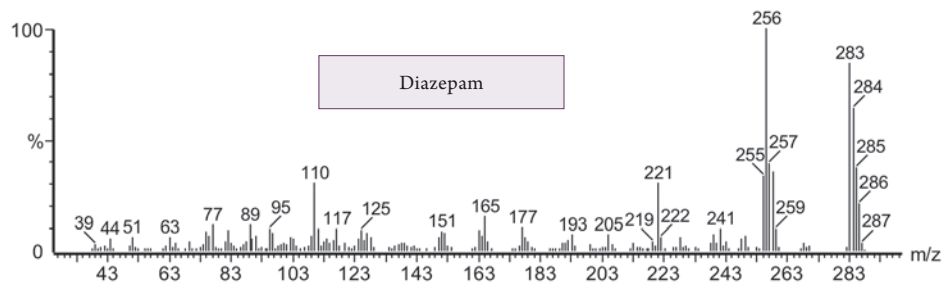
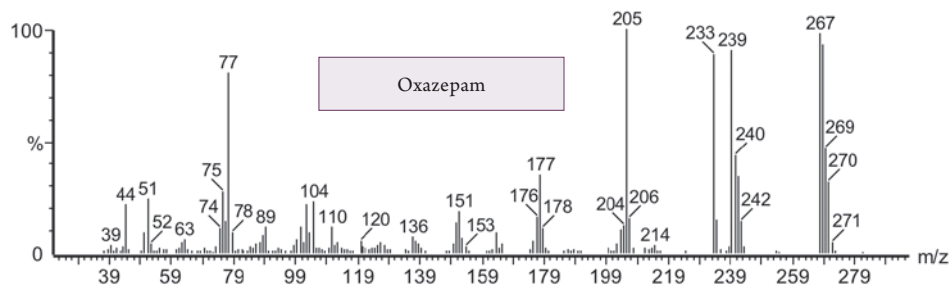
- 4.41 butalbital
- 4.57 amobarbital
- 4.80 pentobarbital
- 5.06 secobarbital
- 5.94 phenobarbital

