


MINERAL ID LAB: SIMPLE CHEMISTRY & FLAME TESTING

Note: Anything marked in gray is filled in by the instructor. All other fields, checks, and write-ups to be completed by you!

Name:	Course section ID
Date received:	Due Date:
 The following Due Date Penalty applies: -10% / day	<input type="checkbox"/> 100% or _____%
	%
Overall SIMPLE CHEMISTRY & FLAME TESTING LAB Grade:	/50

Lab Access Badge #: Lab safety training completed on:

Maintenance Infraction(s): Assigned Lab Equipment BIN number:
 Warning Only! -5% -10%
 -15% and Lab Revocation Assigned PLM number:

Refer to Manual of Rapid Mineral Identification - Volume I: Mineral ID Tests and Determinations
 9 PHYSICAL / CHEMICAL MINERAL ID PROCEDURE - FLAME TESTS p.48
 10 SIMPLE CHEMICAL MINERAL ID PROCEDURES p.51

ASSIGNMENTS: I am using the client sample alternate sample

- /10 COMPOSITION & LAYOUT - 2 point deduction per infraction
 The appearance is neat and orderly. Generally, the template is followed. The lab is typed, and graphics and data are electronically prepared and analyzed. Subscripts and superscripts are appropriately used, and equations are explained. The lab is complete with all fields populated. Graphics and data are placed in a coherent form. Proper formatted citations are included.
- /10 WRITING & GRAMMAR - one point deduction per infraction
 Spelling and grammar are correct. Word repetition and use of first person language is avoided. Statements are factually correct. Appropriate and complete language becoming to a professional report is used.
- /20 METHOD, EXECUTION, DATA COLLECTION - one or multiple point deduction per infraction
 The METHOD (NOT Procedure or Instructions!) is adequately described and explanation for using the METHOD is given. Appropriate methodology of the lab is evident from the writing and data. Make / Model of instrumentations used is indicated. Any software or App used is cited. For numerical data, significant figures are watched and applied and precision is calculated. When appropriate, one or multiple controls are used and described to identify the integrity of the data. Any data inconsistencies are explained.
- /10 GRAPHICS, ILLUSTRATIONS, TABLES - one or multiple point deduction per infraction
 At minimum a graphical representation of the lab set-up and/or execution is required. All illustrations must be electronically prepared. Pictures should be clear, of high quality, and with neutral background. Graphs should have a title with appropriate axis and unit labels. Graphics need to meet minimum resolution (300 DPI) requirements. All graphics & tables have properly formatted captions. Citation of source must be included in the captions.



ALL ANSWERS MUST BE TYPED USING A WORD PROCESSOR! This includes chemical formulas, equations, tables and special characters. Become intimately familiar with these functions in your preferred word processor. Where graphics are indicated insert the proper graphic or picture. Be familiar with placing and sizing visuals into a written document. Attach your completed document(s) to this sheet!

LAB PROCEDURE: You may work with a partner for collecting data and running the lab experiments. However, this is NOT a group project. Each individual in the group is responsible for his/her own lab write-up, which includes OWN pictures, data tables, graphics, etc.! Do **NOT** copy and share except for RAW data!!!



For ALL assignments use a citation's database:

ZOTERO citations database	ZOTERO is a citations database that incorporates itself into Word and your Browser.	Free open source software available at https://www.zotero.org/
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Note: You may use a different citations database, if desired. But you MUST use a citations database!

NOTE: After downloading and installing ZOTERO, take an hour or two to become familiar with the operation of the software. One of your first tasks will be to set the citation style to the United States Geologies Survey (USGS) format in ZOTERO. The USGS citation system will be required for this course and your final product.

Loading the USGS citation format into ZOTERO: Once Zotero Standalone is installed, click on "Preferences" under the Edit tab. Once there click on "Cite" and go to the "Styles" tab. Click on the "Get additional styles..." below the Styles Manger Box. When the Zotero Styles Repository Window opens, click on the "geology" button within the "Fields" section. A list of geology journals should now appear. Scroll down to the U.S.Geological Survey and click on it. The U.S.G.S style will now be part of your Zotero system and you can set your citations to be formatted accordingly in Zotero.

General Writing Instruction Summary:

- Use professional language, which means AVOID first person expressions such as "I", "we", "our". Use normal prose, active voice and third party language. Do NOT use informal wording, contractions, jargon, slang terms, or superlatives. Exclude similes/metaphors (and humor!)
- Use present tense to report well accepted facts, e.g. 'Pyrite is a sulfide mineral'. Use past tense to describe specific results, e.g. 'When acid was applied, the specimen effervesced'
- Be quantitative wherever relevant (stats, numbers etc.).

