

SCIENTIFIC AND TECHNICAL NOTES	SCITEC 16 2009
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Screening Colour Test and Specific Colour Tests for the Detection of
Methylenedioxyamphetamine and Amphetamine Type Stimulants

Laboratory and Scientific Section, Division of Policy Analysis

1. Introduction

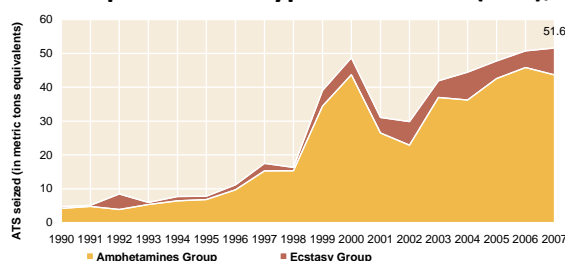
The term *amphetamine type stimulants* (ATS) refer to a range of drugs mostly derived from the phenethylamines. Amphetamines are central nervous system (CNS) stimulants that were first synthesised more than a century ago for medical applications, but are currently mostly found on illicit drug markets.

Globally, ATS use occurs in a range of contexts, and for a variety of purposes. Both recreational and occupational reasons may determine initial use; and use may occur in public settings (e.g., nightclubs), private parties, work environments or as sex aids. In this respect, ATS have demonstrated their attractiveness in a very wide range of situations that seem to differ across countries. ATS are used recreationally to experience the drug's effects of increased sociability, loss of inhibitions, a sense of escape, or to enhance sexual encounters³⁰⁻³⁴. In many high income countries, users typically have a history of other drug use and may use other substances in combination with M/A³⁵⁻³⁸. M/A is sometimes used in occupational settings to sustain long work hours and to increase energy and productivity. Examples of this include use by jade-mine workers in Myanmar, sex workers in Cambodia (Chouvy & Meissonnier, 2004), truck drivers^{73 159-161} and even pilots in armed forces, where it has been provided by Governments (Emonson & Vanderbeek, 1995).

Amphetamine (AMPT) and **methamphetamine** (MAMPT) both increase the release of dopamine, noradrenalin, adrenaline and serotonin (Seiden, Sobol, & Ricaurte, 1993; World Health Organization, 2004), stimulate the central nervous system, and have a range of effects including increased energy, feelings of euphoria, decreased appetite, elevated blood pressure and increased heart rate. These substances can come in pill, powder or crystalline forms; these different forms are likely to vary in purity (with the crystalline form typically of the highest purity). **3,4-methylenedioxymethamphetamine** (MDMA) – commonly known as “ecstasy” – also acts predominantly on the cardiovascular and central nervous systems; it has both stimulant and hallucinogenic effects (Parrott, 2001; World Health Organization, 2004). It has relatively greater euphoric and hallucinogenic effects compared to meth/amphetamine (M/A).

There has been a steady increase in global seizures of ATS over the past 15 years, suggesting an increase in both manufacture and consumption. Currently, ATS are the second most commonly used illicit drug type worldwide, after cannabis. Amphetamine users outnumber opiate users in all regions except Europe and South Asia. UNODC recently estimated that there were between 16 to 51 million past-year ATS users in 2007, and between 12 to 24 million ecstasy users.

Global seizures of amphetamine-type stimulants (ATS), 1990 - 2007



Source: UNODC, Annual Report Questionnaire Data/DELTA; UNODC Drug Information Network for Asia and the Pacific (DAINAP); Government reports; World Customs Organization (WCO), *Customs and Drugs Report 2007* (Brussels, 2008) and previous years.

In view of the rapid increase in the clandestine manufacture, traffic and abuse of a variety of ATS, there is the need for law enforcement to identify these substances and differentiate between them due to the similarity in chemical structure.

Following the interest expressed by Member States in the possibility of identifying the above substances by means of a simple colour reaction, a study was carried out by the UNODC laboratory and Scientific Section to explore the feasibility. This note summarizes the results of the study which has developed a reliable colour test for thirteen ATS derived from phenethylamines.

Classification

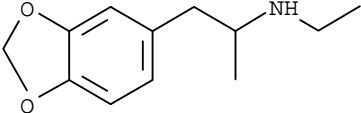
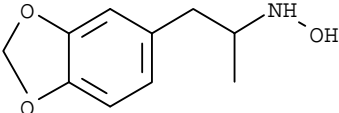
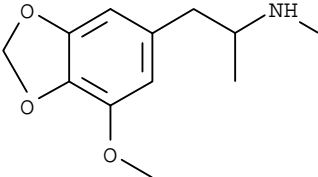
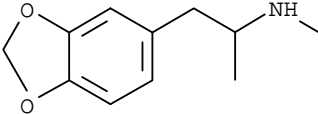
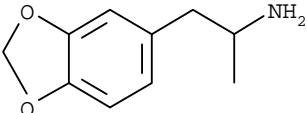
ATS can be categorized for the purposes of these technical notes into four groups: 1) Methylenedioxy amphetamine type compounds, 2) Amphetamine, 3) Methamphetamine and 4) Amphetamine type compounds (Table I.)

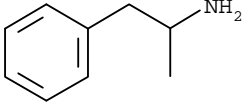
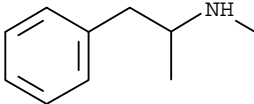
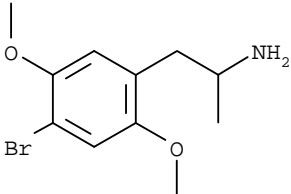
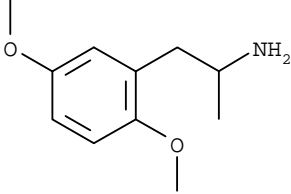
Table I.

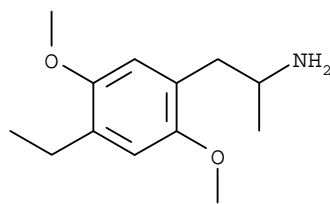
No.:	Abbreviation	Substance
Group I METHYLENedioxyAMPHETAMINE TYPE COMPOUNDS		
1	MDE	N-Ethyl-3,4-methylenedioxy amphetamine HCl
2	N-OH MDA	N-Hydroxy-3,4-methylenedioxy amphetamine HCl
3	MMDA	5-Methoxy-3,4-methylenedioxy amphetamine HCl
4	MDMA	3,4-Methylenedioxy methamphetamine HCl
5	MDA	3,4-Methylenedioxy amphetamine HCl
Group II AMPHETAMINE		
6	AMPT	Amphetamine H ₂ SO ₄
Group III METHAMPHETAMINE		
7	MAMPT	Methamphetamine HCl
Group IV AMPHETAMINE TYPE COMPOUNDS		
8	DOB	4-Bromo-2,5-dimethoxy amphetamine
9	DMA	2,5-Dimethoxy amphetamine HCl
10	DOET	2,5-Dimethoxy-4-ethyl amphetamine
11	NNDA	N,N-dimethyl amphetamine
12	PMA	4-Methoxy amphetamine HCl
13	DOM (STP)	2,5-Dimethoxy-4-methyl amphetamine HCl

The development of simple colour test for the selected ATS involved the evaluation of a range of chemicals and reagents. The chemical structures and molecular weight information of the ATS analysed are shown in Figures 1, 2, 3 and