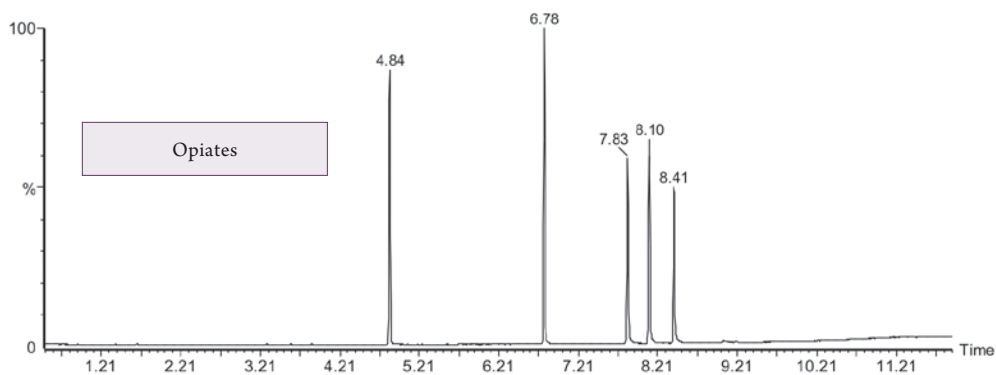




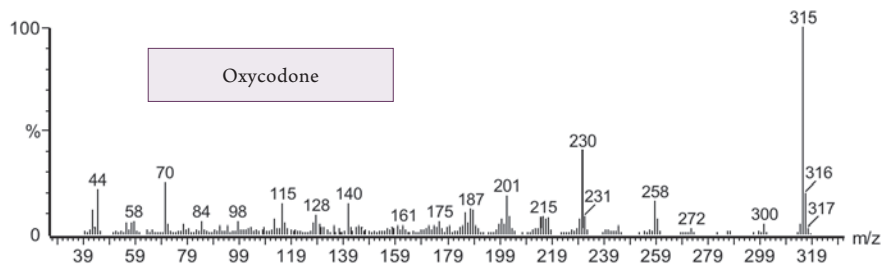
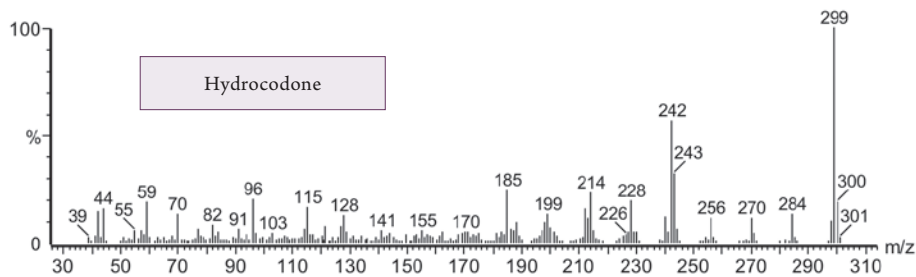
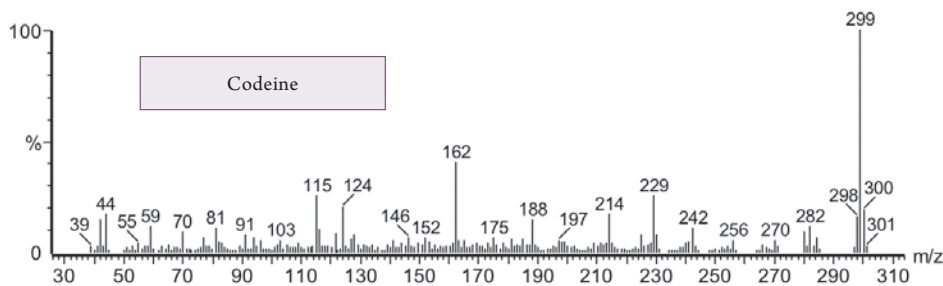
Benzodiazepines

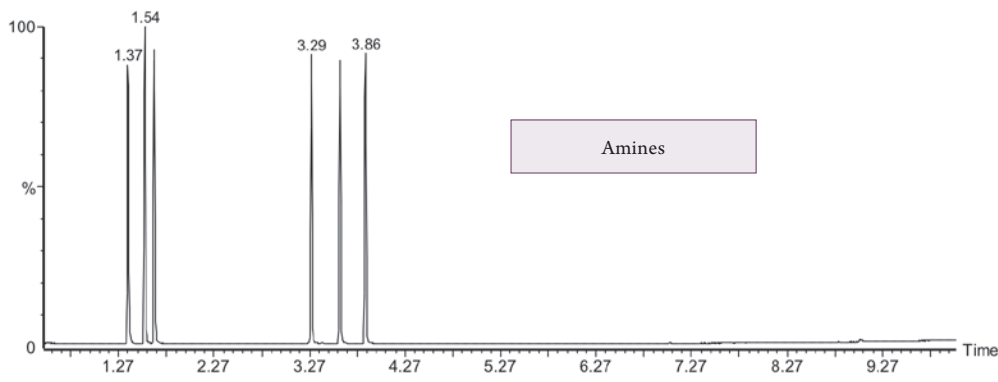
- 7.62 oxazepam
- 7.95 lorazepam
- 8.07 diazepam
- 8.67 temazepam
- 8.75 flunitrazepam
- 9.34 nitrazepam
- 9.63 clonazepam
- 9.97 alprazolam



