

UR GEOLOGY: Tables, Figures, Equations

UR Research Title:

Name:

Course section ID

WARNING: Only ONE single submittal possible. Read the grading rubric very carefully and make sure all elements are present and accounted for. You are NOT allowed to resubmit your work after grading with fixes to your mistakes. There will be NO regrading of your work. Your grade on the assignment will be AS-IS. **You have been warned!**

10 pts Pass - All elements present, professional and satisfactory
 8 pts Small Improvement needed - One element weak
 6 pts Improvement needed - Two elements weak
 4 pts somewhat unsatisfactory - Three elements weak and/or some omissions
 2 pts unsatisfactory - Several elements weak and/or omissions
 0 pts Fail - unsatisfactory / missing

OVERALL COMPOSITION & LAYOUT

The appearance is neat and orderly. The paper is typed and graphics and data are electronically prepared and analyzed. Subscripts and superscripts are appropriately used and any equations are explained. The paper contains title and header as well as one table, one original electronically prepared graphic, one modified electronically prepared graphic or photo, one equation and a reference page.

/10

OVERALL 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 college report is used.

10 pts Pass - All elements present, professional and satisfactory
 8 pts Improvement needed - A few elements weak
 5 pts somewhat unsatisfactory - Some elements weak and/or some omissions
 3 pts unsatisfactory - Multiple elements weak and/or major omissions
 0 pts Missing

TABLE

Includes concise caption ABOVE table. Only horizontal, NO vertical lines. Columns / rows are appropriately labeled. Units are indicated. Includes basic statistical data: Mean, Standards deviation. Stats are used to identify margin of error for precision and/or accuracy. Includes one paragraph explaining the data in your table

10 pts Pass - All elements present, professional and satisfactory
 8 pts Improvement needed - A few elements weak
 5 pts somewhat unsatisfactory - Some elements weak and/or some omissions
 3 pts unsatisfactory - Multiple elements weak and/or major omissions
 0 pts Missing

ORIGINAL GRAPHIC

Graphic must be ORIGINAL of your own design, not modified / copied from web or literature. Graphic is of high quality and legible especially writing and print labels. Includes caption BELOW the graphic with short description of the figure. Axis are labeled and units are appropriately indicated. Paragraph explaining the graphic is included.

10 pts Pass - All elements present, professional and satisfactory
 8 pts Improvement needed - A few elements weak
 5 pts somewhat unsatisfactory - Some elements weak and/or some omissions
 3 pts unsatisfactory - Multiple elements weak and/or major omissions
 0 pts Missing

MODIFIED E-PREPARED GRAPHIC / PHOTO

Graphic is modified from a cited original or is own photo with labels / descriptors added. Graphic is of high quality and legible especially writing and print labels. Includes caption BELOW the graphic with short description of the figure. Includes phrase "modified after...." with citation in the caption if taken from a cited publication. Photos should indicate name and date of the photographer in the caption. Any axis are labeled and units are appropriately indicated. Paragraph explaining the graphic is included.

5 pts Pass - satisfactory
 3 pts Improvement needed - Some elements weak
 1 pts Unsatisfactory - very weak and/or much missing
 0 pts Missing

EQUATION

Electronic equation editor was used. Contains explanation of symbols and uses / indicates appropriate units. Paragraph explaining the equation is included.

5 pts Pass - satisfactory
 3 pts Improvement needed - Some elements weak
 1 pts Unsatisfactory - very weak and/or much missing
 0 pts Missing

REFERENCE PAGE

Accurately formatted literature citations in alphabetical order, sorted by first author

FIGURES, TABLES, EQUATIONS ASSIGNMENT

Use a 12- or 11-point standard font (Times, Arial, Helvetica), double spaced. Use letter size paper with 1 inch margins, single sided. Place header on each page. Use HEADINGS!