Fig. 1 Chemical structures and molecular weight information

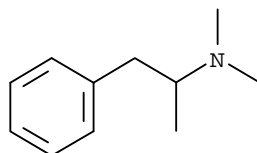
No. 1	MDE	N-Ethyl-3,4-methylenedioxy amphetamine HCl	 $C_{12}H_{17}NO_2$ MW 207.27 $C_{12}H_{17}NO_2 \cdot HCl$ MW 243.73
No. 2	N-OH MDA	N-Hydroxy-3,4-methylenedioxy amphetamine HCl	 $C_{10}H_{13}NO_3$ MW 195.22 $C_{10}H_{13}NO_3 \cdot HCl$ MW 231.68
No. 3	MMDA	3-Methoxy-4,5-methylenedioxy amphetamine HCl	 $C_{11}H_{15}NO_3$ MW 209.25 $C_{11}H_{15}NO_3 \cdot HCl$ MW 245.71
No. 4	MDMA	3,4-Methylenedioxy methamphetamine HCl	 $C_{11}H_{15}NO_2$ MW 193.25 $C_{11}H_{15}NO_2 \cdot HCl$ MW 229.71
No. 5	MDA	3,4-Methylenedioxy amphetamine HCl	 $C_{10}H_{13}NO_2$ MW 179.22 $C_{10}H_{13}NO_2 \cdot HCl$ MW 215.68

No. 6	AMPT	Amphetamine H ₂ SO ₄	C ₉ H ₁₃ N MW 135.21 (C ₉ H ₁₃ N) ₂ .H ₂ SO ₄ MW 368.50
			
No. 7	MAMPT	Methamphetamine HCl	C ₁₀ H ₁₅ N MW 149.24 C ₁₀ H ₁₅ N.HCl MW 185.70
			
No. 8	DOB	4-Bromo-2,5-dimethoxy amphetamine	C ₁₁ H ₁₆ NO ₂ Br MW 274.16 C ₁₁ H ₁₆ NO ₂ Br.HCl MW 310.62
			
No. 9	DMA	2,5-Dimethoxy amphetamine HCl	C ₁₁ H ₁₇ NO ₂ MW 195.26 C ₁₁ H ₁₇ NO ₂ .HCl MW 231.72
			
No. 10	DOET	2,5-Dimethoxy-4-ethyl amphetamine	C ₁₃ H ₂₁ NO ₂ MW 223.32 C ₁₃ H ₂₁ NO ₂ .HCl MW 259.78



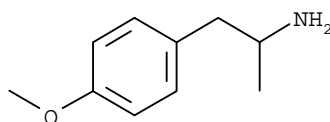
No. 11 **NNDA** **N,N-Dimethyl amphetamine**

$C_{11}H_{17}N$
 MW 163.26
 $C_{11}H_{17}N.HCl$
 MW 199.72



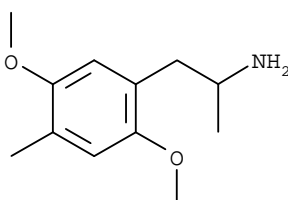
No. 12 **PMA** **4-Methoxy amphetamine HCl**

$C_{10}H_{15}NO$
 MW 165.23
 $C_{10}H_{15}NO.HCl$
 MW 201.69



No. 13 **DOM (STP)** **2,5-Dimethoxy-4-methyl amphetamine HCl**

$C_{12}H_{19}NO_2$
 MW 209.29
 $C_{12}H_{19}NO_2.HCl$
 MW 245.75



Chemicals and Reagents

Table II. Chemicals and Reagents

REAGENT	COMPOSITION
1	Concentrated sulfuric acid (H ₂ SO ₄ conc.)
2	Simon Reagent (0.9g sodium nitroprusside (Na ₂ [Fe(CN) ₅ NO]·2H ₂ O) in 90ml distilled H ₂ O + 10ml acetaldehyde / 2g sodium carbonate (Na ₂ CO ₃) in 100ml distilled H ₂ O)
3	37% Formaldehyde / H ₂ SO ₄ conc.
4	5% Ammonium molybdate tetrahydrate ((NH ₄) ₆ Mo ₇ O ₂₄ ·4H ₂ O) in H ₂ SO ₄ conc. (Froede-reagent)
5	5% Selenious acid (H ₂ SeO ₃) in H ₂ SO ₄ conc. (Mecke-reagent)
6	20% Citric acid in acetic anhydride
7	Karo Reagent (10% Potassium persulfate (K ₂ S ₂ O ₈) in H ₂ SO ₄ conc.)
8	H ₂ SO ₄ conc. + concentrated nitric acid (HNO ₃ conc.) (2:1, v/v)
9	0.5% Ammonium vanadate (NH ₄ VO ₃) in H ₂ SO ₄ conc. (Mandelin-reagent)
10	2% Sodium 1,2-naphthoquinone-4-sulfonate in H ₂ SO ₄ conc.
11	10% <i>p</i> -Dimethylaminobenzaldehyde in H ₂ SO ₄ conc.
12	20% Sodium permanganate (NaMnO ₄) in distilled H ₂ O / H ₂ SO ₄ conc.
13	5% Ammonium dichromate ((NH ₄) ₂ Cr ₂ O ₇) in distilled H ₂ O / H ₂ SO ₄ conc.
14	Fast Blue B + B-3
15	Fast Red B + B-4 (FAST RED B: Fast Red B : Na ₂ SO ₄ = 0.2 : 5.0, B-4: 2g NaOH + 25ml distilled water + 25ml PEG + 10ml MeOH)
16	0.1% 2,4,5-Trinitro-9-fluorenone in PPG / 10% LiOH
17	0.1% 2,4,5,7-Tetranitro-9-fluorenone in PPG / 10% LiOH
18	0.1% 1-Fluor-2,4-dinitrobenzene in PPG / 10% LiOH
19	10% LiOH in distilled water
20	20% Di-Sodium-Chromotropate (4,5-dihydroxy-2,7-naphthalene disulfonic acid disodium salt) in distilled H ₂ O / H ₂ SO ₄ conc.
21	3% Iodic acid (HIO ₃) in H ₂ SO ₄ conc. + HNO ₃ conc. (2:1) (1g iodic acid + 20ml H ₂ SO ₄ conc. + HNO ₃ conc. 10ml)
22	Karo Reagent (1g K ₂ S ₂ O ₈ in 10ml glacial acetic acid)
23	Concentrated nitric acid (HNO ₃ conc.)

COLOUR TESTS

Method I: H₂SO₄ conc. (R-1)

Protocol: A small amount of sample (1/10 the size of a match head) is placed on a spot plate and 1-2 drops of R-1 are introduced. The immediate development of a violet colour is indicative of the presence of MDE, N-OH MDA, MDMA or MDA.

Table III. Results of test with H₂SO₄ conc.

No.	Substance Abbreviation	Colour (develops at once)
1	MDE	violet
2	N-OH MDA	violet
3	MMDA	yellow brown
4	MDMA	violet
5	MDA	violet
6	AMPT	-
7	MAMPT	-
8	DOB	-
9	DMA	-
10	DOET	-
11	NNDA	-
12	PMA	-
13	STP	-

Legend: Hyphen (-) indicates "no colour"

Specificity of drug screening method using conc. H₂SO₄

The specificity of the test was assessed based on cross reactivity with a number of substances including some under international control (Table IV. – IX.)

