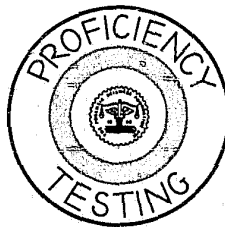


LABORATORY PROFICIENCY TESTING PROGRAM

REPORT NO. 10
PAINT EXAMINATION

47531
1917



THE FORENSIC SCIENCES FOUNDATION, INC.

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LABORATORY PROFICIENCY TESTING PROGRAM

REPORT NO. 10 PAINT EXAMINATION

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Prepared for the Department of Justice, Law Enforcement Assistance Administration, National Institute of Law Enforcement and Criminal Justice, under Grant 74-NI-99-0048.

Points of view or opinions stated in this document are those of the authors and do not necessarily represent the official position or policies of the U.S. Department of Justice.

FOREWORD

The analysis summarized in this report is the tenth of a series that will be made in conjunction with this proficiency testing research project.

In the course of this testing program participating laboratories will have analyzed and identified ten different samples of physical evidence similar in nature to the types of evidence normally submitted to them for analysis.

The results of Test Number Ten are reflected in the charts and graphs which follow.

The citing of any product or method in this report is done solely for reporting purposes and does not constitute an endorsement by the project sponsors.

Comments or suggestions relating to any portion of this report or of the program in general will be appreciated.

March 1976

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BACKGROUND

This laboratory proficiency testing research project, one phase which is summarized in this report, was initiated in the fall of 1974.

This is a research study of how to prepare and distribute specific samples; how to analyze laboratory results; and how to report those results in a meaningful manner. The research will be conducted in two cycles, each of which will include five samples: a controlled substance; firearms evidence; blood; glass; and paint.

Participation in the program is voluntary. Accordingly, invitations have been extended to 235 laboratories to share in the research. It is recognized that all laboratories do not perform analyses of all possible types of physical evidence. Thus, in the data summaries included in this report, space opposite some Code Numbers (representing specific laboratories) may be blank, or marked "No Data Returned".

Additional evaluations of individual tests will be published in a separate report.

The Project is under the direct control of the Project Advisory Committee whose members' names are listed on the Title Page. Each is a nationally known criminalistic laboratory authority.

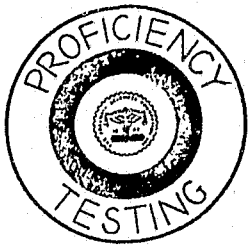
Supporting the Project Advisory Committee in their efforts is the Forensic Sciences Foundation with additional support from the National Bureau of Standards in the areas of sample evaluation and data analysis and interpretation.

SUMMARY

Test Sample #10 consisted of paint samples A, B and C packaged in glassine envelopes. The samples were mailed on October 22, 1976 with instructions to handle the samples in a manner similar to like evidence and submitted for analysis.

In the accompanying data summaries, 110 laboratories responded with completed data sheets, 7 responded they do not do paint analysis, and no response was received from 66 laboratories. This represents a participation rate of 62%.

No effort was made in the report to highlight areas wherein laboratory improvements might be instigated.



LAB CODE A _____

ANNEX A

CHECK HERE (AND RETURN) IF YOU DO NOT PERFORM PAINT EXAMINATION

DATE RECEIVED IN LAB _____

DATE PROCESSED IN LAB _____

DATA SHEET PROFICIENCY TESTING PROGRAM

TEST #10A PAINT EXAMINATION

Item B represents a paint sample removed from the door jamb of a burglarized building. Items A and C represent samples found on the clothing of two different suspects.

1. Could Items A or C have common origin with B?

	<u>ITEM A</u>	<u>ITEM C</u>
YES	<input type="checkbox"/>	<input type="checkbox"/>
NO	<input type="checkbox"/>	<input type="checkbox"/>
INCONCLUSIVE	<input type="checkbox"/>	<input type="checkbox"/>

2. What information (qualitative and quantitative) did you develop to arrive at your conclusions in Question 1? Please check all appropriate boxes and provide values where applicable.

In the left hand column indicate the sequence (1,2,3 etc.) in which the tests were run. Indicate with an asterisk (*) the point where a conclusion was reached, even though subsequent tests were performed for confirmatory purposes.

Sequence of Testing

ITEM A

ITEM B

ITEM C

_____ DENSITY STUDIES			
_____ EMISSION SPECTROSCOPY (Specify Elements Identified)			
_____ FLUORESCENT STUDIES			
_____ INFRARED ANALYSIS			
_____ MACROSCOPIC EXAMINATION			
_____ MICROSCOPIC EXAMINATION			
_____ PYROLYSIS G-C			
_____ SOLUBILITY TESTS (Specify Solvents Used)			
_____ THIN LAYER CHROMATOGRAPHY			
_____ UV SPECTROPHOTOMETRY			
_____ X-RAY DIFFRACTION			
_____ X-RAY FLUORESCENCE (Count Ratio)			
_____ OTHER (SPECIFY)			

- 2 -

3. Please specify the information developed with each of the methods and instruments checked in Question 2. (Example: Solubility tests using HCl, H₂SO₄, Acetone and HNO₃). Please provide specific and complete responses. Attach additional sheets if necessary.

Method:

Method:

Method:

4. Additional Comments:

DATA SHEETS MUST BE RECEIVED AT THE
FOUNDATION OFFICE BY NOVEMBER 26, 1975

ANNEX B

National Bureau of Standards Analysis

LABORATORY TESTING PROGRAM

Test No. 10 - Paint

In this test, each of 183 laboratories were sent three paint samples which were referred to as Items A, B, and C. Participants were asked: (1) Could Items A or C have common origin with B? (2) What information did you develop to arrive at your conclusions in Question 1? (3) What methods and instruments were used?

Of the 183 laboratories, 110 laboratories responded with data, seven indicated they do not perform paint analysis, and 66 did not respond. Table 1 lists the codes for laboratories in each of these last two categories.

The information in Table 2 - Supplier's Characterization of Samples, and Table 3 - Results of the Referee Laboratories, show that the three paint samples all had different origins. Table 4 lists the responses to Question 1. 78.2% of the laboratories reported that Items A and B were not the same, 63.6% reported Items B and C were not the same, and 48.2% reported that neither A nor C was the same as B. These and other responses are listed in Table 4a. Table 5 lists the methods used to answer Question 1 and the frequency of use of the methods. Additional information concerning the performance of the 8 most frequently reported methods is given in Tables 6a and 6b. Table 7 shows the methods used and the results reported by each laboratory.

This annex was prepared by the Law Enforcement Standards Laboratory (LESL) of NBS. The test results anonymously reported by participating forensic laboratories were analyzed and tabulated by James McLeod, Research Associate in the Laboratory Evaluation Technology Section and Alvin Lewis of the Hazards Analysis Section, NBS. This work was supported by the National Institute of Law Enforcement and Criminal Justice, Department of Justice.

Table 1

Code Numbers of Non-responding LaboratoriesTHE FOLLOWING LABS INDICATED THEY DO NOT PERFORM
PAINT ANALYSIS

707	780	924
736	824	
774	852	

Total Labs = 7

THE FOLLOWING LABS DID NOT RESPOND

703	738	792	825	871	912	973
708	744	795	834	872	914	979
709	762	796	837	879	917	984
713	768	809	854*	887	926	988
715	770	811	858	889	927	989
722	772	814	861	895	931	999
723	773	817	864	898	946	
728	779	820	865	902	964	
733	782	821	867	903	969	
737	787	822	869	905	972	

Total Labs = 66

*manufactured samples

Table 2

Supplier's Characterization of Samples

The paints were drawn at six mils wet film on glass to yield approximately 120 square inches for each sample. The three samples consist of the following:

<u>Content</u>	<u>A</u>	<u>Sample B</u>	<u>C</u>
TiO ₂	3.0 lbs.	3.0 lbs.	2.0 lbs.
ZnO			1.0 lbs.
Solids Soya Alkyd		3.6 lbs.	3.6 lbs.
Solids Acrylic Alkyd	3.6 lbs.		

All have traces of Iron, Zinc, Lead and Cobalt.

Samples A, B, and C could not have common origin with each other.

Table 3

RESULTS OF THE REFEREE LABORATORIES

Question 1. Could Items A and C have common origin with B?

	<u>ITEM A</u>	<u>ITEM C</u>
Referee Laboratory 1.	No	No
Referee Laboratory 2.	No	No

Question 2: What information did you develop to arrive at your conclusions in Question 1?

