

Chapter 4

FORENSIC ANALYSIS OF CONTROLLED SUBSTANCES

Part A. Training of New Personnel

A constant problem for the forensic chemist is the fact that most controlled substances are white powders, in common with many household substances. Therefore, analysis of collected evidence is complicated by the need to analyze both for controlled substances and common household substances that may have been either deliberately or accidentally collected during the seizure process. The analysis procedure below is designed to identify controlled substances and common household substances.

As a new trainee in forensic procedures, you will analyze three samples for your first assignment. **Two of the samples contain TWO different substances and one sample contains only ONE substance.**

Nine of the substances for which you will analyze are taken from the following group:

NaCl (common salt)	Na ₂ CO ₃ (washing soda)	CaCO ₃ (chalk)
H ₃ BO ₃ (boric acid)	sand	Na ₂ B ₄ O ₇ (borax).
glucose (corn sugar)	NaHCO ₃ (baking soda)	cornstarch

In addition, you will test for the presence of five substances which mimic the properties of controlled substances you will encounter at numerous times in later stages of your training:

pseudo-amphetamine, pseudo-cocaine, pseudo-ecstasy, pseudo-heroin and pseudo-LSD.

You must carefully record the test you are performing and all your observations during each test. When you have finished testing your three unknown samples, you must fill in the Forensic Report, and state the following for each of the three samples:

Number of sample, Brief description of tests performed and observations during tests,
Conclusion regarding substances present in sample.

Finally, at the bottom of the Forensic Report sign your name and date the report.

INSTRUCTIONS

	Test Description	Possible Result	Alternate Result
1.	<p>Testing for solubility in water</p> <p>Put an amount of unknown solid about the size of a small pea into a small test tube. Add 5 mL of water (note that 5 mL fills the test tube HALF FULL), stopper the test tube and shake the tube strongly for one minute.</p>	<p>All the solid dissolves (liquid is colourless and transparent)</p> <p>Possible soluble substances: NaCl, NaHCO₃, Na₂B₄O₇, pseudo-amphetamine, pseudo-cocaine, Na₂CO₃, glucose, pseudo-ecstasy, H₃BO₃, pseudo-LSD</p> <p>Go to Step 5.</p>	<p>The solution is milky or undissolved solid remains</p> <p>Remove the stopper and centrifuge the tube for 2 minutes with an equally-filled tube of water opposite it. The presence of an insoluble substance is obvious but the presence of a soluble substance is also possible. Carefully pour off the liquid into a clean test tube and label the tube "Step 5". Possible insoluble substances: pseudo-heroin, CaCO₃, cornstarch, sand</p> <p>Possible soluble substances: NaCl, NaHCO₃, Na₂B₄O₇, pseudo-amphetamine, pseudo-LSD, pseudo-cocaine, Na₂CO₃, glucose, pseudo-ecstasy, H₃BO₃</p> <p>Go to Steps 2-4 to test the insoluble substance and after that go to Step 5 to test the liquid (soluble substance).</p>