Table IV. Opium alkaloids

No.	Substance	H ₂ SO ₄ conc.
1	Acetylcodeine HCl	-
2	Codeine phosphate	-
3	Heroin (Diacetylmorphine) HCl	-
4	6-Monoacetylmorphine HCl	-
5	Morphine	-
6	Narcotine	light yellow
7	Papaverine	-
9	Thebaine	orange brown

Table V. Coca alkaloids

No.	Substance	H ₂ SO ₄ conc.
1	Cocaine HCl	-
2	Crack	-
3	Ecgonine benzoylester	-

Table VI. Amphetamine and related compounds

No.	Substance	H ₂ SO ₄ conc.
1	Cathine HCl	-
2	Cathinone HCl	very light yellow
3	Ephedrine HCl	-
4	Fencamfamine HCl	-
5	Fenetylline HCl	-
6	Fenproporex HCl	-
7	Norephedrine	-
8	Pseudoephedrine	-

Table VII. Barbiturates

No.	Substance	H ₂ SO ₄ conc.
1	Allobarbital	-
2	Amobarbital	-
3	Barbital	-
4	Butalbarbital	-
5	Cyclobarbital	light orange
6	Methylphenobarbital	-
7	Pentobarbital	-
8	Phenobarbital	-
9	Secobarbital	-

Table VII. Benzodiazepines

No.	Substance	H ₂ SO ₄ conc.
1	Alprazolam	-
2	Estazepam	-
3	Flurazepam	very light yellow
4	Haloxazolam	very light yellow
5	Medazepam	-
6	Nitrazepam	-
7	Przepam	-

Table VIII. Other classes of substances under international control

No.	Substance	H ₂ SO ₄ conc.
1	Cannabinol	yellow
2	Cannabidiol	orange yellow
3	Gluthetamide	-
4	Methaqualone	-
5	Methylphenidate	-
6	Pemoline	-
7	Safrole	brown
6	Isosafrole	reddish brown
7	Anthranilic acid	-
8	N-acetylanthranilic acid	-
9	Phenylacetic acid	-
10	Methyl ethyl ketone	reddish pink
11	P2P	yellowish brown
12	Acetone	pink (purplish)
13	Phosphorus trichloride	-
14	Phosphorus pentochloride	-
15	Thionyl chloride	-
16	Isatoic anhydride	-
17	Piperonal	yellow
18	Ergometrine	very light yellowish brown
19	Ergotamine	light yellowish brown
20	Lysergic acid	light yellowish brown

Table IX. Other classes of substances not under international control

No.	Substance	H ₂ SO ₄ conc.
1	Diphenylhydramine HCl	orange yellow
2	Glucosamine HCl	-
3	Meconic acid	-
4	Procaine HCl	-
5	Pyridoxine HCl	-
6	Semicarbazid HCl	-
7	Caffeine citrate	-
8	Benzidine sulphate	-
9	<i>m</i> -Dinitrobenzene	-
10	Fructose	very light yellow
11	Glucose mono hydrate	-
12	Lactose mono hydrate	-

13	Maltose	-
14	L-Sorbose	very light yellow
15	D-Xylose	-
16	1-Chlor-2,4-dinitrobenzene	-
17	Methylphenylglyoxim	-
18	<i>p</i> -Arbutine	very light purple
19	Diphenylcarbaid	very light pink
20	Sulphathiazole	-
21	Thiopental	-
22	Na-Methohexital	-

Differentiation

These thirteen amphetamine type stimulants can be classified into two groups by means of using H₂SO₄ conc. as below.

Group A (positive colour reaction)	Group B (negative colour reaction)
MDE *	AMPT **
N-OH MDA *	MAMPT ***
MMDA * (characteristic yellowish brown colour)	DOB ****
MDMA *	DMA ****
MDA *	DOET ****
	NNDA ****
	PMA ****
	STP ****

*Methylenedioxy-amphetamines, **Amphetamine, ***Methamphetamine, ****Amphetamine type stimulants

Group A can be further separated into two groups (A-I and A-II) by means of Simon Reagent

Group A-I (positive colour reaction)	Group A-II (negative colour reaction)
MDE *	N-OH MDA *
MDMA *	MDA *

Group B can be further separated into two groups (B-I and B-II) by means of Simon Reagent as below.

Group B-I (positive colour reaction)	Group B-II (negative colour reaction)
MAMPT ***	N-OH MDA *
	MDA *
	AMP **
	DOB ****
	DMA ****
	DOET ****
	NNDA ****
	PMA ****
	STP ****

Method II. 3% Iodic acid (HIO₃) in H₂SO₄ conc. + HNO₃ conc. (2:1)

Iodic acid (3% w/v) in H₂SO₄ + HNO₃ conc. (2:1) (Reagent 21) was examined as a new colour reagent for methylenedioxy-amphetamine. The test is simple to perform and provides results that can be easily interpreted by the chemist. Compared to chromotropic acid, iodic acid provides clearer, more simple, specific, and sensitive results for methylenedioxy-amphetamine and amphetamine-type stimulants.

Protocol: To 1g of iodic acid (HIO₃), add 20 ml conc. H₂SO₄ and 10 ml conc. HNO₃ to produce *Reagent 2* (ca. 3% iodic acid in H₂SO₄ conc. + HNO₃ conc.).

A small amount of sample (1/10 size of match head) is placed on a spot plate and a drop of *Reagent 2* is introduced. A **brilliant orange colour** develops immediately in the presence of methylenedioxy amphetamine (MDE, N-OH MDA, MMDA, MDMA, MDA). A yellow colour develops immediately in the presence of DOB, DMA, DOET, NNDA, PMA and STP.

Table X. Amphetamine type stimulants

No.	Substance	3% HIO ₃ in H ₂ SO ₄ conc. + HNO ₃ conc. (2:1)
1	MDE	brilliant orange
2	N-OH MDA	brilliant orange
3	MMDA	brilliant orange
4	MDMA	brilliant orange
5	MDA	brilliant orange
8	DOB	yellow
9	DMA	yellow
10	DOET	yellow
11	NNDA	yellow
12	PMA	yellow
13	STP	yellow

Specificity of drug screening method using iodic acid (HIO₃) in H₂SO₄ conc. + HNO₃ conc. are below. (Table XI. – XVII.)

Table XI. Opium alkaloids

No.	Substance	3% Iodic acid (HIO ₃) (Reagent 21)
1	Acetylcodeine HCl	light orange yellow
2	Codeine phosphate	-
3	Heroin (Diacetylmorphine) HCl	-
4	6-Monoacetylmorphine HCl	-
5	Morphine	-
6	Narcotine	-
7	Papaverine	orange
9	Thebaine	orange yellow

Table XII. Coca alkaloid

No.	Substance	3% Iodic acid (HIO ₃) (Reagent 21)
1	Cocaine HCl	-
2	Crack	-
3	Ecgonine benzoylester	-

Table XIII. Amphetamine related compounds

No.	Substance	3% Iodic acid (HIO ₃) (Reagent 21)
1	Cathine HCl	-
2	Cathinone HCl	-
3	Ephedrine HCl	-
4	Fencamfamine HCl	-
5	Fenetylline HCl	-
6	Fenproporex HCL	-
7	Norephedrine	-
8	Pseudoephedrine	-

Table XIV. Barbiturates

No.	Substance	3% Iodic acid (HIO ₃) (Reagent 21)
1	Allobarbitol	-
2	Amobarbitol	-
3	Barbitol	-
4	Butalbarbitol	-
5	Cyclobarbitol	very light yellow
6	Methylphenobarbitol	-
7	Pentobarbitol	-
8	Phenobarbitol	-
9	Secobarbitol	-

Table XV. Benzodiazepines

No.	Substance	3% Iodic acid (HIO ₃) (Reagent 21)
1	Alprazolam	-
2	Estazepam	-
3	Flurazepam	-
4	Haloxazolam	-
5	Medazepam	very light pink
6	Nitrazepam	-
7	Prazepam	-

Table XVI. Other classes of substances under international control

No.	Substance	3% Iodic acid (HIO ₃) (Reagent 21)
1	Cannabinol	light red
2	Cannabidiol	light red
3	Gluthetimide	light pinkish red
4	Methaqualone	-
5	Methylphenidate	-