- TITLE PAGE: Full Title; Your Name; Course ID, Instructor, Date
- HEADER on EACH page (excluding Title Page): Abbreviated Title; Your Name; Course ID, Page number
- CREATE THE FOLLOWING:
 - ONE TABLE from YOUR RESEARCH DATA according to the outline below. Needs to have a concise caption ABOVE the table. Only horizontal, NO vertical lines. Columns and rows are appropriately labeled. Units are indicated.
 - ▶ Include basic statistical data: Mean, Standards deviation. Use stats to identify margin of error for precision and/or accuracy.
 - ▶ Write a paragraph explaining the data in your table
 - ONE ORIGINAL electronically prepared GRAPHIC from YOUR RESEARCH DATA according to the outline below. Make sure graphic is legible and reproduces well. Print can be smaller than text, with an 8pt size minimum. Use a minimum resolution of 300dpi. Make sure graphic is of HIGH quality and legible.
 - ▶ Place caption BELOW the graphic. Provide a short description of your figure within the caption.
 - ▶ Make sure axis are labeled and units are appropriately indicated.
 - ▶ Write a paragraph explaining the graphic.
 - ONE MODIFIED electronically prepared GRAPHIC or PHOTO from YOUR RESEARCH according to the outline below. Make sure images are legible and crisp and reproduce well. Print can be smaller than text, with an 8pt size minimum. Use a minimum resolution of 300dpi. Make sure graphic is of HIGH quality and legible. Place caption BELOW the graphic. Provide a short description of your figure within the caption.
 - ▶ Place caption BELOW the graphic. Provide a short description of your figure within the caption. Use the following citation phrases in your caption indicating the level of adaptation:
 - ▶ "Modified after" or "after" = possible redrafting, but no information change
 - ▶ "Modified from" = some changes to original graphic
 - ▶ "Adapted from" = radical changes to original graphic
 - ▶ Photos should show date and the name of the photographer.
 - ▶ Write a paragraph explaining the graphic.
 - ONE EQUATION for YOUR RESEARCH. Use an electronic equation editor. Equations should contain explanation of symbols used. A reader should be able to follow where your values or numbers come from. Indicate accordingly. Do NOT forget UNITS!
 - ▶ Write a paragraph explaining the equation.
- Add the Reference Page with your citations.
- SUBMIT COMPLETED PAPER THROUGH THE CANVAS COURSE PORTAL IN PDF FORMAT

For ALL assignments in GEL4970 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 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_4^{3-} , $a_g=9.8\text{m/s}^2$

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

GRAPHICS & TABLES - DATA INTERPRETATION

Your graphics and tables are often part of your data interpretation. Hence statistics may play an important role in the graphical representation of your data. Some statistical approaches to data interpretation you should know and possibly apply:

Correlation (R-value)

R-values as a measure of linear correlation are meaningless without p-values. The p-values indicate if your correlation is based on some random chance or if the R-values are an actual possible correlation. Therefore the p-values estimate the significance of your correlation:

$p > 0.05$: Even if R is high, there is NO significant linear correlation between x and y = High random chance

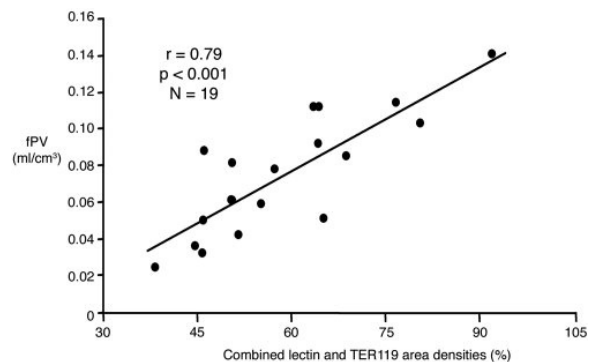
$p < 0.05$: Even if R is low, there IS a significant linear correlation between x and y = Low random chance

A p-value ≤ 0.05 indicates a 5% chance that R is random and is labeled “significant”

A p-value ≤ 0.01 indicates a 1% chance that R is random and is labeled “very significant”

A p-value ≤ 0.001 indicates a 0.1% chance that R is random and is labeled “highly significant”

Example Graphic:



Quick Statistics to Sort Data

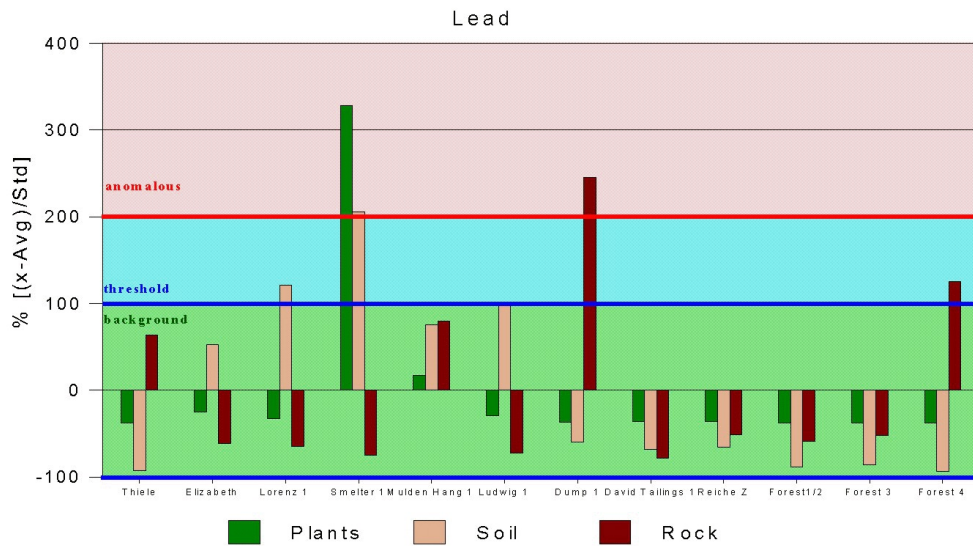
Background, Threshold, & Anomalous values

This approach is especially useful when working with geographic soil concentrations and larger analytical data sets. It is a common technique for reconnaissance assessments of geochemical mining exploration data.

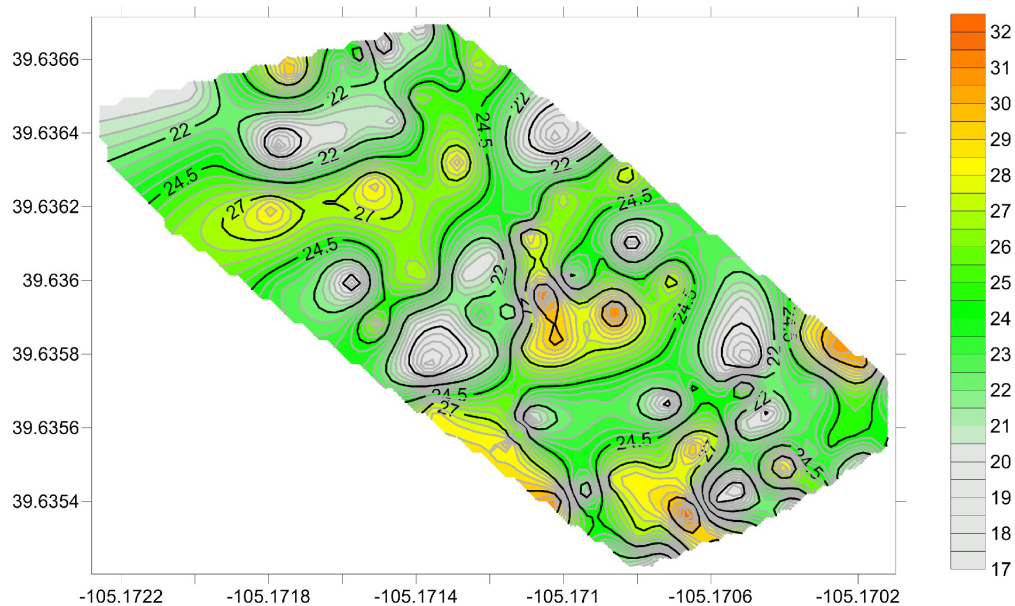
Calculate Mean & Standard Deviation (STD) from your data set. Then interpret your data as follows:

Background values	=	Mean \pm 1 STD
Threshold values	=	(Mean \pm 1 STD) TO (Mean \pm 2 STD)
Anomalous values	=	Anything beyond Mean \pm 2 STD

Examples of background, threshold, and anomalous graphics representations from undergraduate student work:



CPM (Geiger)
 Grey - below Background <19.92 CPM
 Green - Background 19.92 - 27.91 CPM
 Yellow - Threshold 27.91 - 31.90 CPM
 Red - Anomalous > 31.90 CPM



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 summary and examples 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.

CAPTIONS

Captions are required for ALL your tables and figures

CAPTIONS in general:

- Table captions go ABOVE Table
- Figure captions go BELOW Figure

CAPTION CONTENT - ALL captions need

1. Sequential Number or Counter, such as Figure 1, Figure 2, etc. or Chapter Counter Figure 3.2 or the table equivalent Table 1, Table 2, etc.
2. Descriptive Title
3. Descriptor, explaining what the graphic or the table represent
4. Citation & Source. As already explained, graphics or tables that are not your own should have the appropriate citation phrase at the end of the caption: "Modified after" or "after" = possible redrafting, but no information change; "Modified from" = some changes to original graphic; "Adapted from" = radical changes to original graphic
5. **Special Note: NEVER just copy a Figure or Table from another source to paste into your work without attribution. If copyrighted, you need permission of the original author. Therefore, it is BEST to modify the original somewhat. Remember, ALWAYS, ALWAYS, ALWAYS cite the work of others!!!!**

Examples of graphics and tables with appropriate captions:

Table 3 - Comparison of calculated vs. standard molecular weight of clays used in calculating sedimentary minerals.

Clay	Idealized composition	Calculated molecular weight	Standard Molecular weight
Illite	$3.7\text{SiO}_2 - 0.7\text{Al}_2\text{O}_3 - 0.1\text{Fe}_2\text{O}_3 - 0.3\text{MgO} - 0.3\text{K}_2\text{O} - 2.7\text{H}_2\text{O}$	398.64	389.34 ¹
Sericite	$3\text{SiO}_2 - 1.5\text{Al}_2\text{O}_3 - 0.5\text{K}_2\text{O} - 1\text{H}_2\text{O}$	398.30	398.71 ²
Chlorite	$3\text{SiO}_2 - 1\text{Al}_2\text{O}_3 - 0.6\text{Fe}_2\text{O}_3 - 3.7\text{MgO} - 3.9\text{H}_2\text{O}$	597.41	595.22 ³
Mont. / Smectite	$4\text{SiO}_2 - 1\text{Al}_2\text{O}_3 - 0.1\text{Na}_2\text{O} - 0.1\text{CaO} - 10.9\text{H}_2\text{O}$	550.46	549.07 ³
Kaolinite	$2\text{SiO}_2 - 1\text{Al}_2\text{O}_3 - 0.05\text{TiO}_2 - 2\text{H}_2\text{O}$	262.15	258.16 ³

Sources for molecular weight and whole rock geochemistries: ¹ Gaines *et al.* [15]; ² O'Donoghue [16]; ³ Duda and Rejl [17] used

Clinochlore for Chlorite and Montmorillonite for Mont. / Smectite;