LABORATORY 1

<u>Sequence of Testing</u>	<u>Test</u>	<u>Item A</u>	<u>Item B</u>	<u>Item C</u>
1	Microscope Examination	smooth white two layers	smooth white two layers	smooth white two layers
2	Solubility Tests			
	a) acetone	swells	no reaction	no reaction
	b) methylene chloride	swells	no reaction	no reaction
	c) ethylene dichloride	swells	no reaction	no reaction
	d) conc. H ₂ SO ₄	digests in 3-5 min.	digests in 15 min.	digests in 15 min.
	e) 2.8 M HCl	no reaction	no reaction	no reaction
3*	Pyrolysis G-C	A vastly different from B	B and C closely related but have significant variation in intensity.	
4+	X-ray Diffraction	contains TiO ₂ (rutile) and one other unidentified material	contains TiO ₂ (rutile)	contains TiO ₂ (rutile) and ZnO
5	X-ray Fluorescence K α peaks	$\frac{Ti}{Zn} = 24.6$	$\frac{Ti}{Zn} = 40.3$	$\frac{Ti}{Zn} = .826$
6	Emission Spectroscopy (strong) (weak)	Titanium Zinc	Titanium Zinc	Titanium Zinc
7	Infrared Analysis	Alkyd Type	Alkyd Type	Alkyd Type

* concluded A \neq B+ concluded C \neq B

Table 3, continued

LABORATORY 2

<u>Sequence of testing</u>	<u>Test</u>	<u>Item A</u>	<u>Item B</u>	<u>Item C</u>
1*	Macroscopic Exam	More brittle than B and C.		
2	Microscopic Exam			
3	Solubility tests	A, B, C swell slightly		
	a) Acetone	Moderate	B and C swell slightly	
	b) CHCl ₃	swell		
	c) Diphenylamine in H ₂ SO ₄	A, B, C do not blue		
	d) H ₂ SO ₄	A and B turn from flash yellow to tan.	turns from flash yellow to dark.	
4 ⁺	Infrared Analysis	A, B, C are Alkyd Enamel		Extra peak at 740 cm ⁻¹
		Extra peak at 1490 cm ⁻¹	Peaks at 400 cm ⁻¹ and 500 cm ⁻¹ more intense.	
5	Pyrolysis G-C	A very different	B and C similar but show some differences.	
6	Emission Spectroscopy	Si, Ti	Si, Ti	Si, Ti, Zn
	trace	Al, Pb	Al, Pb	Al, Pb
7	X-ray Fluorescence (SEM)	Ti, Al, Si	Ti, Al, Si	Zn, Cl, Ti,
	trace	Zn, S, Cl	Zn, S, Cl	less Al, less Si.
8	X-ray Diffraction	TiO ₂ (rutile)	TiO ₂ (rutile)	TiO ₂ (rutile) ZnO

* concluded A ≠ B

+ concluded C ≠ B

Table 4

TABULATION OF RESPONSES TO QUESTION 1:

Question 1: Could Items A and C have common origin with B?

LAB CODE	ITEM A	ITEM C	LAB CODE	ITEM A	ITEM C	LAB CODE	ITEM A	ITEM B
705	No	No	806	No	No	915	No	No
710	No	No	813	No	No	921	No	Yes
712	No	No	815	Yes	No	923	No	No
717	No	No	818	No	No	925	Yes	No
718	No	No	823	No	No	938	No	No
719	No	Yes	827	No	Yes	942	INC	No
724	Yes	Yes	829	No	Yes	944	No	No
729	No	Yes	830	No	Yes	948	No	No
730	Yes	NR	831	No	No	958	No	Yes
731	No	No	832	No	No	960	No	Yes
732	No	Yes	833	No	No	961	No	Yes
739	No	No	835	No	No	962	No	No
740	No	NR	838	No	No	970	No	No
742	No	No	839	No	No	974	No	Yes
745	No	Yes	842	No	No	975	No	No
746	No	No	843	No	No	978	No	Yes
747	No	No	847	No	Yes	980	No	Yes
748	No	Yes	848	No	Yes	985	No	No
751	No	No	849	No	No	986	No	No
752	No	No	853	No	No	987	No	No
753	No	Yes	855	No	No	994	No	No
754	No	Yes	856	No	Yes	995	No	Yes
756	No	No	860	No	No	998	No	No
757	No	No	863	Yes	No			
760	Yes	No	866	No	Yes			
763	INC	INC	868	No	No			
765	No	No	870	No	No			
766	Yes	No	873	Yes	INC			
769	INC	No	874	INC	Yes			
777	Yes	No	876	No	Yes			
778	No	No	880	INC	No			
781	INC	INC	884	No	Yes			
783	No	Yes	885	No	Yes			
784	Yes	No	888	No	INC			
786	No	No	892	Yes	No			
789	No	No	894	Yes	No			
790	No	Yes	896	No	No			
794	No	Yes	897	No	No			
797	No	Yes	899	INC	No			
798	Yes	No	901	Yes	Yes			
799	Yes	No	904	No	Yes			
804	Yes	No	907	No	Yes			
805	No	No	908	INC	Yes			
			909	No	No			

Table 4a

Summary of Responses to Question 1

Question 1: Could Items A and C have common origin with B?

	<u>Item A</u>	<u>% of total labs (total=110)</u>	<u>Item C</u>	<u>% of total labs (total=110)</u>
Yes	16	14.5	34	30.9
No	86	78.2	70	63.6
Inconclusive	8	7.3	4	3.6
No Response	0	0	2	1.8

% of total labs
(total=110)

Number of Labs responding
Yes for both Items A and C.

2

1.8

Number of Labs r esponding
Yes for Item A and No
for Item C.

12

10.9

Number of Labs responding
No for Item A and Yes for
Item C.

31

28.2

Number of Labs r esponding
No for both A and C

53

48.2

Table 5

Frequencies of the Reported Methods

<u>Instruments or Methods Used</u>	<u>Number of Laboratories</u>	<u>Percent of total labs (total=110)</u>
Microscopic Examination	104	94.5%
Solubility Tests	100	90.9%
Macroscopic Examination	94	85.5%
Pyrolysis G-C	57	51.8%
Infrared Analysis	56	50.9%
Fluorescent Studies	43	39.1%
Emission Spectroscopy	39	35.5%
X-ray Fluorescence	26	23.6%
Density Studies	8	7.3%
X-ray Diffraction	7	6.4%
UV Spectrophotometry	4	3.6%
G-C Solid Sampler	2	1.8%
ATR	1	.9%
Color-Marquis	1	.9%
Pyrolysis Infrared	1	.9%
Atomic Absorption	1	.9%
Spot Test	1	.9%
Spectral Reflectance	1	.9%

Table 6a

Comparison of Item A and Item B
by the Eight Most Frequently Reported Methods

<u>Method</u>	<u>Total Number of Labs Reporting Comparison of Item A and Item B by This Method.</u>	<u>Number of Labs Reporting They Could Differentiate Item A and Item B by This Method.</u>	<u>Number of Labs Reporting They Could Not Differentiate Item A and Item B by This Method.</u>
Microscopic Exam	92	17 (18.5%)	75
Solubility Tests	92	43 (46.7%)	49
Macroscopic Exam	80	5 (6.3%)	75
Pyrolysis G-C	53	50 (94.3%)	3
Infrared Analysis	48	20 (41.7%)	28
Fluorescent Studies	39	2 (5.1%)	37
Emission Spectroscopy	35	7 (20.0%)	28
X-ray Fluorescence	20	4 (20.0%)	16

Table 6b

Comparison of Item B and Item C
by the Eight Most Frequently Reported Methods

<u>Method</u>	<u>Total Number of Labs Reporting Comparison of Item B and Item C by This Method.</u>	<u>Number of Labs Reporting They Could Differentiate Item B and Item C by This Method.</u>	<u>Number of Labs Reporting They Could Not Differentiate Item B and Item C by This Method.</u>
Microscopic Exam	92	11 (12.0%)	81
Solubility Test	90	28 (31.1%)	62
Macroscopic Exam	80	1 (1.3%)	79
Pyrolysis G-C	51	14 (27.5%)	37
Infrared Analysis	47	3 (6.4%)	44
Fluorescent Studies	39	20 (51.3%)	19
Emission Spectroscopy	37	26 (70.3%)	11
X-ray Fluorescence	21	18 (85.7%)	3

Table 7

Responses to Questions 2 and 3 From Each Laboratory

Question 2: What information (qualitative and quantitative) did you develop to arrive at your conclusions in Question 1?

Question 3: Please specify the information developed with each of the methods and instruments checked in Question 2.

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
705	1	Macroscopic Exam	close	close	close
	2	Microscopic Exam	close	close	close
	3*	X-ray Fluorescence	Peaks identical for A & B	Major component Titanium with trace of Zn.	Different for C Major component Zn with a high concentration of Titanium (approx. ratio 2:1)
	4	Pyrolysis G-C	Different for A turned light tan	Peaks identical turned yellow	for B & C turned Yellow
	5	Solubility Tests a) H ₂ SO ₄ b) NaOH	Different rates of reaction Different color reactions		
710	1	Macroscopic Exam	A, B, C white, gloss		
	2	Microscopic Exam	A, B, C single layer		
	3	Fluorescent Studies	No fluorescence, paints look similar		
	4*	Pyrolysis G-C	Not similar to B		Not similar to B
	5	Infrared Analysis	Not similar to B		Not similar to B
	6	ATR	Not similar to B		Not similar to B
712	1	Macroscopic Exam	A, B, C colors and textures all appear similar		
	2*	Microscopic Exam	A, B, C colors and textures all similar - glossy white, one layer structure, similar thickness A much more brittle than B and C		
	3	Solubility Tests a) Acetone b) H ₂ SO ₄	A, B, C insoluble Color change, both sides to tan, did not curl. Entire chip dissolves in about 4 minutes	Color changes, curling, and solubility all slightly different from C. Breaks up and parts dissolve faster than C.	Color changes, solubility, curling and insoluble parts all slightly different from B. Takes longer to break up and dissolve than B.
	4	Pyrolysis G-C	Pyrogram very different from B.	Pyrograms of B & C differed in the relative concentration of many of their similar components.	
717	1	Macroscopic Exam	A, B, C white enamel		
	2	Microscopic Exam	A, B, C one layer		
	3*	Solubility Tests a) H ₂ SO ₄ b) HCl	A, B, C soluble A dissolves almost immediately	B & C have softened and begin bleeding out into solvent after 10 minutes.	C turns beige color after approx 2 minutes Zn present
	4	Emission Spectroscopy	No Zn	No Zn	
	5	Pyrolysis G-C	Obviously different		
718	1	Macroscopic Exam	A, B, C white enamel-like paint		
	2	Microscopic Exam	Multilayered	Two-layered	Two layered
	3	Solubility Tests a) Acetone b) Chloroform c) Sulfuric Acid	Same as B Same as B Same as B		Same as B Same as B Same as B
	4*	Fluorescent Studies	None	None	Orange Fluorescence
	5	Infrared Analysis	A, B, C Inconclusive		
	6*	Pyrolysis G-C	Dissimilar to B		Dissimilar to B
719	1	Macroscopic Exam			
	2*	Microscopic Exam			
	3	Infrared Analysis			
	4	Solubility Tests			
	5	UV Spectrophotometry			
724	1	Macroscopic Exam	Color	Color	Color
	2	Microscopic Exam	Layer structure Texture	same	same
	3	Solubility Tests a) H ₂ SO ₄ b) NaOH c) Acetone d) Toluene e) Methanol f) Carbon Tetrachloride			