6	Pemoline	-
7	Safrole	dark reddish purple
6	Isosafrole	dark reddish black
7	Anthranilic acid	reddish brown
8	N-acetylanthranilic acid	light brown
9	Phenylacetic acid	-
10	Methyl ethyl ketone	light orange
11	P2P	reddish brown. Pink
12	Acetone	very light pinkish orange
13	Phosphorus trichloride	-
14	Phosphorus pentachloride	-
15	Thionyl chloride	-
16	Isatoic anhydrid	-
17	Piperonal	reddish orange
18	Ergometrine	reddish brown
19	Ergotamine	reddish brown
20	Lysergic acid	reddish brown

Table XVII. Other classes of substances not under international control

No.	Substance	3% Iodic acid (HIO ₃) (Reagent 21)
1	Diphenylhydramine HCl	reddish purple
2	Glucosamine HCl	-
3	Meconic acid	-
4	Procaine HCl	-
5	Pyridoxine HCl	-
6	Semicarbazid HCl	-
7	Caffeine citrate	-
8	Benzidine sulphate	-
9	<i>m</i> -Dinitrobenzene	-
10	Fructosa	-
11	Glucose mono hydrate	-
12	Lactose mono hydrate	-
13	Maltose	-
14	L-Sorbose	-
15	D-Xylose	-
16	1-Chlor-2,4-dinitrobenzene	-
17	Methylphenylglyoxim	-
18	<i>p</i> -Arbutine	light brown
19	Diphenylcarbazide	very light pink
20	Sulphathiazol	-
21	Thiopental	-
22	Na-Methohexital	-

Method III 20% Di-Na chromotropate in distilled water (R-20) + H₂SO₄ conc. (R-1)

Protocol: Place a very small amount of sample (1/10 size of match head) place on a spot plate and add 1 drop each of R-20 and R-1.

The immediate formation of a reddish purple colour indicates the presence of the methylenedioxy amphetamines (MDE, MMDA, MDMA, MDA) while a purple colour develops at once if N-OH MDA is present

Warming of the plate within a few minutes of development of the above colours results in a;

- purple colour for MDE, MMDA, MDMA, and MDA and a violet colour for N-OH MDA
- light greyish yellow colour (colour of reagent) for DOB, DMA, DOET, NNDA, PMA, STP, AMPT and MAMPT (Table XVIII.)

Table XVIII. Amphetamine type stimulants

No.	Substance	Chromotropic acid (R-20) + H ₂ SO ₄ conc. (R-1), warm up 80°C
1	MDE	purple
2	N-OH MDA	violet
3	MMDA	purple
4	MDMA	purple
5	MDA	purple
6	AMPT	light greyish yellow (colour of reagent)
7	MAMPT	light greyish yellow (colour of reagent)
8	DOB	light greyish yellow (colour of reagent)
9	DMA	light greyish yellow (colour of reagent)
10	DOET	light greyish yellow (colour of reagent)
11	NNDA	light greyish yellow (colour of reagent)
12	PMA	light greyish yellow (colour of reagent)
13	STP	light greyish yellow (colour of reagent)

Specificity

The specificity of the drug screening method using 20% Di-Na chromotropic acid and conc. H₂SO₄ are below (Table XIX. – XXV.)

Table XIX. Opium alkaloids

No.	Substance	Chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) / gentle warming
1	Acetylcodeine HCl	-
2	Codeine phosphate	-
3	Heroin (Diacetylmorphine) HCl	-
4	6-Monoacetylmorphine HCl	-
5	Morphine	-
6	Narcotine	orange red - purple
7	Papaverine	-
9	Thebaine	orange brown - reddish brown

☐ = colour of reagent

Table XX. Coca alkaloids

No.	Substance	Chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) / gentle warming
1	Cocaine HCl	-
2	Crack	-
3	Ecgonine benzoylester	-

Table XXI. Amphetamine and related compounds

No.	Substance	Chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) / gentle warming
1	Cathine HCl	-
2	Cathinone HCl	-
3	Ephedrine HCl	-
4	Fencamfamine HCl	-
5	Fenetylline HCl	-
6	Fenproporex HCL	-
7	Norephedrine	-
8	Pseudoephedrine	-

Table XXII. Barbiturates

No.	Substance	Chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) / gentle warming
1	Allobarbitol	-
2	Amobarbitol	-
3	Barbital	-
4	Butalbarbitol	-
5	Cyclobarbitol	-
6	Methylphenobarbitol	-
7	Pentobarbitol	-
8	Phenobarbitol	-
9	Secobarbitol	-

Table XXIII. Benzodiazepines

No.	Substance	Chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) / gentle warming
1	Alprazolam	-
2	Estazepam	-
3	Flurazepam	-
4	Haloxazolam	light purplish brown
5	Medazepam	-
6	Nitrazepam	-
7	Prazepam	-

Table XXIV. Other classes of substances under international control

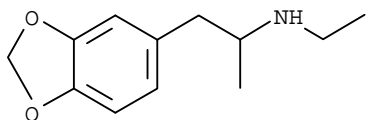
No.	Substance	Chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) / gentle warming
3	Cannabinol	-
4	Cannabidiol	-
3	Gluthetimide	-
4	Methaqualone	-
5	Methylphenidate	-
6	Pemoline	-
7	Safrole	purplish red
6	Isosafrole	purplish red
7	Anthranilic acid	-
8	N-acetylanthranilic acid	-
9	Phenylacetic acid	-
10	Methyl ethyl ketone	light pink - light reddish purple
11	P2P	reddish brown - brown
12	Acetone	-
13	Phosphorus trichloride	-
14	Phosphorus pentachloride	-
15	Thionyl chloride	-
16	Isatoic anhydrid	-
17	Piperonal	yellow - yellow brown
18	Ergometrine	-
19	Ergotamine	light green brown
20	Lysergic acid	-

Table XXV. Other classes of substances not under international control

No.	Substance	Chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) / gentle warming
1	Diphenylhydramine HCl	orange yellow
2	Glucosamine HCl	-
3	Meconic acid	-
4	Procaine HCl	-
5	Pyridoxine HCl	-
6	Semicarbazid HCl	-
7	Caffeine citrate	-
8	Benzidine sulfate	-
9	<i>m</i> -Dinitrobenzene	-
10	Fructose	reddish brown
11	Glucose mono hydrate	-
12	Lactose mono hydrate	-
13	Maltose	-
14	L-Sorbose	brown
15	D-Xylose	pink - red - brown
16	L-Rhamnose	reddish orange - brown
17	L-Arabinose	reddish orange - brown
18	D-Ribose	reddish orange - brown
19	D-Galactose	reddish orange - brown
20	D-Mannit	-
21	Starch	reddish brown
22	D-Mannose	reddish brown
23	1-Chlor-2,4-dinitrobenzene	-
24	Methylphenylglyoxim	-
25	<i>p</i> -Arbutine	light reddish brown
26	Diphenylcarbazid	-
27	Sulphathiazol	-
28	Thiopental	-
29	Na-Methohexital	-

[II] Specific Tests

A. MDE (N-Ethyl-3,4-methylenedioxy amphetamine HCl)

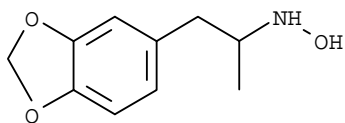


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **MDE** is present are summarised in Table XXVI.

Table XXVI. Colour Tests for MDE

Reagent	Results
H ₂ SO ₄ conc. (R-1)	Violet colour develops at once
Simon Reagent (R-2)	Brilliant deep purple colour develops at once
37% formaldehyde solution (R-3), H ₂ SO ₄ conc. (R-1)	Light yellowish green colour develops at once. Deep green colour develops soon
10% <i>p</i> -Dimethylaminobenzaldehyde in H ₂ SO ₄ conc. (R-11)	Deep reddish orange colour develops at once, and develops reddish brown colour soon

B. N-OH MDA (N-Hydroxy-3,4-methylenedioxy amphetamine)

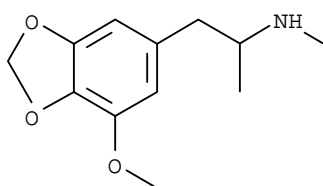


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **N-OH MDA** is present are summarised in Table XXVII.