Subscript & Superscript Use appropriate subscript and superscript, especially when it comes to chemical formulas and mathematical units..

Acceptable examples: 2.9 g/cm^3 , H_2O , PO_{43-} , $a_g=9.8\text{m/s}^2$

Unacceptable examples: $2.9 \text{ g/cm}3$, $\text{H}2\text{O}$, $\text{PO}4 \text{ } 3-$, $a_g=9.8\text{m/s}^2$

- Use precise concrete language, no ambiguity e.g, 'correlated' \neq 'related'. Use simple language – no unnecessary "frills" (distractions). Pay attention to sentence structure and grammar

COMPILING TABLES, FIGURES and EQUATIONS

GRAPHICS are the heart of any report. Nothing is more true than in science that a picture is worth a thousand words. Always compile graphics first and then write your text focusing on your graphic. In order to create good graphics and photographs, follow the instructions below.

Cameras and Photos:

Cell phones with a 7.2MP camera are usually ok. When taking pictures, lighting and background is key. This means dark objects should be photographed with light or white backgrounds (sheet of paper) and visa versa for light objects. Having adequate lighting will also help to get sharp, crisp, in focus pictures. Blurry and out of focus pictures are not acceptable.

Graphics:

You should be able to modify, enhance, annotate or overlay graphics. Minimum resolution is 300dpi. Make sure graphics are crisp,

clear and any label is easily readable. All graphics should have a caption stating the author and/or citation. Preferably use lossless graphic formats, such as .tif or .bmp. Unfortunately .jpg is NOT lossless and will degrade a little every time you open and save it again in order to manipulate picture contents.

Graphics Editor Software: You will need a graphics editor and learn how to use it. Windows comes with its default Windows Paint editor. It is found in the Windows Accessories Folder. For a more advanced option with many more professional features you may try GIMP: <https://www.gimp.org/> This is a FREE, open source image editor working across all computing platforms (Windows, Apple, Linux, etc.). The software comes with ample documentation and examples on how to manipulate any picture or graphic.

Screen Capture Software: A screen capture or snipping software is advantageous in order to only grab the part of a graphic from the screen that is important or necessary. Windows 10 comes with a default snipping tools, such as “Snip & Sketch” found in its own folder or “Snipping Tool” found in the Windows Accessories Folder.
Note: When snapping a picture, make sure it is large enough on the screen to capture enough pixels to have adequate resolution for the final product.

NOTE: Compiling acceptable and good looking graphics and photographs is very involved and can not be rushed. These are often the heart of any report and should be compiled BEFORE writing. Last minute thrown together graphics will without doubt lower your grade on the client report significantly.

COMPOSITION, LAYOUT, WRITING & GRAMMAR SUMMARY

Language

The following list is an example of common faults in language usage and attribution.

Errors / Mistakes / Faults	Examples with margin <i>Fault Counts & Codes</i>
Spelling: incl. capitalization errors & spacing	The mineral <u>florite</u> has a <u>mohs</u> hardness of four. Nicolas Steno__was trained in the classical texts on science.
Grammar: incl. punctuation, superfluous words, transpositions	Isometric crystals are also isotropic. <u>Here light propagates at the same speed.</u> Rocks are composed of many <u>many</u> minerals mixed.
Style: incl. paragraph, repetitive expressions / words, erroneous expression / words, sub- or superscription, unprofessional style, word insertion	<i> Para.</i> ... in the geologic sciences. <u>¶</u> Near the end of the 19 th a new theory ... <i> rep</i> ... is a <u>light colored</u> mineral. These <u>light colored</u> minerals are often <u>light...</u> Stalactites hang from the <u>sealing?</u> of a limestone cave. <i> sup</i> The density of quartz is 2.65 g/cm ³ . <u>I was</u> investigating the outcrop with <u>my</u> group. Sodium sulfate forms a chalky, <u>incoherent</u> precipitate. <i>amorphous?</i>
Sentence: incl. grammar, run-on, strings of nouns	The density of gold is greater <u>then?</u> the density of silver. Pyrite has a symmetrical crystal <u>structure</u> , <u>it is</u> cubic. <u>Skarn mineral zonation?</u> is apparent in the sample.

Content

Errors in content are spelled out. Severe infractions may count for multiple errors.