	Test Description	Possible Result	Alternate Result
2.	<p>Using iodine to test for starch</p> <p>To the solid saved from Step #1, add 2 drops of iodine solution and 1 mL of water, and then stir with a clean stirring rod.</p>	<p>A black, dark grey, deep blue or purple colour forms</p> <p>The presence of cornstarch is confirmed.</p> <p>Analysis of insoluble substance is complete. Go to Step 5 to analyze the liquid saved from Step 1.</p>	<p>Colour is NOT black, deep blue or purple</p> <p>Cornstarch is absent. Possible substances are: pseudo-heroin, CaCO_3, sand</p> <p>Go to Step 3.</p>
3.	<p>Testing for CaCO_3</p> <p>To the Step 2 solution, add 2 mL of 10% HCl and stir with a clean stirring rod.</p>	<p>Vigorous bubbling occurs</p> <p>The presence of CaCO_3 is confirmed.</p> <p>Analysis of insoluble substance is complete. Go to Step 5 to analyze the liquid saved from Step 1.</p>	<p>No bubbles (or only a few) are seen</p> <p>CaCO_3 is absent. Possible substances are: pseudo-heroin, sand</p> <p>Go to Step 4.</p>
4.	<p>Testing for pseudo-heroin versus sand</p> <p>To the solution from Step 3 add 3 drops of 10% BaCl_2 and stir with a clean stirring rod.</p>	<p>The solution becomes cloudy</p> <p>The presence of pseudo-heroin is confirmed</p> <p>Analysis of insoluble substance is complete. Go to Step 5 to analyze the liquid saved from Step 1.</p>	<p>The solution remains transparent, apart from any undissolved solid at the bottom of the test tube.</p> <p>The presence of sand is confirmed.</p> <p>Analysis of insoluble substance is complete. Go to Step 5 to analyze the liquid saved from Step 1.</p>
5.	<p>Testing the acidity of the liquid saved from Step 1</p> <p>Add 5 drops of anthocyanin solution to the solution from Step 1 and stir with a clean stirring rod. Hold the test tube against a piece of white paper to see the colour clearly.</p> <p>IMPORTANT: Save this test tube and its contents for Step 8 unless you are told that "Analysis is complete".</p>	<p>If the colour is yellow or green, possible substances are: pseudo-cocaine or Na_2CO_3</p> <p>Go to Step 6.</p> <p>If the colour is blue or blue with a slight bit of green, the presence of NaHCO_3 is probable, but requires confirmation.</p> <p>Go to Step 7.</p> <p>If the colour is violet, pink purple or grey-purple, possible substances are: NaCl, pseudo-amphetamine, glucose, pseudo-ecstasy, pseudo-LSD, $\text{Na}_2\text{B}_4\text{O}_7$ or H_3BO_3.</p> <p>Put a pea-sized amount of the original solid into a small test tube. Add 5 mL of water, then 3 drops of bromothymol blue and finally 1 drop of buffer. Stopper the test tube and shake the tube for half a minute. Interpret the observed colour as follows.</p>	<p>If the colour is YELLOW, H_3BO_3 is confirmed.</p> <p>If the colour is BLUE, $\text{Na}_2\text{B}_4\text{O}_7$ is confirmed.</p> <p>If the colour is GREEN: H_3BO_3 and $\text{Na}_2\text{B}_4\text{O}_7$ are ABSENT</p>

	Analysis is complete	Analysis is complete	ABSENT. Discard green solution and go to Step 8
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	Test Description	Possible Result	Alternate Result
6.	<p>Testing for Na₂CO₃ versus pseudo-cocaine</p> <p>To the solution from Step 5, add 1 mL of 10% HCl. If no bubbles form, stir with a clean stirring rod.</p>	<p>Vigorous bubbling occurs</p> <p>The presence of Na₂CO₃ is confirmed.</p> <p>Analysis is complete.</p>	<p>No bubbles or only a few tiny bubbles are seen</p> <p>Na₂CO₃ is absent. The presence of pseudo-cocaine is confirmed.</p> <p>Analysis is complete.</p>
7.	<p>Testing to confirm NaHCO₃</p> <p>To the solution from Step 5, add 1 mL of vinegar. If no bubbles form, stir with a clean stirring rod.</p>	<p>Vigorous bubbling occurs</p> <p>The presence of NaHCO₃ is confirmed.</p> <p>Analysis is complete.</p>	<p>No bubbles are seen</p> <p>NaHCO₃ is absent.</p> <p>Treat substance as if it gave a violet colour in Step 5 and go to Step 8.</p>
8.	<p>Testing for pseudo-ecstasy</p> <p>Add 1 mL of NaOH solution to the solution from Step 5 and stir with a clean stirring rod.</p>	<p>Solution becomes cloudy</p> <p>The presence of pseudo-ecstasy is confirmed.</p> <p>Analysis is complete.</p>	<p>Solution becomes transparent green</p> <p>Pseudo-ecstasy is absent. Possible substances are: glucose, pseudo-LSD, pseudo-amphetamine, NaCl,</p> <p>Keep this solution for Step 10. Go to Step 9.</p>
9.	<p>Testing for glucose</p> <p>Put a pea-sized amount of the original solid in a clean test tube and add 10 drops of Fehling's Solution A followed by 10 drops of Fehling's Solution B. Hold the tube in a test tube holder, put a stirring rod in the tube and place the tube in a 250mL beaker 1/2 full of boiling water for 1 minute. Stir the contents of the tube while holding the test tube in the holder. Discard this solution when finished with this step.</p>	<p>A yellow-orange or red-orange solution forms</p> <p>The presence of glucose is confirmed</p> <p>Don't go on to Step 10. Analysis is complete.</p>	<p>The colour is NOT yellow-orange or red-orange</p> <p>Glucose is absent. Possible substances are: NaCl, pseudo-LSD, pseudo-amphetamine</p> <p>Go to Step 10.</p>
10.	<p>Testing for pseudo-LSD</p> <p>To the solution from Step 8 (two steps previous) add 5 drops of 5% Pb(NO₃)₂. DO NOT STIR! CARE! 5% Pb(NO₃)₂ is poisonous.</p>	<p>A bright yellow solid forms at the top</p> <p>The presence of pseudo-LSD is confirmed</p> <p>Analysis is complete.</p>	<p>The solution remains clear or is white at the top</p> <p>Pseudo-LSD is absent. Possible substances are: NaCl, pseudo-amphetamine</p> <p>Go to Step 11.</p>
11.	<p>Testing for pseudo-amphetamine versus NaCl</p>	<p>Solid melts, goes dark yellow-brown and smells like burnt sugar</p>	<p>The flame is coloured bright yellow-orange</p>