* indicates the point where a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
729	1	Macroscopic Exam			
	2	Microscopic Exam			
	3	Fluorescent Studies			
	4	Infrared Analysis	Slight differences noted between A and B		
	5	Solubility Tests a) conc. H ₂ SO ₄ b) NaOH c) HCl d) Diphenylamine e) Methyl Ethyl Keytone f) Acetone g) Chloroform	different color development		
730	1	Macroscopic Exam	White pigment	White	White
	2	Solubility Tests a) H ₂ SO ₄ b) HNO ₃ c) HCl d) Acetone e) Ethyl Acetate f) CHCl ₃	soluble soluble insoluble soluble curl curl	soluble soluble insoluble soluble curl curl	soluble soluble soluble ? insoluble insoluble
	3	Fluorescent Studies	none	none	yellow after acid
	4	Pyrolysis G-C			
	5	Emission Spectroscopy			Na, Cu
731	1	UV Light	purple	purple	purple
	2	Macroscopic Exam			
	3	Microscopic Exam			
	4	Solubility Tests a) NaOH b) H ₂ SO ₄ c) HNO ₃ d) HCl e) Benzene f) Toluene g) Petroleum Ether h) Chloroform j) Acetone k) Ethanol l) Nitrobenzene m) Nitromethane	A, B, C insoluble in solvents		
	5	Density Studies	A > 1.9 g/ml	1.9 g/ml > B > 1.8g/ml	C < 1.8g/ml
	6*	Emission Spectroscopy	Si, Pb, Mg, Ti, Fe	Si, Pb, Mg, Ti, Fe, Sb, Ba	Si, Pb, Mg, Ti, Fe, Zn
732	1	Stereoscope	Slight differences were noted in the textures and reflection of the paints		
	2	Solubility Tests a) H ₂ SO ₄ b) HCl c) Acetone d) Chloroform	All soluble, however, B & C seemed to be more fibrous upon solution A, B, C insoluble A, B, C insoluble A, B, C insoluble		
	3*	Emission Spectroscopy	Si, Ti, Ba, Al, Mg found in A, B, C A different	B & C showed many similarities	
739	1	Microscopic Exam	Single layer white paint	possibly double layer white paint	single layer white paint
	2	Solubility Tests a) Methanol b) Toluene c) Acetone d) Ethyl Acetate e) Arnyl Acetate f) Chloroform g) Methylene Chloride h) Carbon Disulfide j) Dimethylsulfoxide k) conc. Nitric Acid	A, B, C not differentiable A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B, C insoluble A, B insoluble		
	3	Emission Spectroscopy	A, B, C contain Si, Ti A & B not differentiable		C differentiable
	4*	Pyrolysis G-C	A differentiable	B & C not clearly differentiable	
					Possibly some beige discoloration
740	1	Macroscopic Exam			
	2	X-ray Fluorescence	A contains much more Zn	B & C have same elemental profile	
	3*	Infrared Analysis	No differences detectable using this technique		
	4	Pyrolysis 112	Spectra of A, B, C essentially distinguishable		
	5	Microscopic	Revealed no detectable differences		
742	1	Macroscopic Exam	white/gloss	white/gloss	white/gloss
	2	Microscopic Exam	single layer	single layer	single layer
	3	Solubility Tests a) Acetone b) Enamel Red	no differences could be detected no distinguishable differences could be detected no differences were detected by these tests no reaction no reaction no reaction		
	4*	X-ray Fluorescence	Ti:Zn=12.17:1 A & B similar	Ti:Zn=13.55:1	Ti:Zn=.376:1 C different
	5*	Pyrolysis G-C	A dissimilar	B & C similar	

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C	
745	1	Microscope Exam	A, B, C indistinguishable			
	2	Solubility Tests	A, B, C indistinguishable			
		a) conc. H ₂ SO ₄				
		b) Acetone				
		c) Dichloromethane				
	d) conc. HCl					
	e) Xylene					
	f) Ethyl Acetate					
	g) 10% Ammonium Hydroxide					
	3	Infrared Analysis	A slightly different, but results not conclusive			
	4*	Pyrolysis G-C	A different B and C same			
	5	Infrared Analysis	IR spectra of the pyrolysate from method 4 indicate the possible presence of Phthalic Anhydride. A, B, C indistinguishable			
746	1	Fluorescent Studies (Visual observation by long UV)	Dull violet absorbence	Dull violet absorbence	Dull brown-orange fluorescence and numerous bright blue fluorescent spots (eliminates C)	
	2*	Solubility Tests	"Dissolves" with fine particle mist	Particle mist does not appear		
		a) Diphenylamine in conc. H ₂ SO ₄				
747	1	Macroscopic Exam (10-40X)	same as B			
	2	Fluorescent Studies (long wave)	Slightly different from B			
		(short wave)	Different from B			
	3*	Pyrolysis G-C	A different B & C similar			
	4*	X-ray Fluorescence (Energy dispersive)	A, B, C have the same elemental composition with the exception of the significant amount of Zn which was present in C but not in A or B.			
		5	Solubility Tests	same as B		
			a) HNO ₃	A, B, C same		
		b) CHCl ₃	A, B, C same			
		c) CH ₂ Cl ₂	A, B, C same			
		d) Acetone	A, B, C same			
		e) H ₂ SO ₄	A & B same			
		f) NaOH	A, B, C Same			
		g) HCl	A, B, C same			
748	1	Macroscopic Exam				
	2	Microscopic Exam				
	3	Fluorescent Studies				
	4	Solubility Tests				
		a) Acetone				
	b) H ₂ SO ₄					
	c) Methylene Chloride					
	d) HCl					
	5	Infrared Analysis				
	6*	Pyrolysis G-C				
751	1	Macroscopic Analysis	No observable differences in color, hue, texture and/or layers. Differences in thickness measured:			
	2	Microscopic Analysis	60μ	40μ	60μ	
	3*	Solubility Tests				
		a) ALC.KOH in DMF	Turns bright white and stays intact (2 minutes)	B and C bleeds off yellow/brown and dissolves (15 seconds)		
		b) conc. HNO ₃	A & B slight color change - no "warty" appearance (2minutes)		Slight color change, surfaces become "warty" (15 seconds)	
	c) H ₂ SO ₄	Dissolves in 2-3 minutes and changes white to cream	Intact in 3 minutes and changes white to tan.	Intact in 3 minutes and changes white to dark tan. Shows yellow fluorescence		
	4	Fluorescent Studies	A, B show purple absorbance			
752	1	Macroscopic Exam	A, B, C white gloss			
	2	Microscopic Exam	A, B, C single layer			
	3	Solubility Tests	Does not compare with B	B and C Compare		
		a) Acetone	No effect	No effect	No effect	
		b) H ₂ SO ₄	Dissolves	Darkens	Darkens	
		c) Chloroform	No effect	No effect	No effect	
		d) HCl	No effect	No effect	No effect	
		e) Ethyl Acetate	No effect	No effect	No effect	
		f) HNO ₃	No effect	No effect	No effect	
		g) Benzene	No effect	No effect	No effect	
	h) Methylene Chloride	No effect	No effect	No effect		
	4	Pyrolysis G-C	Pyrogram does not compare with B	Pyrogram of B & C compare		