Errors / Mistakes / Faults	Examples with margin <i>Fault Counter & Codes</i>
Unclear / erroneous statements	<i> unclear, units?</i> <u>Mohs hardness of the mineral in question is 16.5.</u>
False / nonsense	<i> Nonsense</i> <u>Glaciation cause severe metamorphism of the region</u>

TABLES, FIGURES & EQUATIONS SUMMARY

Tables

Each table must be sufficiently complete that it could stand on its own, separate from text.

Only HORIZONTAL lines are allowed in tables. Do NOT use any VERTICAL lines.

DO consecutively number and caption tables and refer to them accordingly within your text. Captions go ABOVE the table.

DO provide a short description of your table within the caption.

DO place your tables appropriately, closest to their mention in the text.

DO make sure tables are legible and reproduce well. Print can be smaller than text, with an 8pt size minimum.

DO appropriately label columns. Do NOT forget units for numeric values.

AVOID splitting tables across pages.

Figures

Each figure must be sufficiently complete that it could stand on its own, separate from text.

DO number and caption figures consecutively and refer to them accordingly within your text. Captions go BELOW the figure.

DO provide a short description of your figure within the caption.

DO place your figures appropriately, closest to their mention in the text.

DO use appropriate citations for figures that are NOT your own. If you use a figure that has been modified by you, the phrase “modified after....” is most appropriate. Photos should show the name of the photographer.

DO make sure figures are legible and reproduce well. Print can be smaller than text, with an 8pt size minimum. Use a minimum resolution of 300dpi. This is a common publication standard.

AVOID cluttering of figures with too much detail. Simplify if necessary.

AVOID moire patterns in photos, a nuisance in copied or scanned pictures. Most scanners come with a moire pattern removal tool.

GRAPHS

Understand graphs: Bar graphs and/or line graphs are used when plotting nominal vs. ratio or interval data. Scatter plot graphs are used when plotting numeric vs. numeric data.

DO make sure that the graph axis are appropriately labeled and scaled. Axis should have titles as well as scalar units.

DO use electronic means to generated graphs. Hand drawn graphs are no longer acceptable.

Equations & Computations

- Equations should contain explanation of symbols used.
- A reader should be able to follow where your values or numbers come from. Indicate accordingly.
- WRITE DOWN UNITS!!!!
- Show equations used before indicating any computation

Acceptable Example: $F = m \times a = 0.034\text{kg} \times 9.8\text{m/s}^2 = 0.33\text{kgm/s}^2$

where m is mass of the object in kg as determined with a triple beam balance and a is the gravitational acceleration. F indicates force expressed in kgm/s^2 or N (Newtons).

Unacceptable example: The answer is 0.33. This is obtained by multiplying gravity by 0.034.


**MINERAL ID LAB: SIMPLE CHEMISTRY & FLAME TESTING
FUSIBILITY & FLAME COLOR**

Name:	Course section ID
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POPULATE AND COMPLETE THE FOLLOWING:

Description of METHOD (NOT procedure or instructions) - One paragraph; 3 - 5 sentences:

Instruction:
Use your microtorch, forceps, a sample fragment, and a blue filter (take the blue lens out of a microscope, but replace it immediately when you are done) to do the following:

 **CAUTION:** Heat and open flame involved. Wear fire resistant clothing. Place test set-up on heat resistant surface. Wear eye protection and gloves. Sample might decrepitate and spew hot molten droplets.

NOTE: Flame color is best observed in a darkened room against a white background.

PREP - Hold tips of forceps into micro torch flame to “burn off” interfering sodium contamination (1 minute should suffice). Let forceps cool.

- 1 - Hold sample with forceps and bring slowly toward tip of flame as described in the lab manual..
- 2 - Watch for melting or other action of the sample. Record fusibility number and other observations.
- 3 - Observe flame color and record with possible elemental interpretation!
- 4 - Observe flame color through blue filter and record with possible elemental interpretation!

Check if CLIENT SAMPLE Yes No

Fusibility:	Fusibility #:	Comments:
Flame Color:		Possible Elements:
Flame Color w/ blue filter:		Possible Elements:

Conclusion:

MINERAL ID LAB: SIMPLE CHEMISTRY & FLAME TESTING
OPEN & CLOSED TUBE TEST

Name:

Course section ID

POPULATE AND COMPLETE THE FOLLOWING:

Description of METHOD (NOT procedure or instructions) - One paragraph; 3 - 5 sentences:

Instruction:

Use your microtorch, the open and closed tubes, forceps, a little sample powder to do the following:



CAUTION: Heat and open flame involved. Wear fire resistant clothing. Place test set-up on heat resistant surface. Wear eye protection and gloves.