Table XXVII. Colour Tests for N-OH-MDA

Reagent	Results
H ₂ SO ₄ conc. (R-1)	Violet colour develops at once
Simon Reagent (R-2)	No colour change (Very light pink colouration is the colour of reagent)
5% Ammonium molybdate in H ₂ SO ₄ conc. (R-4)	Dark blue colour develops immediately, turning into orange yellow within a few minutes
H ₂ SO ₄ conc. + HNO ₃ conc. (2:1, 10ml + 10ml, v/v (R-8))	Brilliant yellow colour develops at once
5% Selenious acid in H ₂ SO ₄ conc. (R-5)	Deep bluish green colour develops at once, and brilliant orange colour develops soon
0.1% 2,4,5-Trinitro-9-fluorenone in PPG (R-16), 10% LiOH solution in H ₂ O (R-19) [use 1 drop of R16 then 1 drop of R-19]	Deep brown colour develops at once and a reddish brown colouration develops soon
0.1% 2,4,5,7-Tetranitro-9-fluorenone in PPG (R-17), 10% LiOH solution in H ₂ O (R-19) [use 1 drop of R16 then 1 drop of R19]	Brilliant deep green colour develops at once, and reddish brown colour develops soon
1-Fluor-2,4-dinitrobenzene (R-18), 10% LiOH solution in H ₂ O (R-19) [use 1 drop of R-18 then 1 drop of R-19]	Orange-brown colour develops at once, and reddish brown colour develops soon

C. MMDA (5-Methoxy-3,4-methylenedioxy amphetamine HCl)

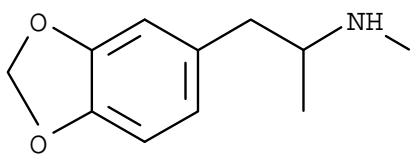


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **MMDA** is present are summarised in Table XXVIII.

Table XXVIII. Colour Tests for MMDA

Reagent	Results
H ₂ SO ₄ conc. (R-1)	Brilliant yellow ⇒ deep orange colour develops at once
Simon Reagent (R-2)	No colour change (Very light pink colouration is the colour of reagent)
10 % Potassium persulfate in H ₂ SO ₄ conc. (R-7)	Deep reddish orange colour develops at once, and develops reddish orange colour soon
2.5 % Sodium chromotropic acid (R-20) / conc. H ₂ SO ₄ (R-1) [use 1 drop of R-20 then 3 drops of R-1]	Brilliant yellow colour develops at once, and purple colour develops soon
Mandelin Reagent (R-9)	Reddish orange colour develops at once, and very deep red colour develops soon
2% Sodium 1,2-naphthoquinone -4-sulfonate in H ₂ SO ₄ conc. (R-10)	Olive green colour develops at once
5% Ammoniummolybdate in H ₂ SO ₄ conc. (R-4)	Light yellowish grey colour develops at once, and grey yellow colour develops soon

D. MDMA (3,4-methylenedioxy methamphetamine HCl)

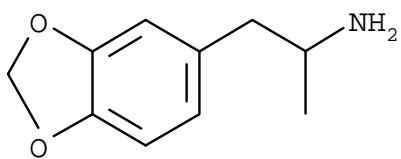


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **MDMA** is present are summarised in Table XXIX.

Table XXIX Colour Tests for MDMA

Reagent	Results
H ₂ SO ₄ conc. (R-1)	Reddish purple colour develops at once
Simon Reagent (R-2)	Brilliant deep purple blue colour develops at once
37% Formaldehyde solution (R-3), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-3, 1-2 drops of R-1]	Grey olive green colour develops at once
5% Potassium persulfate in H ₂ SO ₄ conc. (5% R-7)	Yellow green colour develops at once, and deep black colour develops soon
2.5 % Sodium chromotropic acid (R-20) / H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-20, 3 drops of R-1]	Violet colour produced
20% NaMnO ₄ in distilled water (R-12), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-12 , 1-2 drops of R-1]	Bluish green colour develops at once, and dark green colour develops soon
5% (NH ₄) ₂ Cr ₂ O ₇ in distilled water (R-13), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-13 , 1-2 drops of R-1]	Deep olive green colour develops at once, and green colour develops soon

E. MDA 3,4-Methylenedioxy amphetamine HCl

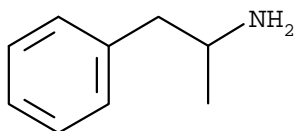


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **MDA** is present are summarised in Table XXX.

Table XXX. Colour Tests for MDA

Reagent	Results
H ₂ SO ₄ conc. (R-1)	Violet colour develops at once
Simon Reagent (R-2)	No colour develops at once, very light pink colour can be seen as colour of reagent
37% Formaldehyde solution (R-3), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-3, 1-2 drops of R-1]	Dark greenish blue to olive colour

F. Amphetamine H₂SO₄



Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **AMPT** is present are summarised in Table XXXI.

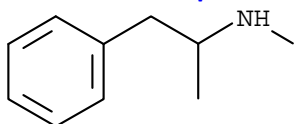
Table XXXI. Colour Tests for AMPT

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	No colour develops at once
FAST RED B* / B-4** (R-15) [Very small amount of FAST RED B Reagent are added, 1-2 drops of B-4 are introduced]	Deep purplish Red develops soon

* FAST RED B ; Fast Red B : Na₂SO₄ = 0.2 : 5.0

** B-4: 2g NaOH + 25ml distilled water + 25ml PEG + 10 ml MeOH

G. Methamphetamine HCl

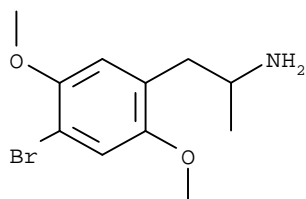


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **MAMPT** is present are summarised in Table XXXII.

Table XXXII. Colour Tests for MAMPT

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	Brilliant violet blue colour develops
5% (NH ₄) ₂ Cr ₂ O ₇ in distilled water (R-13), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-13 , 1-2 drops of R-1]	Dark brown colour develops at once, and green colour develops soon

H. DOB (4-Bromo-2,5-dimethoxy amphetamine)

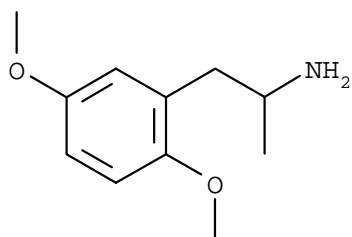


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **DOB** is present are summarised in Table XXXIII.

Table XXXIII. Colour Tests for DOB

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	No colour develops at once
37% Formaldehyde solution (R-3), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-3, 1-2 drops of R-1]	Yellowish green colour develops at once, and deep yellowish green colour develops soon
5% Potassium persulfate in H ₂ SO ₄ conc. (5% R-7)	Greenish yellow colour develops at once, and deep yellow colour develops soon

I. DMA (2,5-Dimethoxy amphetamine HCl)

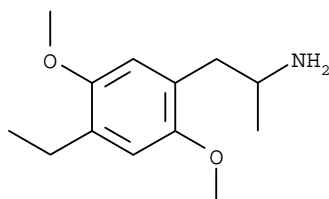


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **DMA** is present are summarised in Table XXXIV.