* Indicates the point where a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
752 (con'd)	5*	X-ray Diffraction	A & B compare, crystalline pigment, TiO ₂ (rutile form)		Does not compare with B. TiO ₂ (rutile) and ZnO
	6	Major elements Emission Spectroscopy	Ti	Ti	Ti, Zn Does not compare with B
753	1	Macroscopic Exam	No differences observed between A, B, and C		
	2	Fluorescent Studies	None		
	3	Microscopic Exam	No differences observed between A, B, and C		
	4	Solubility Tests	No differences observed between A, B, and C		
	5*	a) Chloroform b) Acetone Infrared Analysis	Insoluble Insoluble	Insoluble Insoluble	Insoluble Insoluble A different spectra No differences noted between B & C
754	1	Macroscopic Exam	A, B, C all similar		
	2	Microscopic Exam	A, B, C all similar		
	3*	Solubility Tests	A different	B and C similar	
	4	a) HCl b) Acetone c) HNO ₃ d) H ₂ SO ₄ e) H ₃ PO ₄ f) Diphenylbenzidine in H ₂ SO ₄ g) AgNO ₃ in HNO ₃ h) Marquis j) Mecke k) Froehde			
	5	Pyrolysis G-C Emission Spectroscopy	Different A, B, C all similar	B and C similar	
756	1	Macroscopic Exam			
	2	Microscopic Exam			
	3	Solubility Tests			
		a) Acetone b) H ₂ SO ₄	A, B, C same A and B same	Gave different brown color than A & B	
		c) CHCl ₂ d) HNO ₃ e) Methylene Chloride	A, B, C same A, B, C same A, B, C same		
	4*	Pyrolysis G-C	A different	B and C similar	
	5	X-ray Diffraction (only performed on B & C)	B and C different		
	6*	Emissions Spectroscopy	Si,Al,Ti,Pb,Zn	Si,Al,Ti,Pb,Zn	Si,Al,Ti,Pb,Zn (high)
757	1	Macroscopic Exam	Consistent		
	2	Microscopic Exam	Consistent		
	3	X-ray Fluorescence	$\frac{Zn}{Ti} = .12$	$\frac{Zn}{Ti} = .12$	$\frac{Zn}{Ti} = 5.56$
	4	Pyrolysis G-C	Not consistent		
	5*	Infrared Analysis	Not consistent		
	6	Solubility Tests	Consistent		
		a) H ₂ SO ₄ b) HCl c) Acetone d) Methylene Chloride			
760	1	Macroscopic Exam	Showed no significant differences		White single layer high gloss
			White single layer splinters	White single layer high gloss skin	White single layer high gloss skin
	2	Microscopic Exam	Showed no significant differences		White single layer
			White single layer	White single layer	White single layer
	3	Fluorescent Studies	Dark blue		Faint yellow
	4	Solubility Tests	Showed no significant differences		No moves 15+
		a) Ethyl Acetate b) Benzene c) Methanol d) Acetone	No moves		
	5	Infrared Analysis	Showed no significant differences		
	6	Emission Spectroscopy Principle components	No Zn in A or B Ti, Si, Al, Ca, Fe, Pb, Mg	Ti, Al, Ca, Fe, Pb, Mg, Si	Zn present Ti, Al, Ca, Fe, Pb, Mg, Si, Zn
763	1	Macroscopic Exam			
	2	Microscopic Exam			
	3	Solubility Tests			
	4*	a) Chloroform b) Acetone c) HCl d) H ₂ SO ₄ Microscopic Exam			

*Indicates the point where a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
765	1	Microscopic Exam			
	2*	Solubility Tests			
		a) H ₂ SO ₄	Dissolves 2-5 min	Darkens to light yellow	Darkens to yellow-brown, dissolves 15-20 min
		b) HCl	No reaction	No reaction	Darkens to yellow 15 min
		c) HNO ₃	A, B, C no reaction		
		d) Acetone	A, B, C no reaction		
	3	Infrared Analysis	A, B, C essentially same by this method		
766	1	Microscopic Exam			
	2	Solubility Tests			
	3*	X-ray Fluorescence			
	4	Infrared Analysis			
769	1	Macroscopic Exam	A, B, C similar		
	2	Microscopic Exam	A, B, C similar		
	3	Solubility Tests	A different	B and C same	
		a) H ₂ SO ₄	Very soluble	Soluble	Soluble
		b) HCl	A, B, C not soluble		
		c) Acetone	A, B, C not soluble		
		d) CHCl ₃	A, B, C not soluble		
		e) NaOH	A, B, C not soluble		
		f) Ethyl Acetate	A, B, C not soluble		
	4	Emission Spectroscopy	A, B same		Different
777	1	Microscopic Exam	No distinguishable differences between A, B, C		
	2	Solubility Tests	A, B, C insoluble in all four solvents		
		a) Acetone			
		b) Benzene			
		c) Chloroform			
	d) Ethyl Acetate				
	3	Emission Spectroscopy	No elemental differences detected between A and B		High concentration
		Elements Identified	Si, Mg, Pb, Al, Ca, Ti	Si, Mg, Pb, Al, Ca, Ti	Si, Mg, Pb, Al, Ca, Ti, Zn
778	1	Macroscopic Exam	No significant differences		
	2	Microscopic Exam	No significant differences		
	3*	Solubility Tests			
		a) Ethyl Acetate	A, B, C negative		
		b) Acetone	A, B, C negative		
		c) H ₂ SO ₄	Browns and dissolves readily	Slower reaction	Slower reaction
		d) CHCl ₃	A, B, C negative		
		e) MEK	A, B, C negative		
		f) HNO ₃	A, B, C negative		
	4*	X-ray Fluorescence	A, B appeared consistent		More Zn, less Ti
781		Nothing reported			
783	1	Macroscopic Exam	White small flakes	White large flakes	White large flakes
	2	Microscopic Exam	Thin layer	Thick layer	Thick layer
	3	Pyrolysis G-C			
784	1	Macroscopic Exam	A, B, C identical		
	2	Microscopic Exam	A, B, C identical, color, thickness, layer structure		
	3	X-ray Fluorescence	A, B identical		
	4	Solubility Tests	A, B, C identical		
		a) Acetone			
		b) Chloroform			
		c) Methyl Ethyl Keytone			
		d) Diphenylamine			
	5	Infrared Analysis	A, B, C identical		
	6	Pyrolysis G-C	A, B, C identical		
786	1	Macroscopic Exam	A, B, C similar		
	2	Microscopic Exam	Dull white	Dull white	Shiny white
	3	Fluorescent Studies	Dark purple	Dark purple	Faint purple
	4*	Emission Spectroscopy	A, B, C different		
	5	Solubility Tests			
	a) conc H ₂ SO ₄	Fast	Slower	Slowest	

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
789	1	Macroscopic Exam	A, B, C are white, gloss paints		
	2	Microscopic Exam	A, B, C have smooth, glossy finishes, no discernable differences observed		
	3*	Solubility Tests	A, B, C no changes		
		a) Acetone b) Alcoholic KOH c) conc. H ₂ SO ₄ d) conc. HNO ₃	No changes	B and C soluble Color changes to tan	Color changes to tan Darker than B Color becomes duller (off-white). Surface develops bumps
790	1	Microscopic Exam	No significant differences noted in thickness, texture, color and layer structure.		
	2	Infrared Analysis	Minor differences noted between A & B		
	3*	Pyrolysis G-C	Significant differences noted between A and B	Not possible to distinguish between B & C	
794	1	Microscopic Exam	A, B, C similar with respect to color, thickness, and number of layers.		
	2	Solubility Tests	A, B, C exhibited similar solubilities, could not distinguished.		
		a) Diphenylamine b) Dimethylformamide c) Conc. HNO ₃ d) Acetone e) Chloroform f) conc. NaOH			
	3*	Pyrolysis G-C	Dissimilar pyrogram	B & C similar pyrogram	
797	1	Macroscopic Exam			
	2	Microscopic Exam	A, B, C white monolayer		
	3	Infrared Analysis (Direct)	A, B, C spectra identical		
	4	Emission Spectroscopy	A, B, C contain Titanium. White organic pigment of TiO ₂ .		
	5*	Solubility Tests			
		a) cold H ₂ SO ₄ , 12N b) warm H ₂ SO ₄ , 12N c) 70°C H ₂ SO ₄ , 12N	A, B, C no reaction A, B, C turn brown, become more filmy and flexible B and C disintegrate; upon centrifugation, white residue is separated from brown aqueous portion. Wash 2 times with water. Run IR on residue. UV on H ₂ SO ₄ fluoresces, A does not do so.		
The following solvents on white residue of B & C after H ₂ SO ₄ extraction.					
6*	d) C ₂ H ₂ Cl ₂	B & C do not dissolve			
	e) C ₆ H ₆	B & C do not dissolve			
	f) Ethyl Acetate	B & C do not dissolve			
	g) C ₆ H ₄	B & C do not dissolve			
	h) CHCl ₃	B & C do not dissolve			
7	Infrared Analysis (on residue after H ₂ SO ₄ extraction)	B & C identical			
7	UV Spectrophotometry (on residue after H ₂ SO ₄ extraction)	General feature identical for A, B, C			
		Lower absorption; otherwise identical as B	Comparable absorption; identical as B		
798	1	Fluorescent Studies (under both short and long wave UV light)	A, B, C same		
	2	Macroscopic Exam	A, B, C same		
	3	Microscopic Exam	A, B, C same		
	4*	Solubility Tests			
		a) C ₃ H ₆ O b) CCl ₄	A, B, C same A, B same	Different characteristics	
		c) CHCl ₃ d) HCl e) H ₂ SO ₄	A, B, C same A, B, C same A, B same	Different characteristics	
		f) HNO ₃ g) Acetic Acid	A, B, C same A, B same	Different characteristics	
		h) Diphenylamine in H ₂ SO ₄	A, B same	Different characteristics	
	799	1	Macroscopic Exam	A, B, C indistinguishable white color Fragmented B and C smooth, non-fragmented	
2		Fluorescent Studies	A, B, C indistinguishable, no fluorescence		
3		Microscopic Exam	A, B, C indistinguishable, no fluorescence		
4		Infrared Analysis	A, B, C indistinguishable; each mono-layer, approx. same thickness		