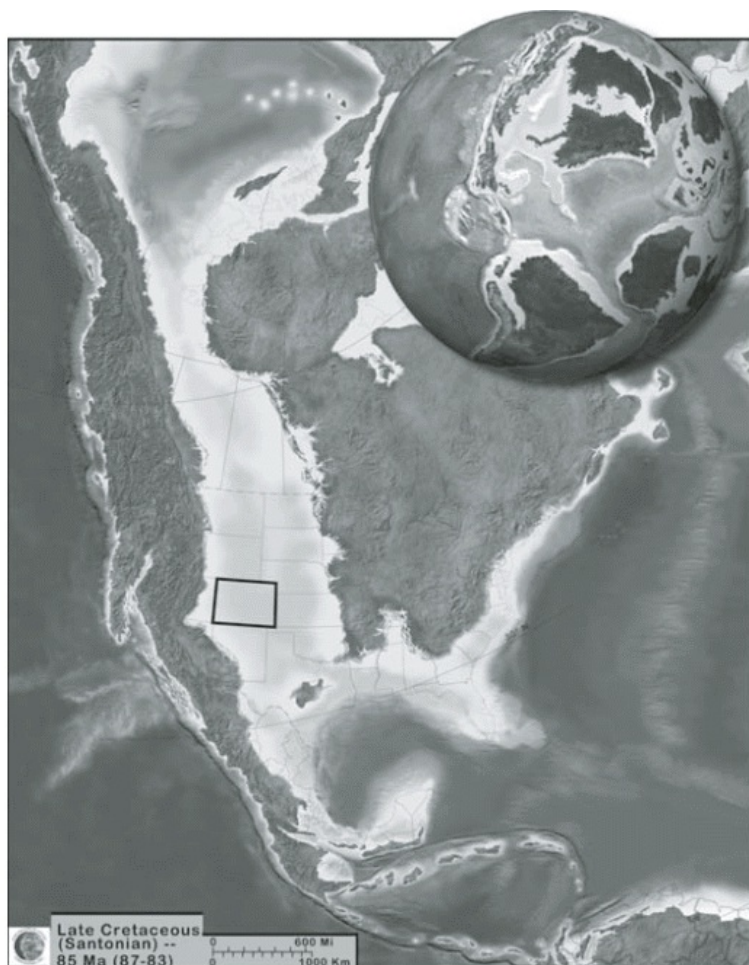
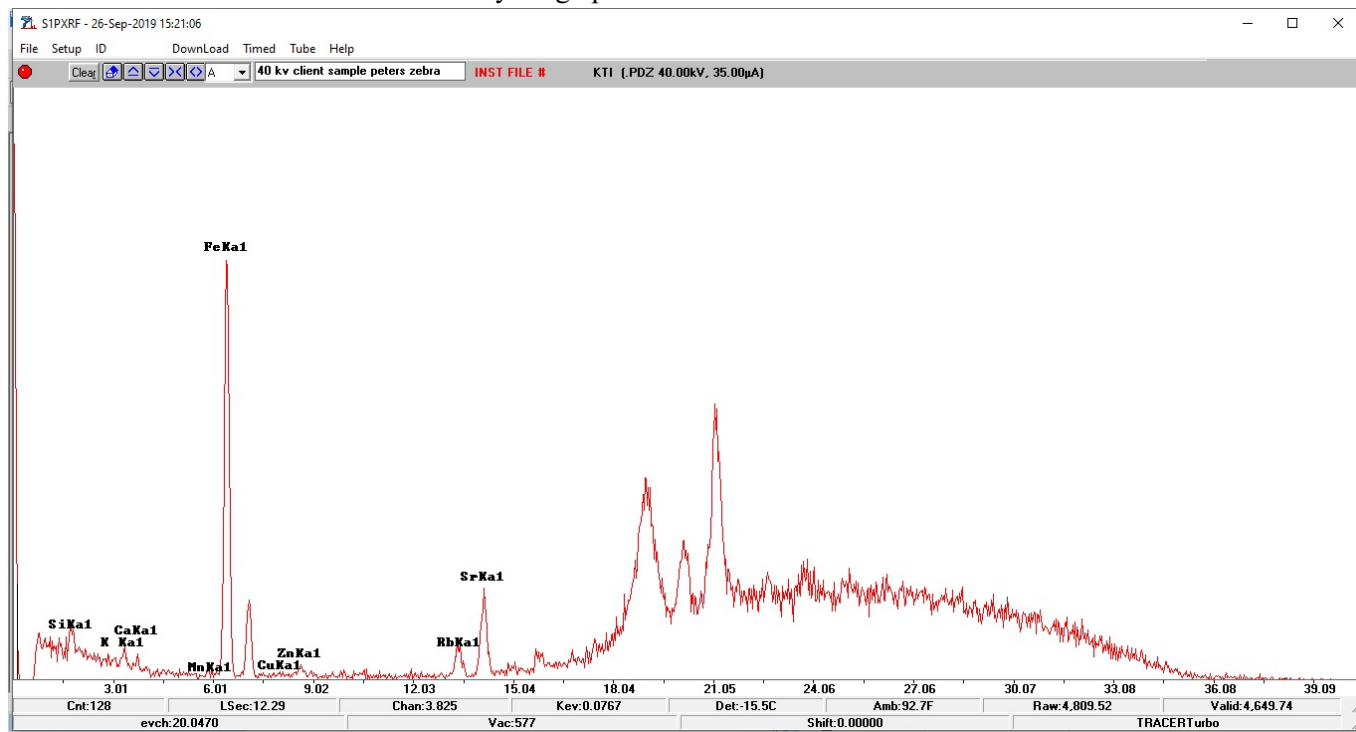