Table XXXIV. Colour Tests for DMA

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	No colour develops at once
5% Selenious acid in H ₂ SO ₄ conc. (R-5)	Deep brown -> reddish brown colour develops at once, and develops deep blue colour soon
Potassium persulfate in H ₂ SO ₄ conc. (R-7)	Olive yellow colour develops at once
H ₂ SO ₄ conc. + HNO ₃ conc. (2:1, (R-8))	Brilliant yellow colour develops at once
10% <i>p</i> -Dimethylaminobenzaldehyde in H ₂ SO ₄ conc. (R-11)	Yellow-greenish blue colour develops at once, and develops very deep green colour soon
20% NaMnO ₄ in distilled water (R-12), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-12, 1-2 drops of R-1]	Deep yellowish blue colour develops at once, and blue colour develops soon
37% Formaldehyde solution (R-3), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-3, 1-2 drops of R-1]	Grey Yellow -> brown pink colour develops at once, and deep blue colour develops soon
5% (NH ₄) ₂ Cr ₂ O ₇ in distilled water (R-13), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-13, 1-2 drops of R-1]	Deep yellowish green colour develops at once, and bluish green colour develops soon

J. DOET (2,5-Dimethoxy-4-ethyl amphetamine)

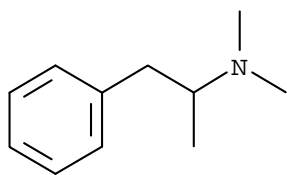


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **DOET** is present are summarised in Table XXXV.

Table XXXV. Colour Tests for DOET

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	No colour develops at once
5% Selenious acid in H ₂ SO ₄ conc. (R-5)	Olive green colour develops at once
Fast Blue B, B-3 (R-14) A small amount of Fast Blue B (1/2 size of match head) is added, 2-3 drops of R-14 are introduced	Deep reddish brown colour develops at once
10% Potassium persulfate in H ₂ SO ₄ conc. (R-7)	Brilliant greenish yellow colour develops at once
0.1g Sodium 1,2-naphthoquinone-4-sulfonic acid in 5 ml H ₂ SO ₄ conc. (R-10)	Olive green colour develops at once
10% <i>p</i> -Dimethylaminobenzaldehyde in H ₂ SO ₄ conc. (R-11)	Greenish yellow colour develops at once, and develops yellowish brown colour soon
20% NaMnO ₄ in distilled water (R-12), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-12, 1-2 drops of R-1]	Light green colour develops at once, and green colour develops soon

K. NNDA (N,N-Dimethyl amphetamine)

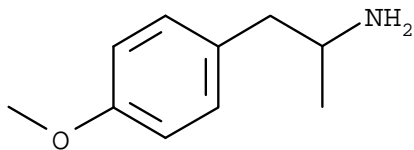


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **NNDA** is present are summarised in Table XXXVI.

Table XXXVI. Colour Tests for NNDA

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	No colour develops at once
5% Selenious acid in H ₂ SO ₄ conc. (R-5)	Dark blue colour develops at once, and deep blue colour develops soon
37% Formaldehyde solution (R-3), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-3, 1-2 drops of R-1]	Orange yellow colour develops at once, and deep yellowish brown colour develops soon
Potassium persulfate in H ₂ SO ₄ conc. (R-7)	Deep green colour develops at once

L. **PMA (p-Methoxy amphetamine HCl)**

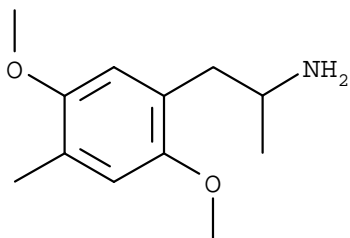


Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **PMA** is present are summarised in Table XXXVII.

Table XXXVII. Colour Tests for PMA

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	No colour develops at once
5% Selenious acid in H ₂ SO ₄ conc. (R-5)	Dark blue colour develops at once, and deep blue colour develops soon
Potassium persulfate in H ₂ SO ₄ conc. (R-7)	Olive brown - yellow brown colour develops at once
Mandelin Reagent (R-9)	Yellowish orange colour develops at once, and yellowish pink colour develops soon

M. DOM (STP) (2,5-Dimethoxy-4-methyl amphetamine HCl)



Protocol: A very small sample amount of sample (1/10 size of match head) is placed on a spot plate. The resultant colours on introduction of 1-2 drops of specified reagents if **DOM (STP)** is present are summarised in Table XXXVIII.

Table XXXVIII. Colour Tests for DOM (STP)

Reagent	Results
H ₂ SO ₄ conc. (R-1)	No colour develops at once
Simon Reagent (R-2)	No colour develops at once
5% Selenious acid in H ₂ SO ₄ conc. (R-5)	Deep olive green colour develops at once, and deep blue colour develops soon
Potassium persulfate in H ₂ SO ₄ conc. (R-7)	Deep yellow green - very dark brown colour develops at once, and brilliant yellow green colour develops within 20 minutes
20% NaMnO ₄ in distilled water (R-12), H ₂ SO ₄ conc. (R-1) [use 1-2 drops of R-12, 1-2 drops of R-1]	Deep green colour develops at once, and light green colour develops soon
5% Ammoniummolybdate in H ₂ SO ₄ conc. (R-4)	Deep dark blue colour develops at once
10% <i>p</i> -Dimethylaminobenzaldehyde in H ₂ SO ₄ conc. (R-11)	Brilliant yellow colour develops at once, and develops deep yellow colour soon

H₂SO₄ conc. (R-1)

No.	Substance	Colour	
		Positive colour reaction	Negative colour reaction
1	MDE*	X	
2	N-OH MDA*	X	
3	MMDA*	X	
4	MDMA*	X	
5	MDA*	X	
6	AMPT**		X
7	MAMPT***		X
8	DOB****		X
9	DMA****		X
10	DOET****		X
11	NNDA****		X
12	PMA****		X
13	STP****		x

* : Methylendioxy-amphetamines

** : Amphetamine

*** : Methamphetamine

**** : Amphetamine type stimulants

Simon reagent (R-2)

No.	Substance	Colour	
		Positive colour reaction	Negative colour reaction
1	MDE*	X	
2	N-OH MDA*		x
3	MMDA*		
4	MDMA*	x	
5	MDA*		x
6	AMPT**		x
7	MAMPT***	x	
8	DOB****		x
9	DMA****		x
10	DOET****		x
11	NNDA****		x
12	PMA****		x
13	STP****		x

Table XXXIX.

(1) 37% Formaldehyde solution (R-3)
(2) H ₂ SO ₄ conc. (R-1)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	light yellowish green	deep bluish green
2	N-OH MDA	-	-
3	MMDA	light purplish red	pink
4	MDMA	deep yellowish green	grey olive green
5	MDA	dark greenish blue	olive
6	AMPT	Light brown	dark blue
7	MAMPT	light brown	dark blue
8	DOB	yellow green to green	brilliant green
9	DMA	grey yellow to brown pink	deep brown
10	DOET	-	-
11	NNDA	orange yellow	yellowish brown
12	PMA	-	-
13	STP	very light yellow	-

Table XL.

5% Ammonium molybdate in H ₂ SO ₄ conc. (R-4)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	light blue	blue
2	N-OH MDA	deep dark blue to orange ring	orange yellow
3	MMDA	light yellowish gray	yellowish gray
4	MDMA	deep blue	greenish blue
5	MDA	deep greenish blue	deep greenish blue
6	AMPT	-	olive green
7	MAMPT	-	olive green
8	DOB	greenish yellow	deep blue
9	DMA	brownish yellow	deep blue
10	DOET	greenish yellow	deep blue
11	NNDA	light yellow	yellow brown
12	PMA	light blue	deep blue
13	STP	yellowish green	deep blue

Table XLI.