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
	5	Solubility Tests a) conc. H ₂ SO ₄ b) Chloroform c) Acetone d) Ethyl Acetate e) HCl f) HNO ₃ g) Acrylic Thinner h) Paint Thinner j) Methyl Ethyl Keytone k) Toluene l) Heptane m) NH ₄ OH n) Carbon Tetrachloride o) Diethyl Ether p) Dichloroethane q) Xylene r) Methanol	A, B, C indistinguishable A, B, C turn yellow A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction A, B, C no reaction		
	6*	X-ray Fluorescence	A, B, C all contain Ti, Zn, Co, Pb, Fe A and B contain greater amount of Ti than Zn		Contains greater amount of Zn than Ti
804	1 2 3	Microscopic Exam UV Light Infrared Analysis	A, B, C one layer white paint A, B total absorption No marked difference from B		Marked difference Possible additional inflex. at approx. 1015 cm ⁻¹ Several marked differences
	4*	Emission Spectroscopy	A appeared to compare with B Si, Al, Mg, Ca, Ti with traces Co, Pb	Si, Al, Mg, Ca, Ti with traces Co, Pb	Si, Al, Mg, Ca, Ti, Na with traces Co, Pb
805	1 2* 3*	Macroscopic Exam Pyrolysis G-C Emission Spectroscopy	A, B, C identical Pyrogram not equal to B & C Not run	B and C pyrogram similar	Significant Zn absent Significant Zn present
806	1 2 3 4* 5	Macroscopic Exam Solubility Tests a) Acetone b) CHCl ₃ c) H ₂ SO ₄ Microscopic Exam Pyrolysis G-C X-ray Diffraction	A, B, C single layer white A, B, C insoluble A, B, C insoluble Slight differences in darkening Inconclusive Major difference in one peak Compares to B		Differed slightly in the peak height ratio of one peak Extra lines; does not compare
813	1 2 3* 4*	Fluorescent Studies (long and short wave UV) X-ray Fluorescence Infrared Analysis Pyrolysis G-C	A, B no fluorescence $\frac{TiKa}{ZnKa} = 23.7 \pm .2$ Has peaks where B and C don't Pyrogram different	A, B no fluorescence $\frac{TiKa}{ZnKa} = 23.8 \pm .2$ B & C similar with slight variations B & C similar with slight variations	Shown fluorescence $\frac{TiKa}{ZnKa} = .60$
815	1* 2 3 4 5	Macroscopic Exam Microscopic Exam X-ray Diffraction Emission Spectroscopy Infrared Analysis	No visible difference in colors No visible difference in colors using Wratten filters and IR scope A, B showed strong violet fluorescence with 3660A A, B, C single thick layer of white paint. Rubber-like consistency "indicate" a latex paint A, B scalloped edges A, B diffraction patterns same; TiO ₂ - rutile pigment A, B same elements present and relative concentration; Sb, Mg, Fe, Ti, Ca, Zn, Si; Al not present A, B spectra same	No UV fluorescence C has no scalloped edges Diffraction pattern different Different elements present and different concentration; More Mg, Ti, Ca, Zn, Si; No Sb, Fe. Al present Not run	

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C	
818	1	Macroscopic Exam	A, B same		Appears more green than A & B	
	2	Microscopic Exam	Brittle	Pliable	Pliable; slightly different	
	3*	Fluorescent Studies (UV light)	A, B no fluorescence		Fluoresces very weak yellow	
	4*	Solubility Tests	A, B, C showed no differences			
		a) Methanol	A, B, C showed no differences			
		b) Acetone	A, B, C showed no differences			
c) CHCl ₃		A, B, C showed no differences				
d) Ethyl Acetate		A, B, C showed no differences				
5*	X-ray Fluorescence	e) Conc. HCl	A, B, C showed no differences			
		f) 1% Diphenylamine in H ₂ SO ₄	Color same as B; solubility different than B & C	Color same as A; solubility same as C	Color different than A & B; solubility same as B	
	g) CHCl ₃ followed by .5N alcoholic KOH	Soluble		B and C difficultly soluble		
6	G-C of Vehicle	A, B ratio of Fe, Zn, Pb to Titanium same		Ratio of Fe, Zn, Pb, to Titanium different		
823	1	Microscopic Exam	A, B, C single layered white paint. and texture		All similar in color	
	2*	Solubility Tests	A different			
		a) Methyl Ethyl Keytone	A, B, C no reaction			
	3	Infrared Analysis	b) Diphenylamine in H ₂ SO ₄	A yellows and dissolves slowly	B and C yellow	
				A, B, C spectra very similar. between A and B	Small differences noted	
4*	X-ray Fluorescence (energy dispersive)	A and B similar		C dissimilar containing predominately Titanium and Zinc with traces of Aluminum and Sulfur.		
5	Pyrolysis G-C	Pyrogram of A different	Pyrogram of B and C similar			
827	1	Macroscopic Exam	Breaks in long thin pieces	B and C break in irregular chips		
	2	Microscopic Exam	A, B, C identical			
	3	Solubility Tests	A, B, C insoluble			
		a) Acetone	A, B, C insoluble			
		b) CHCl ₃	A, B, C insoluble			
		c) HCl	A, B, C insoluble			
d) HNO ₃		A, B, C insoluble				
4	Fluorescent Studies	e) H ₂ SO ₄	A, B soluble	C insoluble		
5	Pyrolysis G-C	A, B, C no UV				
6*	Emission Spectroscopy	A dissimilar	B and C similar	B and C contain Cu		
829	1	Macroscopic Exam	A, B, C appear similar in color and texture			
	2	Microscopic Exam	Thicker layers	B and C similar in layer thickness		
	3	Solubility Tests	Immediately charred and rapidly dissolved			
		a) H ₂ SO ₄	B and C brown slowly and dissolve slowly			
b) Acetone						
	c) Butanol Benzene					
	d) Chloroform					
	e) Dimethylsulfoxide					
	f) Ethyl Acetate					
	g) Ethyl Alcohol					
	h) Hexane					
	j) HCl					
	k) Methyl Ethyl Keytone					
	l) NaOH					
4	Emission Spectroscopy	A, B, C contains Antimony, Ca, Cu, Fe, Mg, Mn, Si, Zn				
830	1	Macroscopic Exam	A, B, C white paint			
	2	Microscopic Exam	A, B, C one layer		Thinner than A and B	
	3*	Infrared Analysis	Peak ratios of A not equal to B		Peak ratios of B and C equal	
831	1	Microscopic Exam				
	2*	Solubility Tests	Dissolves		B and C do not dissolve	
		a) conc. H ₂ SO ₄				
b) conc. HNO ₃						
	c) KOH in alcohol	Dissolves		Dissolves more slowly		
3	Infrared Analysis					

Table 7, continued

22

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
832	1	Macroscopic Exam	A, B, C white paint; all samples appear generally the same		
	2	Microscopic Exam	A, B, C single layer white paint, all samples appear generally the same		
	3	X-ray Fluorescence	A, B Ti to Zn ratios match		Contains more Zn
	4*	Pyrolysis G-C	A different	B and C match	
	5	Solubility Tests a) Ethyl Acetate	Remained one layer	B and C separate into two layers	
833	1	Macroscopic Exam.	A, B, and C not differentiable		
	2*	Microchemical reactivity	La Rosen not brick red	La Rosen Test yellow	La Rosen test yellow
	3*	Solubility Test	Differences noted in reaction to acids and base		
	4	Microscopic Exam.	A, B, and C not differentiable		
	5*	Fluorescent Studies	LW - reddish coloration SW - A, B, and C not differentiable	LW - A=B	LW - Yellow coloration
	6	Infrared Analysis**	Major Peaks: 1725, 1260, 700, 735 CM	Major peaks: 1725, 1250 730 CM ⁻¹	Major peaks: 1725, 1260 740, 700 CM ⁻¹

**Slight differences were noted in the spectra from A, B, and C; however, differences not sufficient to serve as a basis for discrimination.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
835	1	Macroscopic Exam.	A, B and C not differentiable		
	2*	Fluorescent Studies	A and B same, C different		
	3	Microscopic Exam.	A, B and C not differentiable		
	4	Solubility Test	A and B same, C different		
	5	Infrared Analysis	A, B and C not differentiable		
	6*	Pyrolysis G-C	A, B and C different		
838	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3*	Solubility Tests	In H ₂ SO ₄ A dissolved before B or C		
	4	Fluorescent Studies	A, B ² and C not differentiable		
	5*	Pyrolysis G-C	A, B and C different		
839	1	Microscopic Exam.	A, B and C smooth, white two layers		
	2	Solubility Tests	In Acetone A swells, B and C had no reaction In Methylene chloride and Ethylene Chloride A swells, B and C had no reaction In H ₂ SO ₄ A digested B and C in 15 min. In HCL, no reaction in A, B or C		

