

## Training Procedure for Drug Classification and Structure

**1.0 Purpose** – Controlled substances, with the exception of anabolic steroids, generally produce their major effect by acting at the level of the central nervous system (CNS). Knowledge of the structure and chemistry of these compounds is useful in the process of identifying controlled substances present in evidence. In this unit, the Forensic Scientist will become familiar with the statutes and structures of commonly encountered controlled substances associated with forensic evidence.

**2.0 Scope** - This procedure applies to trainees in Drug Chemistry Sections of the State Crime Laboratory.

**3.0 Definitions** – N/A

**4.0 Procedure**

### 4.1 Objectives

**4.1.1** Learn the chemical structures of drugs commonly encountered in forensic evidence.

**4.1.2** Identify the general class of a drug based on the structure.

**4.1.3** Become familiar with the following statutes/bills as they relate to the legal status of NC controlled substances:

- *Chapter 90, Article 5 of the NC General Statutes – the North Carolina Controlled Substances Act*  
(<http://www.ncga.state.nc.us/gascripts/statutes/statutes.asp>)
- Subchapter 26 F of Title 10A of the North Carolina Administrative Code
- *Session Law 2011-12 Senate Bill 7* “AN ACT TO ADD MEPHEDRONE, METHYLENEDIOXYPYROVALERONE AND CERTAIN DERIVATIVES OF 2-AMINO-1-PHENYL-1-PROPANONE, AND SYNTHETIC CANNABINOIDS TO THE LIST OF CONTROLLED SUBSTANCES.”
- *Session Law 2013-109 House Bill 813* “AN ACT TO MAKE THE MANUFACTURE, POSSESSION, SALE, USE AND DELIVERY OF ALL SYNTHETIC CANNABINOIDS UNLAWFUL.”
- *Session Law 2015-162 House Bill 341* “AN ACT TO ADD ‘NBOME’ COMPOUNDS AND OTHER SUBSTANCES TO THE CONTROLLED SUBSTANCES SCHEDULES.”
- *Session Law 2017-115 House Bill 464* “AN ACT REVISING THE SCHEDULE OF CONTROLLED SUBSTANCES TO ADD SYNTHETIC FENTANYLS, DESIGNER HALLUCINOGENS, SYNTHETIC CANNABINOIDS, SYSTEM DEPRESSANTS, AND OTHER SUBSTANCES AND MAKING CONFORMING CHANGES; AND CREATING THE TASK FORCE ON SENTENCING REFORMS FOR OPIOID DRUG CONVICTIONS.”
- *The Heroin and Opioid 12 Prevention and Enforcement (HOPE) Act of 2018* “AN ACT AMENDING LAWS PERTAINING TO THE NORTH CAROLINA CONTROLLED SUBSTANCES ACT AND THE NORTH CAROLINA CONTROLLED SUBSTANCES REPORTING SYSTEM ACT, INCLUDING THE REVISION AND ESTABLISHMENT OF PENALTIES FOR

CERTAIN VIOLATIONS; AND APPROPRIATING ADDITIONAL FUNDS FOR COMMUNITY-BASED SUBSTANCE USE DISORDER TREATMENT AND RECOVERY SERVICES, THE PURCHASE OF OVERDOSE MEDICATIONS, AND OPERATION MEDICINE DROP.

4.1.4 Use approved/verified internet resources as well as any drug chemistry resources (ex: Drugs.com) to identify marked tablets.

4.1.5 Successfully complete a written exam.

## 4.2 Study Questions

4.2.1 Review Chapter 90-95 of the *North Carolina Controlled Substances Act (Schedules I-VI, as well as violations and penalties)*. It is not necessary to note punishments classes (ex: Class I). Determine the crime (i.e., misdemeanor, felony, or trafficking) based on the quantity and schedule of a controlled substance. Review *Session Law 2011-12 Senate Bill 7 as well as Session Law 2013-109 House Bill 813* and familiarize yourself with Session Law 2017-115 House Bill 464.