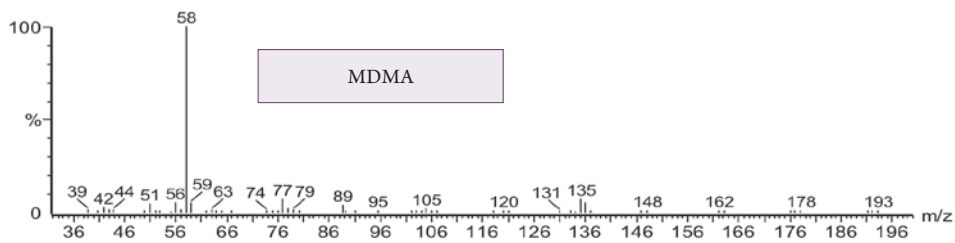
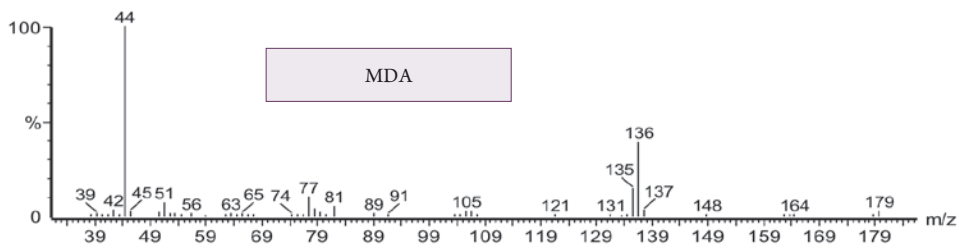
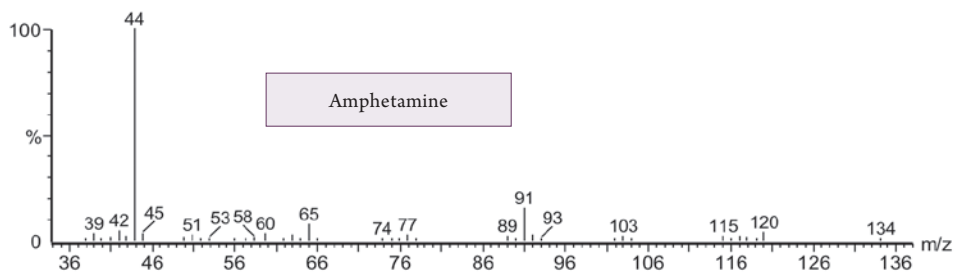