	3	Pyrolysis G-C	A ≠ B	B ≠ A	C close to B but not same
	4*	X-Ray Diffraction	Ti ₂ O ₃	Ti ₂ O ₃	Ti ₂ O ₃ + ZnO
	5	X-Ray Fluorescence	Ti/Zn = 24.6	Ti/Zn = 40.3	Ti/Zn = .826
	6	Emission Spectroscopy	Titanium (strong) & Zinc (weak)	Titanium (strong) & Zinc (weak)	Titanium (strong) & Zinc (strong)
	7	Infrared Analysis	Alkyd type	Alkyd type	Alkyd type
842	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.		A, B and C not differentiable	
	3	Fluorescent Studies		A, B and C not differentiable	
	4*	Emission Spectroscopy		Zinc was present in C but not A and B	
	5	GC. Solid Sampler		A, B and C not differentiable	
	6	Solubility Tests		A, B and C not differentiable	
843	1	Macroscopic Exam.		A, B and C are white	
	2*	Microscopic Exam.	2 layers white	1 layer white	2 layers white
	3	Fluorescent Studies	A and B no fluorescence		Slight fluorescence
	4	Solubility Tests	Conc. HCL no change	Conc. HCL no change	Conc. HCL rust surface color
	5	X-Ray Fluorescence	Count ratios compare to B	Count ratios compare to A	count ratios different from A and B
847	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.		A, B and C not differentiable	
	3*	Solubility Tests		H ₂ SO ₄ A more soluble than B and C	
	4	Infrared Analysis		Slight difference between A and (B and C)	
	5	Pyrolysis G-C	Sig. difference from B and C	Same as C	Same as B

*Indicates the point at which a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
848	1	Microscopic Exam.	Slightly different from B	Same as C	Same as B
	2	Solubility Tests		A, B and C not differentiable	
	3	Pyrolysis G-C	Completely different from B	Same as C	Same as B
849	1	Macroscopic Exam.	Flake	Chip	Chip
	2	Microscopic Exam.	1 layer	1 layer	1 layer
	3	Fluorescent Studies	Mg, Ti, Si	Mg, Ti, Si	Mg, Ti, Si, Zn
	4*	Solubility Tests	Insoluble in ALCKOH	Insoluble in H ₂ SO ₄ , ALCKOH	Insoluble in HCL, H ₂ SO ₄ , ALCKOH
	5*	Emission Spectroscopy	Mg, Ti, Si	Mg, Ti, Si	Mg, Ti, Si, Zn
853	1	Macroscopic Exam.		A, B and C are all white	
	2	Microscopic Exam.	Different from B	Off White	Same as B
	3*	Solubility Tests	Different from B	Different from A	Same as B
	4*	Emission Spectroscopy	Same as B	Same as A	Different from B
855	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.		A, B and C not differentiable	
	3	Fluorescent Studies		A, B and C not differentiable	
	4	Solubility Tests		A, B and C not differentiable	
	5*	Infrared Analysis	Slightly different from B and C		
	6*	Emission Spectroscopy		A and B different from C	
	7	Pyrolysis G-C		Large differences in A, B and C	
856	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Fluorescent Studies		A, B and C not differentiable	
	3	Microscopic Exam.		A, B and C not differentiable	
	4*	Pyrolysis G-C	Different from B	Different from A	Same as B
	5	Solubility Tests	Different from B and C	Insoluble in Methylene Chloride, Acetone, HCL and HNO ₃ . Slightly soluble in H ₂ SO ₄ .	Same as B
	6*	Infrared Analysis	Different from B and C	B and C have identical IR curves	

860	1	Macroscopic Exam.		A, B and C not differentiable			
	2	Microscopic Exam.		A, B and C not differentiable			24
	3*	Fluorescent Studies	Same as B	Same as A		Different from A and B	
	4	Solubility Tests a) CHCl ₃ b) Acetone c) H ₂ SO ₄		A, B, C insoluble A, B, C insoluble A, B same		C had different reaction both in resultant color and appearance.	
	5	Infrared Analysis		A, B, C similar			
	6*	Pyrolysis G-C	Different from B and C	Different from A and C		Different from A and B	
863	1	Solubility Tests: HCl H ₂ SO ₄ Acetone Ethyl Acetate Benzene		Color change for C A, B and C inconclusive A, B and C inconclusive A, B and C inconclusive A, B and C inconclusive			
	2	Infrared Analysis		A, B and C inconclusive			
	3*	Emission Spectroscopy	Same as B	Same as A		Different from A and B	
866	1	Macroscopic Exam.					
	2	Solubility Tests					
	3	a) Alcoholic KOH Emission Spectroscopy	Insoluble Conc. of Zinc higher than B and C	Soluble Conc. of Zinc same as C		Soluble Conc. of Zinc same as B	
868	1	Macroscopic Exam.		A, B and C gloss white			
	2	Microscopic Exam.		A, B and C gloss white			
	3	Solubility Tests a) Methyl ethyl ketone b) Diphenylamine in H ₂ SO ₄ c) NaOH	no reaction no reaction no reaction	no reaction no reaction no reaction		no reaction no reaction no reaction	
	4	Infrared Analysis	Alkyd resin	Alkyd resin		Alkyd resin	
	5*	Pyrolysis G-C	Different from B	Similar to C		Similar to B	
	6*	Emission Spectroscopy	Si, Mg, Ti	Si, Mg, Ti,		Si, Mg, Ti, Zn	

*Indicates the point at which a conclusion was reached

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
869	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.			
	3*	Solubility Tests a) Acetone b) Chloroform c) Conc. H ₂ SO ₄	Bilayer point	Single layer point	Single layer point
	4	Pyrolysis G-C	Dissolved much more readily than B and C	Behaved differently than A	Behaved differently than A
873	1	Macroscopic Exam.		A, B and C shiny white	
	2	Microscopic Exam.		A, B and C shiny white	
	3	Solubility Tests a) CHCl ₃ b) CH ₂ Cl ₂ c) 10% NaOH		All insoluble All insoluble All insoluble	
	4	Infrared Analysis		All are similar	
	5*	Pyrolysis Infrared	A and B gave sharp peak at 9.9μ		C did not
874	1	Macroscopic Exam.		A, B and C similar	
	2	Microscopic Exam.		A, B and C similar	
	3	Solubility Tests Acetone, ethyl Acetate H ₂ SO ₄ , Methyl ethyl ketone, HCl, HNO ₃ , Chloroform		A, B and C similar	
	4	Infrared Analysis	Set differences noted	Similar	Similar
	5*	Pyrolysis G-C	Set differences	Similar	Similar

876	1	Macroscopic Exam.			
	2	Microscopic Exam.			
	3	Fluorescent Studies			
	4	Solubility Tests: H ₂ SO ₄ , HCl, Acetone, Ethyl Acetate		All samples non-soluble	
	5	Density Studies			
	6*	Pyrolysis G-C	Different from B	Different from A	Same as B
880	1	Macroscopic Exam.	White	White	White
	2	Microscopic Exam.	Uniform	Uniform	Uniform
	3	Solubility Tests:			
		a) Acetone	Negative	Negative	Negative
	4*	b) Chloroform X-Ray Fluorescence	Negative Zn/Ti = .061±.002	Negative Zn/Ti = .051±.002	Negative Zn/Ti = 1.86±.01
884	1	Macroscopic Exam.	Soft white	Soft white	Soft white
	2	Macroscopic Exam.	One layer	One layer	One layer
	3	Solubility Tests		All similar in 3NHCL, Conc. H ₂ SO ₄ , Acetone, Chloroform and Ethyl Acetate	
	4*	Infrared Analysis	Not similar to B	Similar to C	Similar to B
	885	1	Macroscopic Exam.		A, B and C similar
2		Microscopic Exam.		A, B and C similar	
3		Infrared Analysis		A, B and C similar	
4		Solubility Tests:			
		a) H ₂ SO ₄	Ruled out		
		b) NaOH			
		c) Ethyl Alcohol		A, B and C to be drying oil paints	
	d) Acetone				
	5*	Pyrolysis G-C	Different from B and C	Could be similar to C	Could be similar to B
	6	Pyrolysis G-C/ Mass. Spect.	Different from B and C	Similar to C	Similar to B

*Indicates the point at which a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
888	1	Macroscopic Exam.	A, B and C no significant differences		
	2	Microscopic Exam.	A, B and C no significant differences		
	3	Fluorescent Studies	A, B and C no difference		
	4	Solubility Tests:			
		a) Acetone	A, B and C no differences		
		b) Chloroform	A, B and C no differences		
		c) Benzene	A, B and C no differences		
	d) HCl	A, B and C no differences			
	e) HNO ₃	A, B and C no differences			
	f) H ₂ SO ₄	Turns yellow brown immediately	Turns yellow brown	Turns yellow brown	
	5*	Pyrolysis G-C	Different pyrogram	Pyrogram somewhat similar to C but also some minor differences	Pyrogram somewhat similar to B but also some minor differences
892	1	Macroscopic Exam.	White slivers	White flakes	White flakes
	2	Microscopic Exam.	Single layer	Same as A	Same as A
	3	Fluorescent Studies	No fluorescence	Same as A	Same as A
	4	Solubility Test	MEK - neg. diphenyl amine - neg.	Same as A	Same as A
	5*	X-Ray Fluorescence	No Barium detected in A or B		High conc. of Ba
894	1	Macroscopic Exam.	A, B and C similar		
	2	Microscopic Exam.	A, B and C similar		
	3	Solubility Tests:	A, B and C similar		
		H ₂ SO ₄ , NH ₄ OH, CHCl ₃ , Dioxane, Ethyl Acetate, Methyl Ethyl Ketone			
	4*	Density Studies	Same as B	Same as B	Less than A or B
896	1	Macroscopic Exam.	A, B, and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		