4.2.2 Define the following terms and prefixes:

- Alkaloid
- Alkyl
- Alkoxy
- Alkylene dioxy
- Analgesic
- Antihistamine
- Antipyretic
- Antitussive
- Ergot alkaloid
- Halide
- Haloalkyl
- Histamine
- Narcotic
- Opiate/Opium
- Opioid
- Semi-synthetic opiate
- Isomer
- Enantiomer
- Diastereomer
- Phenyl ring
- Pseudo-
- Nor-
- Desoxy-
- Dextro-
- Levo-

4.2.3 Familiarize yourself with the primary chemical structure of the following and be able to draw the structures of several examples from each class of compound.

- Cathinone (2-amino-1-phenyl-1-propanone)
- Indoles
- Opiates
- Opioids
- Phenethylamines
- Barbiturates
- Benzodiazepines
- Anabolic Steroids

**4.2.4** Draw the chemical structure of the following drugs based on Chapter 90 of the *North Carolina General Statutes, as well as the above mentioned House/Senate Bills*. Be able to list the North Carolina Schedule (includes substances currently in NCAC), DEA Federal schedule, or list that the substance is non-controlled., Familiarize yourself with the trade names of each (listed below in parentheses), if applicable.

- 4-Methylmethcathinone
- Acetaminophen
- Acetylsalicylic acid
- Acetylfentanyl
- Alprazolam
- Amphetamine
- Benzocaine
- Benzoylecgonine
- 1-Benzylpiperazine (BZP)
- Bufotenine
- Buprenorphine
- Caffeine
- Cannabidiol
- Cannabinol
- Carisoprodol
- Cathinone (2-amino-1-phenyl-1-propanone)
- Clorazepate
- Chlordiazepoxide
- Clonazepam
- Cocaine
- Codeine
- Delta-9 Tetrahydrocannabinol (THC)
- Dextropropoxyphene
- Diazepam
- Diltiazem
- N,N-Dimethyltryptamine (DMT)
- Diphenhydramine
- Fentanyl
- Fluorobutyrylfentanyl isomers (p-FBF, m-FBF, o-FBF)
- Fluoroisobutyrylfentanyl isomers (p-FIBF, m-FIBF, o-FIBF)
- Gamma-Butyrolactone (GBL)
- Gamma Hydroxybutyric Acid (GHB)
- Guaifenesin

- Heroin
- Hydrocodone
- Hydromorphone
- Ibuprofen
- JWH-018
- JWH-073
- Levamisole
- Lidocaine
- Lysergic Acid Diethylamide (LSD)
- Lysergic Acid N-(Methylpropyl) Amide (LAMPA)
- Meprobamate
- Mescaline
- Methadone
- Methamphetamine
- Methandrostenolone
- Methcathinone
- Methorphan
- 3,4-Methylenedioxyamphetamine (MDA)
- 3,4-Methylenedioxymethamphetamine (MDMA, "Ecstasy")
- Methylenedioxypyrovalerone (MDPV)
- Methylphenidate
- Morphine
- Naproxen
- Naloxone
- Nordiazepam
- Oxycodone
- Papaverine
- Pentobarbital
- Pethidine
- Phenazepam
- Phencyclidine (PCP)
- Phenobarbital
- Phentermine
- Phenylpropanolamine (PPA)
- 1-Piperidinocyclohexanecarbonitrile (PCC)
- Procaine
- Pseudoephedrine
- Psilocin
- Psilocybin
- Secobarbital
- Stanozolol
- Testosterone
- 3-Trifluoromethylphenylpiperazine (TFMPP)
- Zolpidem

- 4.2.5** Sort the compounds listed in **4.2.4** into the following categories and be able to draw the structures of several examples from each category. (Some compounds may fit into more than one category.)