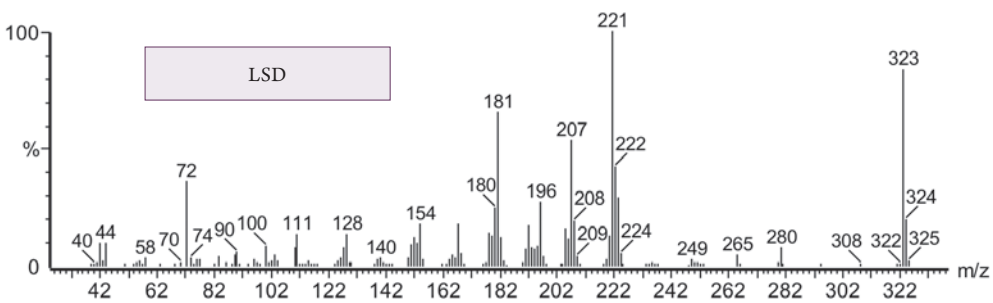
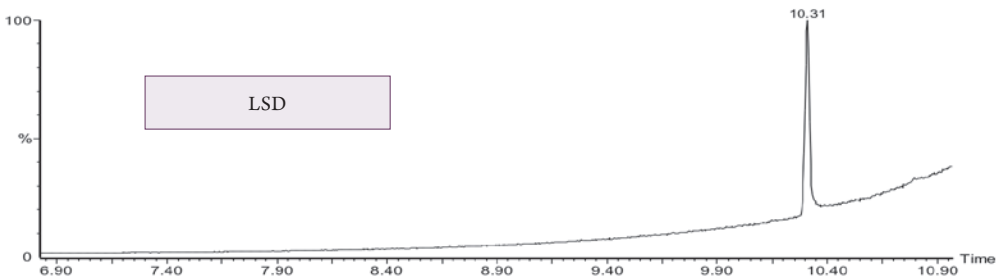
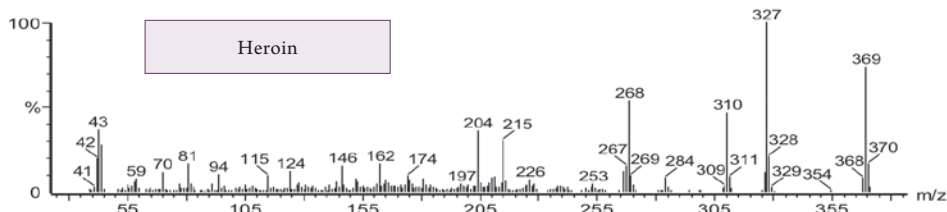
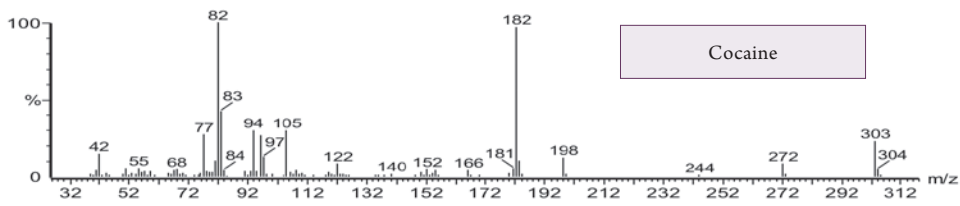
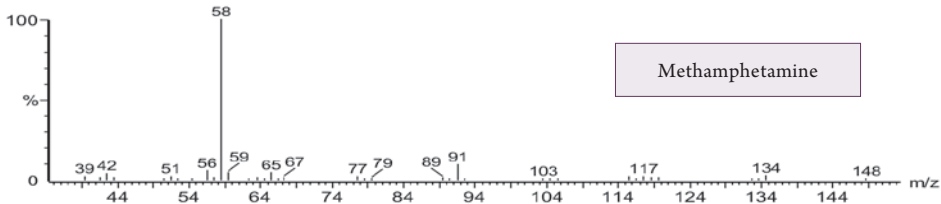
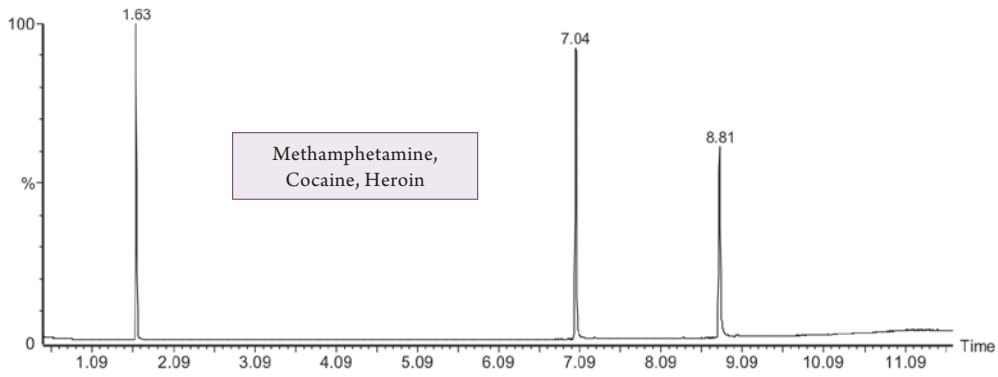
- 6.78 methadone
- 7.83 codeine
- 8.10 hydrocodone
- 8.41 oxycodone
- 4.84 meperidine