	3	Solubility Tests: Chloroform, Acetone and diphenylamine	A, B and C not differentiable		
	4*	Pyrolysis G-C	Not identical with B or C		
	5*	Emission Spectroscopy			Not identical with A or B
897	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Pyrolysis G-C	Pyrogram similar to C	Pyrogram different from A and C	Pyrogram similar to A
	4	Solubility Tests: Sulfuric Acid Nitric Acid, Hydrochloric Acid, Acetone, and Methylene Chloride	A, B and C not differentiable		
	5*	X-Ray Fluorescence	Ti, Fe, Zn, Cm, Pb	Same	Same
	6	Infrared Analysis	Different from B and C	Similar to C	Similar to B
899	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Infrared Analysis	A, B and C not differentiable		
	4	Emission Spectroscopy	Si, Al, Mg, Ti	Si, Al, Mg, Ti	Si, Mg, Al, Ti, Zn
	5	X-Ray Fluorescence	A, B and C not differentiable		
	6	Fluorescent Studies	C fluorescence did not match A and B		
	7*	Pyrolysis G-C	Different from B	Different from A	
901	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Solubility Tests: CHCl ₃ Acetone Benzene, Ethyl Acetate, Toluene HCl NaOH H ₂ SO ₄ H ₂ O	Results identical for A, B and C		
901 Cont.	4	Infrared Analysis	Spectra identical for A, B and C		
	5*	Emission Spectroscopy	Identical results for A, B and C Ti, Al, Si, Mg, and Zn		

Table 7. continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
	6	Solubility Tests a) CHCl ₃ b) Acetone c) Benzene d) HCl e) NaOH f) H ₂ SO ₄ g) H ₂ O	Results identical for A, B, C		
	7	Fluorescent Studies	No fluorescence detected		
904	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Fluorescent Studies	Black	Black	Black
	4	Solubility Tests: Chloroform, Acetone Methylene Chloride and Sulfuric Acid	A, B and C not differentiable		
	5	UV Spectrophotometry	Different from B and C	Same as C	Same as C
	6*	Infrared Analysis	Different from B and C	Same as C	Same as B
907	1	Macroscopic Exam.	White, glossy shaving	White, glossy plate (film)	White, glossy plate (film)
	2	Microscopic Exam.	3 layers	>2 <4	2 layers
	3*	Solubility Tests	Soluble in NaOH and H ₂ SO ₄	Stable in Na	Stable in
	4	Pyrolysis G-C	Unique	Comparable w/C	Comparable w/B
	5	Infrared Analysis	A, B and C inconclusive		
908	1	Macroscopic Exam	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Fluorescent Studies	No fluorescence in A, B or C		
	4	Solubility Tests: CHCl ₃ Xylene HCl Dioxane Ether EtOH Acetone H ₂ SO ₄	" " " A, B and C insoluble " " " A, B and C soluble		

	5	Density Studies	A, B and C similar		
	6	Infrared Analysis	A, B, C match		
	7	Atomic Absorption	Titanium detected in A, B and C		
909	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Solubility Tests: HCl, H ₂ SO ₄ , NaOH CHCl ₃ , EtA _C , 10% Na ₂ S, 5% AgNO ₃ in 20% HNO ₃	No significant differences recorded		
	4	Infrared Analysis	A, B and C not differentiable		
	5*	Emission Spectroscopy	Pb, Ti, Ca	Pb, Ti, Ca	Pb, Zn
	6*	Pyrolysis G-C	Different from B	Different from A and C	Different from B and C
915	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	1 layer white	1 layer white	1 layer white
	3	Solubility Tests:	A, B and C softens in Acetone		
	4*	Pyrolysis G-C	A ≠ B = C	A ≠ B = C	A ≠ B = C
	5*	X-Ray Fluorescence	Ti/Zn = 22	Ti/Zn = 23.5	Ti/Zn = 0.5
921	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	UV - Light	A, B and C not differentiable		
	4	Solubility Tests: Conc Hydrochloric Acid, Sodium Hydroxide, Sulfuric Acid, Chloroform, Nitric Acid, Hexane, and Diethyl Ether Potassium Hydroxide Methanol	Insoluble	Soluble	Soluble
	5*	Emission Spectroscopy	Ti, Al, Zn	Ti, Al, Zn	Ti, Al, Zn

*Indicates the point at which a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
923	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Fluorescent Studies	No fluorescence	Same as A	Slight fluorescence
	4*	Solubility Tests: Acetone, Trichloro- ethylene, Hydrochloric acid, Nitric Acid, Toluene Sulfuric Acid	A and B match	B and C match	
	5*	Pyrolysis G-C	Soluble Different from B	Soluble B and C match	Partially soluble
925	1	Macroscopic Exam.	A, B and C not differentiable		
	2	Microscopic Exam.	A, B and C not differentiable		
	3	Solubility Tests: Acetone, Chloroform, Methylethyl Ketone Ethyl Acetate, H ₂ SO ₄	A, B and C insoluble		
	4	Energy - Dispersion X-Ray Analysis	Major Fe Minor Zn, Pb	Same as A	Mg, Zn Minor Ti
	5*	X-Ray Diffraction	Ti O ₂ Rutile	Ti O ₂ Rutile	Ti O ₂ Rutile Zn O Zincite
	6	Infrared Analysis	A, B and C Alkyd Enamel		
938	1	Macroscopic Exam.	A, B and C same color		
	2*	Microscopic Exam. Pigment comparison (paint chips dissolved in 2m Na OH and immediately observed; also heated in crucible until ashed)	Micron size equant, yellowish high refractive index birefringence particles similar to Ti O ₂	Thickness different: A < B < C 1) Same as A 2) Approx. 15 microns in diameter conchoidal fracture equant isotropic particles (Ri. = 1.495) similar to pumice	1) Same as B 2) Same as B 3) Approx. 0.5 x 6 microns acicular, high refractive index, low bire- fringence particles similar to Zn O

	3	Spot Test	Ti - Positive Zn - Negative	Same as A	Ti - Positive Zn - Positive
	4*	Pyrolysis G-C	Differentiated from B and C	B and C similar pyrograms	
	5*	Infrared Analysis	Ti O ₂ spectrogram	Ti O ₂ spectrogram	Ti O ₂ and Zn O composite spectrogram
942	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.		A, B and C not differentiable	
	3	Solubility Tests: CHCl ₃ , CCl ₄ , Acetone, HNO ₃ , NaOH H ₂ SO ₄		A, B and C similar	
	4*	X-Ray Fluorescence	Ti = 100% Zn = 20% Pb = 10.5% Br = 11.9%	Ti = 100% Zn = 24% Pb = 8% Br = 16%	A and B dissolved and remained white C dissolved turned yellow brown
	5	Infrared Analysis		A, B and C inconclusive	
	6	Pyrolysis G-C		A, B and C inconclusive	
944		Macroscopic Exam.		A, B and C not differentiable	
	*	Microscopic Exam.		A, B and C not differentiable	
		Solubility Tests: WH ₄ OH, HCl, HNO ₃ Acetone, Acetic Acid, Toluene H ₂ SO ₄		A, B and C non-soluble	
		Infrared Analysis	Soluble but slower than B	Soluble	Soluble but slower than B
948	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.		A, B and C not differentiable	
	3*	Solubility Tests: Acetone, CHCl ₃ , HCl, H ₂ SO ₄ KOH/ALC		A, B and C not differentiable	
				A different from B and C	

*Indicates the point at which a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
948 Cont.	4*	Pyrolysis G-C		Differentiated A, B and C	
	5	Infrared Analysis	Not run	Same as C	Same as B
	6	Density Studies	A and B similar	B and C different	
	7	X-Ray Fluorescence		A, B and C contain different elements and quantity	
958		Macroscopic Exam.		A, B and C not differentiable	
		Microscopic Exam.		A, B and C not differentiable	
		Solubility Tests		A different from B and C in conc. sulfuric acid and alcoholic potassium solvents. B and C have same solvent properties.	
		Emission-Spectroscopy	Large qty. of Ti and Zn	Large qty of Ti Small qty. of Zn	Same as B
		Pyrolysis G-C	Different	Same as C	Same as B
960	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.		A, B and C not differentiable	
	3	Pyrolysis G-C	Different	Same as C	Same as B
	4	Solubility Tests: Acetone, DMF, HCl	Same	Same	Same
	5	Density Studies	Different	Same as C	Same as B
	6	Fluorescent Studies	Different	Same as C	Same as B
	7	Infrared Analysis	Same	Same	Same
961	1	Macroscopic Exam.		A, B and C not differentiable	
	2	Microscopic Exam.		Pigmentation variation	
	3*	Solubility Tests		A differs from B and C in Methylene Chloride	
	4*	Infrared Analysis		A differs from B and C	
962	1	Macroscopic Exam.		A, B and C white	
	2	Microscopic Exam.		A, B and C unilayer	
			Somewhat brittle	Pliable	Pliable