- Antipyretic
- Antitussive
- Antidepressant
- Non-narcotic analgesic
- Narcotic analgesic
- Antihistamine
- Local anesthetic
- Stimulant
- Sedative/hypnotic
- Muscle relaxant
- Hallucinogen
- Steroid
- Synthetic cannabinoid
- Opiates
- Semi-synthetic Opiates
- Opioids
- Identify any compound that does not fall within any of the categories.

#### 4.3 Practical/Laboratory Exercises

##### 4.3.1 Draw the structure of both bupropion and cathinone.

Based on your reading of Paragraph j of Senate Bill 7 and House Bill 813, list examples of substituted cathinones that would fit the definitions of subparagraphs (i), (ii), and (iii).

- Draw structures for each of your examples.
- Be able to explain why your examples fit the legal definition of a cathinone derivative.

##### 4.3.2 Use approved resources to identify the following tablets based upon the description and imprint codes. Consult with the Training Coordinator for current websites/resources used for identification.

- Mylan 345, orange, round, scored tablet
- 71, green speckled, oblong tablet
- OC on one side, 10 on other side, white, circular tablet
- Vicodin, white, oblong tablet, scored
- G 3722, white, rectangular tablet, scored
- Watson 349, white, capsule shape, scored
- AHR 6447, orange, round tablet, scored

#### 5.0 Required Reading

*North Carolina Controlled Substances Act and Regulations*, Internet:

<http://www.ncga.state.nc.us/gascripts/Statutes/Statutes.asp>.

*SESSION LAW 2011-12 SENATE BILL 7 "AN ACT TO ADD MEPHEDRONE, METHYLENEDIOXYPYROVALERONE AND CERTAIN DERIVATIVES OF 2-AMINO-1-PHENYL-1-PROPANONE, AND SYNTHETIC CANNABINOIDS TO THE LIST OF CONTROLLED SUBSTANCES."*

<http://www.ncleg.net/EnactedLegislation/SessionLaws/PDF/2011-2012/SL2011-12.pdf>

SESSION LAW 2013-109 HOUSE BILL 813 “AN ACT TO MAKE THE MANUFACTURE, POSSESSION, SALE, USE, AND DELIVERY OF ALL SYNTHETIC CANNABINOIDS UNLAWFUL”; addition of paragraph “j”.

<http://www.ncleg.net/EnactedLegislation/SessionLaws/PDF/2013-2014/SL2013-109.pdf>

SESSION LAW 2015-162 HOUSE BILL 341 “AN ACT TO ADD ‘NBOME’ COMPOUNDS AND OTHER SUBSTANCES TO THE CONTROLLED SUBSTANCES SCHEDULES.”

Session Law 2017-115 House Bill 464 “AN ACT REVISING THE SCHEDULE OF CONTROLLED SUBSTANCES TO ADD SYNTHETIC FENTANYLS, DESIGNER HALLUCINOGENS, SYNTHETIC CANNABINOIDS, SYSTEM DEPRESSANTS, AND OTHER SUBSTANCES AND MAKING CONFORMING CHANGES; AND CREATING THE TASK FORCE ON SENTENCING REFORMS FOR OPIOID DRUG CONVICTIONS.”

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## 6.0 References

Baselt and Cravey. *Disposition of Toxic Drugs and Chemicals in Man*. Foster City, California: Chemical Toxicology Institute, 1995.

Budavari, et al. *The Merck Index*. Rahway, New Jersey: Merck and Company, Inc., 1989.

Moffat, A.C., et al., eds. *Clarke’s Isolation and Identification of Drugs*. 2<sup>nd</sup> Edition, London: Pharmaceutical Press, 1986.

Goldfrank, et al. *Goldfrank’s Toxicological Emergencies*. 7<sup>th</sup> Ed., USA: McGraw-Hill Company, Inc., 2002.

*North Carolina Controlled Substances Act and Regulations*, Internet:  
<http://www.ncga.state.nc.us/gascripts/Statutes/Statutes.asp>.

