MINERAL ID LAB: OPTICAL MINERAL ID

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:	m/d/yy
⚠ The following **Due Date Penalty** applies: -10% / day	☐ 100% or _____%
Overall OPTICAL MINERAL ID LAB Grade:	%
	/50

Lab Access Badge #: Badge ID

Lab safety training completed on: m/d/yy

Maintenance Infraction(s):
☐ Warning Only! ☐ -5% ☐ -10%
☐ -15% and Lab Revocation

Assigned Lab Equipment BIN number:

Assigned PLM number:

Refer to Manual of Rapid Mineral Identification - Volume I: Mineral ID Tests and Determinations
11 OPTICAL MINERAL ID p.62

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/

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 Geologics 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=9.8m/s^2
Unacceptable examples: 2.9 g/cm3, H2O, PO4 3-, ag=9.8m/s^2

- Use precise concrete language, no ambiguity e.g, 'correlated' ≠ '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 Accessaries 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 *Fault Counts & Codes*	
Spelling:	| |	The mineral florite has a mohs hardness of four.
incl. capitalization errors & spacing	|	Nicolas Steno__was trained in the classical texts on science.
Grammar:		
incl. punctuation, superfluous words, transpositions	|	Isometric crystals are also isotropic Here light propagates at the same speed.
	| |	Rocks are composed of many ~~many~~ minerals mixed.
Style:		
incl. paragraph, repetitive expressions / words	*|Para.*	... in the geologic sciences.¶Near the end of the 19th a new theory ...
erroneous expression / words,	*|||rep*	... is a light colored mineral. These light colored minerals are often light...
sub- or superscription,	|	Stalactites hang from the sealing? of a limestone cave.
unprofessional style,	*|sup*	The density of quartz is 2.65 g/cm3.
word insertion	| |	I was investigating the outcrop with my group.
	|	Sodium sulfate forms a chalky, ~~incoherent~~ precipitate. *amorphous?*
Sentence:		
incl. grammar, run-on, strings of nouns	|	The density of gold is greater then? the density of silver.
	|	Pyrite has a symmetrical crystal structure, it is cubic.
	| |	Skarn mineral zonation? 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 *Fault Counter & Codes*	
Unclear / erroneous statements	*|unclear, units?*	Mohs hardness of the mineral in question is 16.5.
False / nonsense	*||Nonsense*	~~Glaciation cause severe metamorphism of the region~~

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

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: OPTICAL MINERAL ID
GEM REFRACTOMETER

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 a gem refractometer, refractometer oil, vinyl gloves, and tweezers.
Note: If gem refractometer is unavailable, use an alternate method!

CAUTION: Refractory oils of high RI are toxic. Wear appropriate gloves to avoid absorption through the skin.

PREP - Clean your specimen and do not touch with bare hands. Make sure sample fits under the gem refractometer lid and has one completely flat side or crystal face to be tested. Thoroughly clean the refractometer hemisphere window in the instrument.

1 - Place a drop of refractory oil on the hemicylinder window and place specimen with the flat side down on the window with the drop.

2 - Follow procedure as explicitly outlined in the lab manual. Record readings in the table below!

Check if CLIENT SAMPLE ☐Yes ☐No

	Specimen Position 1	Specimen Position 2	Specimen Position 3	Specimen Position 4	IR Spread (Hi - Lo)
Polarizer Position 1 (N-S)	*Record IR:*	*Record IR:*	*Record IR:*	*Record IR:*	
Polarizer Position 2 (E-W)	*Record IR:*	*Record IR:*	*Record IR:*	*Record IR:*	
Calculations:					

Interpretation:

Sample IR or IR Range	Sample Birefringence	Sample Optic Axis	Sample Optic sign

MINERAL ID LAB: OPTICAL MINERAL ID
GRAIN MOUNT SLIDE

Name:	Course section ID
GRADE:	/5

1 - Prepare a permanent grain mount slide. 2 - Take a picture of the grains in PPL under the PLM. Attach the labeled picture. 3 - Take a picture of the grains in XPL under the PLM. Attach the labeled picture.	*[Insert labeled PPL picture]* *[Insert labeled PPL picture]*

MINERAL ID LAB: OPTICAL MINERAL ID
PLM GRAINMOUNT ASSESSMENT

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 a PLM, clean microscope slides, refractory oils, vinyl gloves, and toothpicks.

CAUTION: Refractory oils of high RI are toxic. Wear appropriate gloves to avoid absorption through the skin.

PREP - Crush a small split of your sample into 75µm size particles.

1 - Sprinkle very few sample grains (maybe a dozen) into the oil drop. Make sure there is enough oil that when covering with a cover slip NO air pockets remain.

2 - Follow the indicated flow-chart as outlined in the lab manual and record your observations in the table below.

Check if CLIENT SAMPLE ☐Yes ☐No

PPL	Cleavage:	XPL	☐ Isotropic ☐ Anisotropic
	Color:		Highest Birefringence Color / Order:
	Pleochroism:		Extinction & Angles: *[Average 3 measurements]*
	Relief:		
	Becke-Line IR measurements: Oil1 RI:_____ Becky line moves into: ☐Oil ☐Grain Oil2 RI:_____ Becky line moves into: ☐Oil ☐Grain Oil3 RI:_____ Becky line moves into: ☐Oil ☐Grain Oil4 RI:_____ Becky line moves into: ☐Oil ☐Grain		Interference Figure Assessment, if applicable: ☐ UNIAXIAL ☐ Positive ☐ Negative ☐ BIAXIAL ☐ Positive ☐ Negative 2V Angle: _____
	estimated IR or IR-Range:		

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.