NOTE: Take pictures of positive tube tests.

1 - Place small amount of sample powder into the closed tube. Carefully heat the tube. **NOTE: The tube should never start to glow or melt!** Observe vapor, sublimation, deposition, coloration, etc. Record, document and interpret results.

2 - Place small amount of sample powder into the open tube. Carefully heat the tube. **NOTE: The tube should never start to glow or melt!** Observe vapor, sublimation, deposition, coloration, etc. Record, document and interpret results.

Check if CLIENT SAMPLE Yes No

Open Tube Test:	Descriptive Observation & Interpretation:	[insert picture]
Closed Tube Test:	Descriptive Observation & Interpretation:	[insert picture]

**MINERAL ID LAB: SIMPLE CHEMISTRY & FLAME TESTING
SOLUBILITY TEST**

Name:

Course section ID

POPULATE AND COMPLETE THE FOLLOWING:

Description of METHOD (NOT procedure or instructions) - One paragraph; 3 - 5 sentences:

Instruction:

You will need streak plate, water and various acids, a handlense or binocular microscope, and microtorch, as outlined in the lab manual.

- 1 - Create a health powder streak of your mineral on the streak plate
- 2 - Place a drop of test solution on the streak while observing under magnification. Use a fresh, dry streak for additional test solutions (do NOT mix solutions). If NO reaction, heat very, very gently.
- 3 - Record SOLUBILITY, OBSERVED REACTIONS, and any ODORS

Check if CLIENT SAMPLE Yes No

Test Solution	Solubility	Reaction, if applicable!	Odors, if applicable!
Water			
1:5 HCl			
1:1 HCl			
1:1 H ₂ SO ₄			
1:1 HNO ₃			
Aqua Regia 1 drop conc. HNO ₃ to 3 drops conc. HCl.			

Conclusion:

MINERAL ID LAB: SIMPLE CHEMISTRY & FLAME TESTING
ION CHROMATOGRAPHY PAPER TEST

Name:

Course section ID

POPULATE AND COMPLETE THE FOLLOWING:

Description of METHOD (NOT procedure or instructions) - One paragraph; 3 - 5 sentences:

Instruction:

Follow the digestion and chromatography procedure as outlined in detail in the lab manual. Process an unknown plus a known reference sample to calculate R_f correction factors for the unknown mineral.

1 - Record Results by taking pictures of your chromatography strip and completing a descriptive observation.

2 - Complete the table for R_f calculations

3 - Based on R_f and ion spot color, estimate possible chemistry.

Check if CLIENT SAMPLE Yes No

[insert sideways photo of untreated chromatograph. Erase this text!]

Comments:

[insert sideways photo of 8-Hydroxyquinoline treated chromatograph. Erase this text]

Comments:

[insert sideways photo of treated chromatograph under UV light. Erase this text]

Comments:

[insert sideways photo of NH_4OH treated chromatograph, if applicable. Erase this text]

Comments:

Reference Mineral or Compound:		Reference Target Cation(s):	
Wetting Front Distance:			
___ Ion 1 spot distance:		___ Ion 2 spot distance:	
___ Ion 1 calculated R_f :		___ Ion 2 calculated R_f :	
___ Ion 1 given R_f :		___ Ion 2 given R_f :	
Ion 1 correction factor : (calculated / given)		Ion 2 correction factor : (calculated / given)	
CORRECTION FACTOR AVERAGE:			

Unknown Mineral			
Wetting Front Distance:			
Ion spot distance:		2 nd Ion spot distance (if applicable):	
Ion calculated R_f :		2 nd Ion calculated R_f (if applicable):	
Ion corrected R_f : (calculated / correction factor)		2 nd Ion corrected R_f (if applicable): (calculated / correction factor)	

Interpretation:

CITATIONS: if applicable! ALL citations should be processed through the ZOTERO citation database software, freely available at <https://www.zotero.org/>

Citations should follow the USGS citation standard!

GENERAL NOTES:

- If you are using the CLIENT SAMPLE, then everything in the **green framed fields** needs to be transferred to your final client report as indicated in the report outline and template.
- Pay particular attention to the grading and comments / feedback associated with the **green framed fields**. Your grade on the final report depends in part on you incorporating these corrections.