5% Selenious acid in H ₂ SO ₄ conc. (R-5)

No.	Substance	Colour
-----	-----------	--------

		develops at once	within few minutes
1	MDE	deep bluish green to deep blue	very deep blue
2	N-OH MDA	deep bluish green to deep blue	orange-ring around blue brilliant orange
3	MMDA	dark olive green	deep brown
4	MDMA	deep yellow green to deep blue	very deep blue
5	MDA	bluish green	deep blue
6	AMPT	yellow brown	yellow brown
7	MAMPT	yellow brown	yellow brown
8	DOB	yellow	yellow
9	DMA	olive brown to orange	deep blue
10	DOET	greenish yellow	yellow
11	NNDA	-	very light yellow
12	PMA	grey blue	deep blue
13	STP	deep olive green	deep green

Table XLII.

Karo Reagent: 1g K₂S₂O₈ in 10 ml c. HAc (glacial acetic acid) (R-22)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	deep purple	
2	N-OH MDA	deep blackish purple	reddish purple
3	MMDA	deep reddish orange	deep reddish orange
4	MDMA	yellow green to very deep purple	blackish purple
5	MDA	very deep purple	orange brown
6	AMPT	Light olive green	deep olive green – brown
7	MAMPT	light olive green	deep olive green – brown
8	DOB	greenish yellow	deep yellow
9	DMA	olive yellow to olive	deep brown
10	DOET	brilliant greenish yellow	deep yellow
11	NNDA	deep green	deep brown
12	PMA	olive brown	yellow brown
13	STP	greenish yellow	brilliant yellow green

Table XLIII.

10 ml H₂SO₄ conc. + 10 ml HNO₃ conc. (1:1 v/v)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	yellow	yellow
2	N-OH MDA	very brilliant reddish orange	brilliant orange
3	MMDA	purplish red	very light yellow
4	MDMA	yellowish orange	yellow

5	MDA	yellow	very light yellow
6	AMPT	-	-
7	MAMPT	-	-
8	DOB	very light yellow	-
9	DMA	brilliant yellow	-
10	DOET	yellow green	-
11	NNDA	-	-
12	PMA	very light yellow	-
13	STP	yellow green	very light yellow

Table XLIV.

0.5% Ammonium vanadate (NH_4VO_3) in H_2SO_4 conc. (Mandelin-reagent) (**R-9**)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	purple	blackish brown
2	N-OH MDA	purple	blackish brown
3	MMDA	reddish orange	very deep red
4	MDMA	purple	blackish brown
5	MDA	purple	blackish brown
6	AMPT	yellow green	yellow green
7	MAMPT	yellow green	yellow green
8	DOB	yellow green	yellowish green
9	DMA	yellow green to olive	brownish green
10	DOET	light yellow green	yellow green
11	NNDA	yellowish blue	yellowish blue
12	PMA	yellowish orange	yellowish pink
13	STP	yellow green	yellowish green

Table XLV.

2% Sodium 1,2-Naphthoquinone-4-sulfonic acid in H_2SO_4 conc. (**R-10**)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	olive dark brown	-
2	N-OH MDA	-	-
3	MMDA	deep reddish brown	-
4	MDMA	deep blackish brown	-
5	MDA	olive dark brown	-
6	AMPT	-	-
7	MAMPT	-	-
8	DOB	deep yellowish brown	-
9	DMA	-	-
10	DOET	olive green	-
11	NNDA	deep yellowish brown	-
12	PMA	-	-
13	STP	-	-

Table XLVI.

10% <i>p</i> -Dimethylaminobenzaldehyde in H ₂ SO ₄ conc. (R-11)			
No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	deep reddish orange	reddish brown
2	N-OH MDA	deep reddish orange	reddish brown
3	MMDA	yellowish brown	yellowish brown
4	MDMA	deep reddish orange	reddish brown
5	MDA	reddish orange	reddish orange
6	AMPT	light yellow purple	light yellow purple
7	MAMPT	light yellow purple	light yellow purple
8	DOB	very yellow	deep yellow
9	DMA	yellow-greenish blue	very deep green
10	DOET	greenish yellow	yellowish brown
11	NNDA	brilliant yellow	deep yellow
12	PMA	orange yellow	deep yellow
13	STP	brilliant yellow	deep yellow

Table XLVII.

(1) 20% NaMnO ₄ in distilled water solution (R-12)			
(2) H ₂ SO ₄ conc. (R-1)			

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	blue	light blue
2	N-OH MDA	blue	light blue
3	MMDA	deep blue	blue
4	MDMA	greenish blue	brilliant deep blue
5	MDA	deep blue	deep blue
6	AMPT	-	-
7	MAMPT	-	-
8	DOB	yellowish green	green
9	DMA	deep yellowish blue	brilliant deep blue
10	DOET	light green	green
11	NNDA	white	-
12	PMA	light blue	light blue
13	STP	deep green	light green

Table XLVIII.

(1) 5% (NH ₄) ₂ Cr ₂ O ₇ in distilled water (R-13)			
(2) H ₂ SO ₄ conc. (R-1)			

No.	Substance	Colour	
		develops at once	within few minutes

1	MDE	yellowish brown	yellow green
2	N-OH MDA	deep yellowish brown	olive
3	MMDA	yellowish brown	yellow green
4	MDMA	deep olive green	green
5	MDA	deep yellowish brown	deep yellowish brown
6	AMPT	dark brown	deep dark brown
7	MAMPT	dark brown	green
8	DOB	yellowish brown	greenish yellow
9	DMA	yellowish green	bluish green
10	DOET	yellowish brown	greenish yellow
11	NNDA	brownish yellow	yellow brown
12	PMA	brownish yellow	yellow brown
13	STP	yellowish brown	yellow brown

Table XLIX.

(1) 0.1% 2,4,5-Trinitro-9-fluorenone in PPG (R-16)
(2) 10% LiOH (R-19)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	very light yellowish olive	brown
2	N-OH MDA	deep brown	reddish brown
3	MMDA	very light yellowish olive	brown
4	MDMA	-	-
5	MDA	-	-
6	AMPT	yellow green	brown
7	MAMPT	yellow green	brown
8	DOB	light olive	light brown
9	DMA	-	-
10	DOET	-	light purplish red
11	NNDA	-	light brown
12	PMA	-	brownish red
13	STP	-	-

Table L.

(1) 0.1% 2,4,5,7-Tetranitro-9-fluorenone in PPG (R-17)
(2) 10% LiOH (R-19)

No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	light olive	light brown
2	N-OH MDA	brilliant deep green	dark brown
3	MMDA	light greenish yellow	light brown
4	MDMA	olive green to brown	-
5	MDA	light greenish yellow	-
6	AMPT	olive yellow	light purplish yellow
7	MAMPT	olive yellow	light purplish yellow

8	DOB	light purplish red	brown
9	DMA	-	-
10	DOET	-	-
11	NNDA	-	-
12	PMA	olive	-
13	STP	light purplish red	-

Table LI.