SESSION LAW 2011-12 SENATE BILL 7 “AN ACT TO ADD MEPHEDRONE, METHYENEDIOXYPROVALERON AND CERTAIN DERIVATIVES OF 2-AMINO-1-PHEYNL-1-PROPANONE, AND SYNTHETIC CANNABINOIDS TO THE LIST OF CONTROLLED SUBSTANCES.”

SESSION LAW 2013-109 HOUSE BILL 813 “AN ACT TO MAKE THE MANUFACTURE, POSSESSION, SALE, USE, AND DELIVERY OF ALL SYNTHETIC CANNABINOIDS UNLAWFUL”; addition of paragraph “j”.

SESSION LAW 2015-162 HOUSE BILL 341 “AN ACT TO ADD ‘NBOME’ COMPOUNDS AND OTHER SUBSTANCES TO THE CONTROLLED SUBSTANCES SCHEDULES.”

Session Law 2017-115 House Bill 464 “AN ACT REVISING THE SCHEDULE OF CONTROLLED SUBSTANCES TO ADD SYNTHETIC FENTANYLS, DESIGNER HALLUCINOGENS, SYNTHETIC

*CANNABINOIDS, SYSTEM DEPRESSANTS, AND OTHER SUBSTANCES AND MAKING CONFORMING CHANGES; AND CREATING THE TASK FORCE ON SENTENCING REFORMS FOR OPIOID DRUG CONVICTIONS.”*

*The Heroin and Opioid 12 Prevention and Enforcement (HOPE) Act of 2018 “AN ACT AMENDING LAWS PERTAINING TO THE NORTH CAROLINA CONTROLLED SUBSTANCES ACT AND THE NORTH CAROLINA CONTROLLED SUBSTANCES REPORTING SYSTEM ACT, INCLUDING THE REVISION AND ESTABLISHMENT OF PENALTIES FOR CERTAIN VIOLATIONS; AND APPROPRIATING ADDITIONAL FUNDS FOR COMMUNITY-BASED SUBSTANCE USE DISORDER TREATMENT AND RECOVERY SERVICES, THE PURCHASE OF OVERDOSE MEDICATIONS, AND OPERATION MEDICINE DROP.*

## 7.0 Records

- Drug Chemistry Training Checklist
- Section Completion Summary

## 8.0 Attachments – N/A

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original Document
03/22/2013	2	<b>Forward</b> – Clarified that only The Training Checklist is signed by trainee. <b>Scope</b> – Re-worded to match other Laboratory documents. <b>5.2.3</b> – Added requirement to be able to draw the structures of several examples from each class of compound and added Anabolic Steroid. <b>5.2.4</b> – Re-worded - the requirement to be able to list the schedule and identify the trade name of each was moved to separate sentence. <b>5.2.5</b> – Added requirement to be able to draw the structures of several examples from each category.
05/10/2013	3	<b>Forward</b> removed from document - duplicated in Training Procedures Index
12/06/2013	4	Added issuing authority to header
10/19/2015	5	<b>Header</b> – Revised issuing authority <b>Objectives, 4.3.1</b> - Reformatted objectives, and added new Session Law 2013-109 House Bill 813 <b>4.1.4, 4.3.2</b> – Edited resources for tablet identifications <b>4.2.5</b> - Corrected new line reference <b>4.3.2</b> – Edited tablet description information <b>Required Reading</b> – Added new section with General Statutes and Session Laws for 2011, 2013, and 2015

		<b>References</b> – Updated internet link for General Statutes, added Session Laws for 2011, 2013, and 2015
08/17/2018	6	4.1.3 - typos edited, HB 464 added, Hope Act added 4.1.4 – removed Drug ID bible and added drugs.com 4.2.1 – HB 464 added and updated review 4.2.2 – updated definitions 4.2.3 – changed wording, added opioids as a grouping 4.2.4 – add HB's, Removed trade names and butalbital and added fentanyl compounds 4.2.5 – added categories 4.3.2 – removed invalid tablet 5.0 – updated required reading 6.0 – updated references Required Reading – Added Hope Act References – Added Hope Act