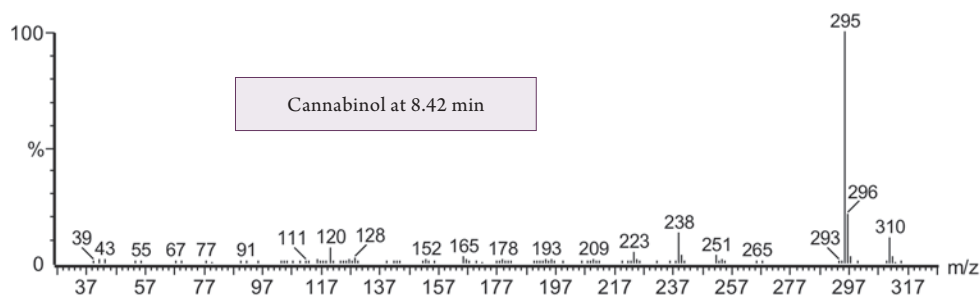
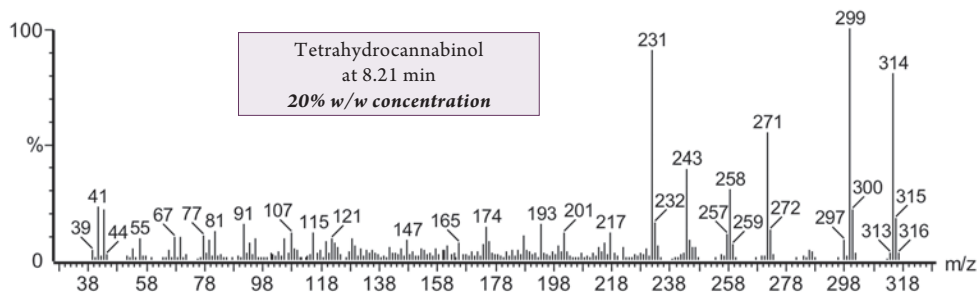
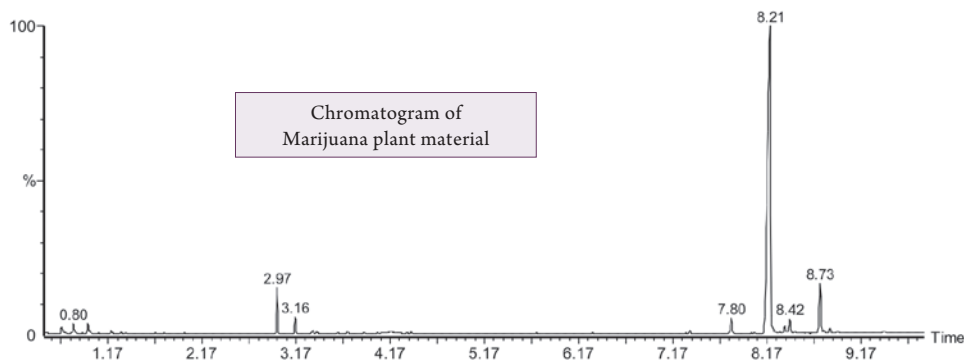


- 1.37 amphetamine
- 1.54 phentermine
- 1.65 methamphetamine
- 3.29 3,4-methylenedioxyamphetamine
- 3.60 3,4-methylenedioxymethamphetamine
- 3.86 3,4-methylenedioxyethylamphetamine





Cannabis sativa L. (marijuana) analysis can be done by GC/MS for purposes of legal matters, but new applications for the analysis of this controlled substance are now being used. In the USA, medical marijuana dispensaries are now legal in several states. Suppliers of the plant material to these dispensaries are interested in the strength of the plant material, primarily the concentration of THC. The higher the THC content, the better the marijuana. So now GC and Mass Spec have arrived as quality control tools for the medical marijuana industry. In addition, the ratios of THC, cannabiniol and cannabidiol can be used to grade plant maturity as immature, adolescent or mature plants. THC concentration of modern marijuana is now 3-4 times the strength of street marijuana several decades ago.



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