Concentrated nitric acid (HNO ₃ conc.) (R-23)
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No.	Substance	Colour	
		develops at once	within few minutes
1	MDE	yellow	yellow
2	N-OH MDA	brilliant orange red	reddish orange
3	MMDA	brown	yellow
4	MDMA	yellow	-
5	MDA	yellow	-
6	AMPT	-	-
7	MAMPT	-	-
8	DOB	yellow	-
9	DMA	yellow	-
10	DOET	light yellow	-
11	NNDA	no colour	-
12	PMA	-	-
13	STP	light yellow	-

Table LII. Cross-reactivity results (Amphetamine type)

No	Substance	Reagent	Colour
1	MDE	10% p-Dimethylaminobenzaldehyde in H ₂ SO ₄ conc. (R-11)	deep reddish orange - reddish brown
2	N-OH MDA	5% Ammonium molybdat in H ₂ SO ₄ conc. (R-4)	deep dark blue-orange ring + deep dark blue-orange brown
		H ₂ SO ₄ conc. + HNO ₃ conc. (R-8)	brilliant orange
3	MMDA	H ₂ SO ₄ conc. (R-1)	brilliant yellow ☐ deep orange
		10% Potassium persulfate in H ₂ SO ₄ conc. (R-7)	deep reddish orange- reddish orange
		2.5% Di-Sodium-Chromotropate/H ₂ SO ₄ conc. (R-19/R-1)	brilliant yellow-purple
		0.5% Ammonium vanadate in H ₂ SO ₄ conc. (R-9)	reddish orange- very deep red

4	MDMA	10% Potassium persulfate in H ₂ SO ₄ conc. (R-7)	yellow green-black
		5% (NH ₄) ₂ Cr ₂ O ₇ in distilled water/H ₂ SO ₄ conc. (R-13/R-1)	deep olive green - green
5	MDA	5% Ammonium molybdate in H ₂ SO ₄ conc. (R-4)	deep dark blue
		H ₂ SO ₄ conc. + HNO ₃ conc. (R-8)	brilliant yellow
6	AMPT	Fast Red B/B4 (R-15)	deep purplish red
7	MAMPT	Simon reagent (R-2)	brilliant violet blue
8	DOB	37% Formaldehyde/H ₂ SO ₄ conc. (R-3/-R-1)	yellow green to deep yellow green
9	DMA	10% p-Dimethylaminobenzaldehyde in H ₂ SO ₄ conc. (R-11)	brilliant violet to deep violet
10	DOET	2% Sodium 1,2-Naphthochinone-4-sulfonic acid in H ₂ SO ₄ conc. (R-10)	olive green
11	NNDA	10% Potassium persulfate in H ₂ SO ₄ conc. (R-7)	green to deep green
12	PMA	0.5% Ammonium vanadate in H ₂ SO ₄ conc. (R-9)	yellowish orange to yellowish pink
13	STP	10% Potassium persulfate in H ₂ SO ₄ conc. (R-7)	deep yellow green - very dark brown to yellow green

Table LIII. Cross-reactivity results (Amphetamine and Methamphetamine)

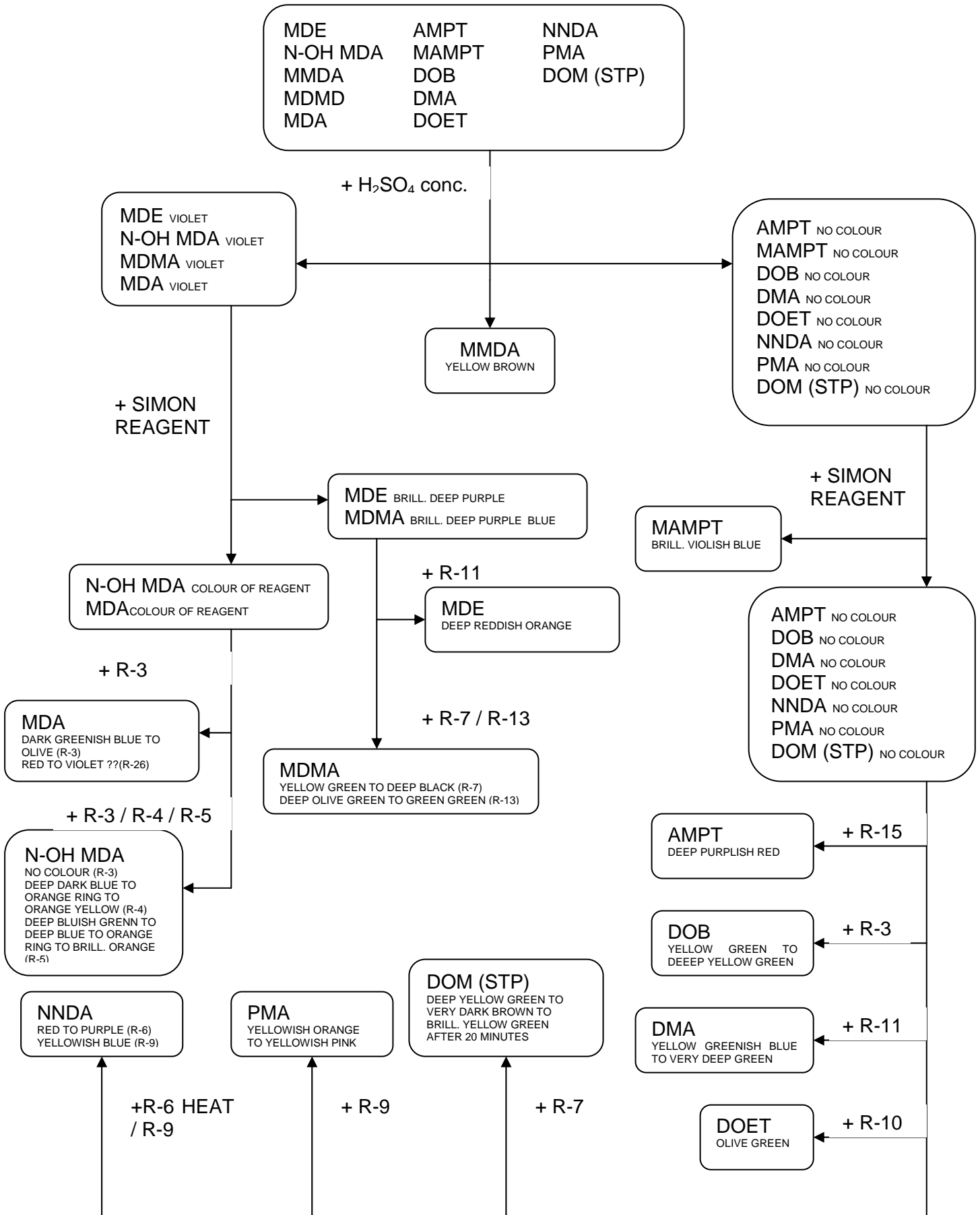
No	Reagent	Amphetamine	Methamphetamine
1	H ₂ SO ₄ conc. + HNO ₃ conc. (R-8)	-	-
2	5% Karo-reagent (R-22)	light olive green - deep olive green - brown	light olive green - deep olive green - brown
3	Mandeline-reagent	yellow green	yellow green
4	5% Selenious acid in H ₂ SO ₄ conc.	yellow brown	yellow brown
5	2% Naphthochinone sulfonic acid in H ₂ SO ₄ conc.	no colour	-
6	p-Dimethylaminobenzaldehyde in H ₂ SO ₄ conc.	light yellow purple (colour of reagent)	light yellow purple (colour of reagent)
7	5% Ammonium molybdate in H ₂ SO ₄ conc.	-- light olive green	-- light olive green
8	37% Formaldehyde/H ₂ SO ₄ conc.	light brown - dark blue	light brown-dark blue
9	5% (NH ₄) ₂ Cr ₂ O ₇ in distilled water/H ₂ SO ₄ conc.	dark brown	dark brown - green

34. The colour reaction using 1) 20% Di-Na Chromotropate aq. dist. solution 2) 3% Iodic acid c. Sulfuric acid + c. Nitric acid, and 3) c. Sulfuric acid examined in this study was tested about 80 substances for possible cross-reactivity each of them. (Table IV-IX, XI-XVII, and XIX-XXV). The results obtained was encouraging and seemed to justify a preliminary reports from UNDCP, even though time did not permit for these reactions to be exhaustively tested.

35. Table shows substance which yielded some colours with the Amphetamine Type Stimulants tests, but could not interfere with its detection. The methods involved can, however, be further

tested, as far as present stock of standard chemical substances available at UNDCP laboratory permit, within a relatively short time.

36. The advantages of the tests not only separation but also identification are that they are simple, rapid and easily reproducible, requiring only very small amounts of sample and chemicals and not special laboratory equipment.



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