3	X-Ray Fluorescence Zn to Ti ratio Minor traces	1/13 Zn, Cu, Ca, Cr, Fe	A, B and C contain Ti 1/18 Zn, Cu, Ca, Cr, Fe	Contains Zn 11/18 Zn, Cu, Ca, Cr, Fe
4	Infrared Analysis	A, B and C spectra generally same Has sharp peak that is absent in B and C		
5	Emission Spectroscopy Trace element	Major elements Ti Cu, Al, Si, Mg, Pb		Minor element Zn Cu, Al, Si, Mg, Pb
6	X-Ray Diffraction	A, B contain Ti O ₂		Contains Ti O ₂ and Zn O
7	Pyrolysis G-C	Different pattern B and C have same pattern		
8	Solubility Tests	Solvents at room temp. and 2 hrs. @ 50°C		
	a) Acetone	No effect on A, B, C		
	b) Ethyl Acetate	No effect on A, B, C		
	c) Chloroform	No effect on A, B, C		
	d) Conc. HCl	No effect on A, B, C		
	e) Conc. HNO ₃	No effect on A, B, C		
	f) 10M NaOH @ room temp. 2 hrs. @ 50°C	No effect on A, B, C		
970	1 Macroscopic Exam.	All items appear similar		
	2 Microscopic Exam.	All items appear similar		
	3 Fluorescent Studies	A, B exhibited dull gray color		Exhibited a dull yellow-green color
	4* Emission Spectroscopy	Ti, low intensity Zn	Ti, low intensity Zn	Ti, high intensity Zn
	5 Solubility Tests	No response		
	a) Acetone	No response		
	b) Benzene	No response		
	c) Chloroform	No response		
	d) Conc. H ₂ SO ₄	Disintegrated rapidly		B and C disintegrated slowly
	6* Infrared Analysis	Displayed weak aromatic peaks		Displayed none of the aromatic peaks

*Indicates the point at which a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C
974	1	Macroscopic Exam.			
	2	Microscopic Exam.			
	3	Solubility Tests:	Indicate slight difference		
		a) CHCl ₃			
		b) Acetone			
		c) Diphenylamine			
		d) H ₂ SO ₄			
		e) Pyraline			
		f) NaOH			
	4	Pyrolysis G-C	Prove difference in which A and B very obvious		
	5*	Emission Spectroscopy	Very obvious differences in B and C. Zinc is major difference.		
975	1	Macroscopic Exam.	A, B and C appeared similar in color, texture and gloss.		
	2	Microscopic Exam.	A, B and C appeared similar in color, texture and gloss.		
	3	Solubility Tests:	Samples appeared to exhibit similar characteristics		
		a) HCl	A, B and C no change		
		b) H ₂ SO ₄	A, B and C turned light yellow		
		c) HNO ₃	A, B and C turned faint yellow		
		d) NH ₄ OH	A, B and C no change		
		e) NaOH	A, B and C no change		
		f) Acetone	A, B and C no change		
		g) Chloroform	A, B and C no change		
	4	Fluorescent Studies (using long and short wave UV)	A, B and C similar		
	5*	Pyrolysis G-C	A, B and C different		

	6	Infrared Analysis	N/A	B and C similar	
	7	X-Ray Fluorescence		Titanium confirmatory	Titanium and Zinc confirmatory $\frac{\text{Ti}}{\text{Zn}}$ approx. $\frac{65}{35}$
978	1	Fluorescent Studies		No significant fluorescence for A, B, C	
	2	Macroscopic Exam.		A, B, C similar	
	3	Microscopic Exam.		A, B, C similar	
	4	Infrared Analysis		A, B and C showed no significant differences, however, subsequent scans using pyrolyzates showed A to differ from B and C in 5 major areas.	
	5	Solubility Tests:		A, B and C showed same color reactions	
		a) NaOH			
		b) HCl			
		c) H ₂ SO ₄		A, B, and C chip turns peach or beige color	
		d) HNO ₃		A, B and C chip turns light creme color	
		e) Methanol			
		f) Chloroform			
		g) Methyl Ethyl Ketone			
		h) Acetone			
		j) Xylene			
		k) Benzene			
		l) Diphenylamine		A, B and C chip turns light brown	
		m) Hexane			
	6*	Pyrolysis G-C	Dissimilar	B and C similar	
	7	Spectral Reflectance		No significant differences noted between A, B, C	
	8	Emission Spectroscopy		A, B, C similar. Zinc detected.	
980	1	Macroscopic Exam.		A, B and C similar in color and gloss	
	2	Microscopic Exam.		A, B and C similar in color and texture, number of layers (single)	
	3*	Infrared Analysis	Dissimilar	B and C similar	
	4	X-Ray Diffraction		A, B and C similar. Contain Ti O ₂ (rutile)	
	5	Pyrolysis G-C	Dissimilar	Major component in A not found in B and C	

*Indicates the point at which a conclusion was reached.

	4	Solubility Tests:		No definite conclusions reached	
		a) Ethyl Acetate		A, B and C insoluble	
		b) Benzene		A, B and C insoluble	
		c) Acetone		A, B and C insoluble	
		d) NaOH		A, B and C insoluble	
		e) HCl		A, B and C insoluble, however C discolored differently	
		f) H ₂ SO ₄		A, B and C dissolved after setting in H ₂ SO ₄ for several minutes. When initially placed in H ₂ SO ₄ all discolored to a yellowish-brown color and B and C curled up towards glossy side, A did not curl.	
	5*	Emission Spectroscopy		Ti, Zn, Pb, Si, Mg, Al, Cu found in A, B and C More Zn and Pb, less Ti in C	
	6*	Density Studies	Most dense	More dense than C, less than A	Least dense
987	1	Macroscopic Exam.		A, B and C white paints, one side with gloss and other without. No distinctive pigmentation characteristics found, all appear to be free of wood prime, covering, thicknesses not greatly different, all are single layered paints	
	2	Microscopic Exam.			
	3*	Solubility Tests:		A, B and C insoluble	
		a) Ethyl Acetate		A, B and C insoluble	
		b) Acetone		A, B and C insoluble	
		c) Benzene		A, B and C insoluble	
		d) Xylene		A, B and C insoluble	
		e) Con. HCL		A, B and C insoluble	
		f) H ₂ SO ₄	Soluble	A, B and C insoluble Discolors	
		g) H ₂ SO ₄ with diphenylamine	Soluble	B and C insoluble B and C insoluble	
	4	Energy Dispersive X-Ray Analysis		A and B similar concentrations for eight elements	C shows quite different elements and concentrations

*Indicates the point at which a conclusion was reached.

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C	
980 Cont.	6	Solubility Tests: a) Acetone b) Chloroform c) H ₂ SO ₄ d) Methylene Chloride e) HCl f) Ethyl Acetate g) Benzene h) HNO ₃		A, B and C similar A, B and C insoluble A, B and C insoluble A, B and C partially soluble, turns brown A, B and C insoluble A, B and C insoluble A, B and C insoluble A, B and C insoluble A, B and C insoluble		
	7	Emission Spectroscopy	Al, Si, Mg, Pb, Ti, Ca, Zn	Al, Si, Mg, Pb, Ti, Ca, Zn	Al, Si, Mg, Pb, Ti, Ca, Zn (greatest concentration of Zn)	
985		Microscopic Exam.		A, B and C have same color, color shade and thickness		
	*	Macroscopic Exam.				
	*	Fluorescent Studies	A, B had some fluorescence		Different fluorescence	
		Solubility Tests: a) H ₂ SO ₄ b) HNO ₃ c) Acetone d) CHCl ₃		A, B and C each reacted differently Different A and B similar Different	B and C similar B and C similar	Different
986	1	Macroscopic Exam		A, B and C white paints; glossy on one side, textures similar Small, elongated flakes B and C large flakes		
	2	Microscopic Exam.		A, B and C white, single layered, glossy on one side. No apparent differences noted		
	3	Fluorescent Studies		No fluorescence observed for A, B, C.		

Table 7, continued

Lab Code	Sequence of Testing	Test	Item A	Item B	Item C	
994	1	Macroscopic Exam.		A, B and C similar		
	2	Microscopic Exam.		A, B and C similar		
	3	Solubility Tests: a) Acetone b) Ethyl Acetate c) Chloroform d) H ₂ SO ₄	Dissimilar		B and C similar	
				A, B and C insoluble A, B and C insoluble A, B and C insoluble		
	4	Marquis Reagent (H ₂ SO ₄ and Formaldehyde)	Brownish-red color develops on both sides	Pale yellow color developed on both sides	Tan color developed on one side while the other side turned a pale yellow	
	5*	Emission Spectroscopy		A, B and C completely distinguishable		
	6	Fluorescent Studies		A, B and C dissimilar		
	7	UV Spectrophotometry	A and C similar	B dissimilar		
8	Density Studies	Most dense	A, B and C dissimilar	More dense than C, less dense than A	Least dense	
995	1	Macroscopic Exam		A, B, and C white gloss; similar in color		
	2	Microscopic Exam		A, B, and C white gloss; single layer; color, texture, thickness similar for A, B, C.		
	3	Solubility Tests a) Acetone b) conc. H ₂ SO ₄		insoluble changes color, begins to decompose in approx. 2 min	insoluble B and C change color, begin to decompose in approx. 3 1/2 min.	insoluble
	4	Infrared Analysis	A qualitatively different from B		B and C qualitatively, quantitatively the same	
	5	Pyrolysis G-C	Pyrolysis pattern for A different from that of B		Pyrolysis patterns for B and C are qualitatively and quantitatively consistent	

Table 7 continued

998	1	Macroscopic Exam.		
	2	Microscopic Exam.		No layering, thickness of C slightly less than B, thickness of A nearly identical to B.
	3*	Solubility Tests		
		a) Acetone		No differences
		b) Sulfuric Acid based reagent	A distinctly different	B and C slightly different
	4*	Emission Spectroscopy	A and B appear really identical	C has different elemental content



END