Dispose of the solution from Step 10. Put a pea-sized amount of the original solid on a metal spatula and heat the substance in the flame of a burner. (Tilt the spatula to let the flame get at the solid.) If the substance blackens and bubbles, quickly smell the fumes.	smells like burnt sugar The presence of pseudo-amphetamine is confirmed. Analysis is complete.	The presence of NaCl is confirmed. Analysis is complete.
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SAMPLE FORENSIC REPORT

Accused	Heeza Badguy	Gender	M	Case No.	415-31200451-87-01
Charge	Possession of a controlled substance				
New case (N) or Reopened case (R)	N	Exhibit No.	3		
Circumstances of seizure	The suspect was pulled over for speeding and erratic operation of his motor vehicle. Three clear plastic bags containing white powders were on the passenger seat in clear view. When the suspect was asked to get out of car he tried to hide the plastic bags under the passenger seat. The suspect had slurred speech, his eyes could not focus and he was unsteady on his feet.				
Analysis sought	Controlled substances, with possible contamination by one unknown household substance.				
Urgency:	Immediate	1 week	X	Normal	
Case officer	Cpl. John E. Canuck	Detachment	Kamloops (Southwest)		
Date submitted for analysis	22-10-02				
Results of analysis	This space for use of Forensic Laboratory staff only .				
	<p>Sample 75 (a): Step 1: Water added = solution is milky Step 2: Iodine added to solid = colour is white Step 3: 10% HCl added = vigorous bubbling. Confirms CaCO₃ Step 5: Anthocyanin added to liquid from step 1 = colour is yellow Step 6: 10% HCl added = No bubbles Confirms pseudo-cocaine.</p>				
	<p>Sample 75 (b): Step 1: Water added = all solid dissolves Step 5: Anthocyanin added to liquid from Step 1 = violet colour Water, bromothymol blue, buffer added to original solid = green colour Step 8: NaOH added = transparent green Step 9: Added Fehling's Solution A & B = colour is blue Step 10: Added Pb(NO₃)₂ = cloudy white Step 11: Heated original solid = burnt sugar smell Confirms pseudo-amphetamine</p>				
	<p>Sample 75 (c): Step 1: Water added = undissolved solid remains Step 2: Iodine added to solid = colour is white Step 3: 10% HCl added = no bubbles Step 4: 10% BaCl₂ added = clear solution. Confirms sand. Step 5: Anthocyanin added to liquid from step 1 = colour is blue Step 7: Vinegar added = vigorous bubbling. Confirms NaHCO₃</p>				
Analysis performed by (PRINT)	Bobby Student		Date of analysis	October 17, 2002	
Signature	Bobby Student				

FORENSIC REPORT (Trainee Form 3785-B)

Accused	Heeza Badguy	Gender	M	Case No.	415-31200451-87-01
Charge	Possession of a controlled substance				
New case (N) or Reopened case (R)	N	Exhibit No.	3		
Circumstances of seizure	The suspect was pulled over for speeding and erratic operation of his motor vehicle. Three clear plastic bags containing white powders were on the passenger seat in clear view. When the suspect was asked to get out of car he tried to hide the plastic bags under the passenger seat. The suspect had slurred speech, his eyes could not focus and he was unsteady on his feet.				
Analysis sought	Controlled substances, with possible contamination by one unknown household substance.				
Urgency:	Immediate	1 week	X	Normal	
Case officer	Cpl. John E. Canuck	Detachment	Kamloops (Southwest)		
Date submitted for analysis	22-10-02				
Results of analysis	This space for use of Forensic Laboratory staff only .				
Analysis performed by (PRINT)				Date of analysis	
Signature					