Figure 2. Map of Late Cretaceous Western Interior epeiric seaway (85 Ma), western hemisphere projection with position of Colorado indicated; globe insert 90 Ma. Modified from Blakey, R. Globe © 2006, Map © 2013 Colorado Plateau Geosystems, used with permission.

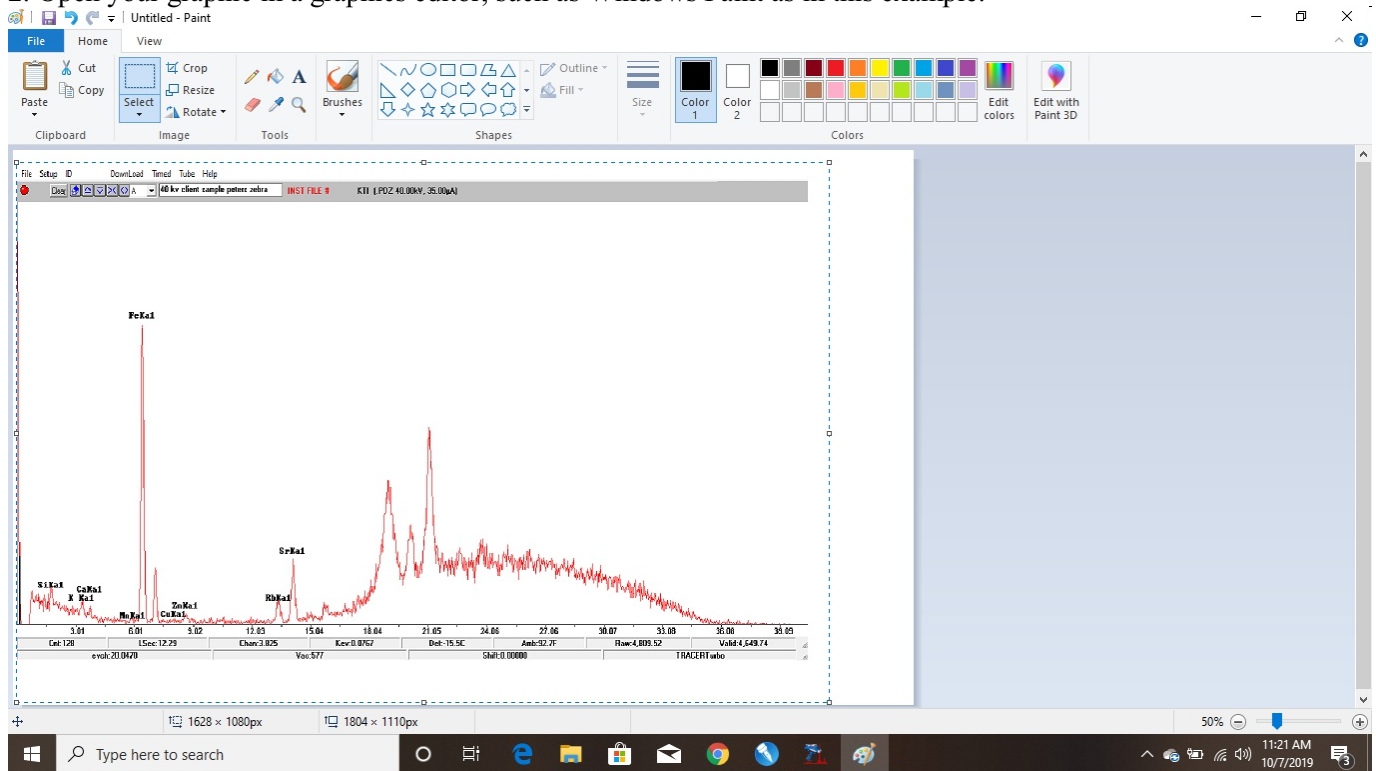
HOW TO PREPARE or ADAPT A GRAPHIC

Example of graphic manipulation for XRF data processed through the S1PXRF software:

1. Obtain the complete data and label the energy peaks. **Notice:** The labels are too small for report presentation and much information is redundant. Therefore your graphic needs to be edited.

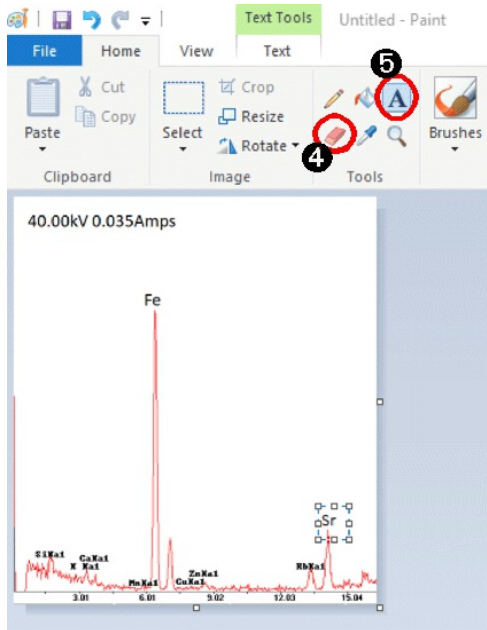
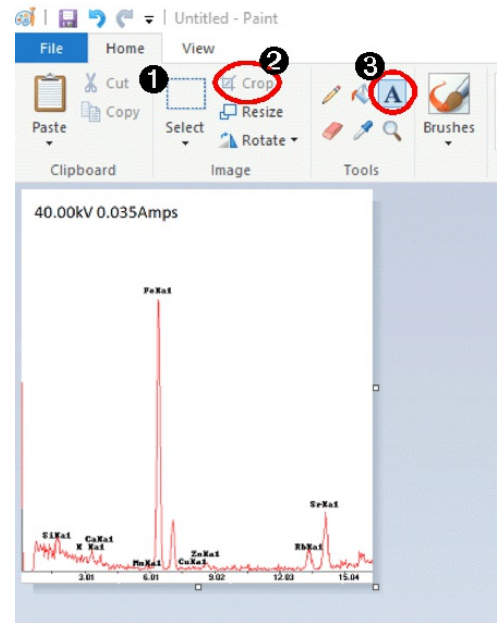


2. Open your graphic in a graphics editor, such as Windows Paint as in this example:



3. Use the Crop Function to eliminate any superfluous part in the graphic by first selecting the area to be maintained (1) and then clicking the crop symbol (2).

4. Add any relevant information, that was cut during cropping such as voltages for the obtained spectra by using the Text Function (3). Make sure that the font is large enough to be crisp on your final graphic.



5. Replace any inadequate labeling (too small, too confusing) by either

(a) erasing the original label through the Erase Function (4) and then adding new labels through the Text Function (5) [shown on the left for Fe and Sr]

or (b) by saving / exporting the original XRF graph without the energy peak labels, cropping it and then adding the labels later using the Text Function in the graphics editor (5).

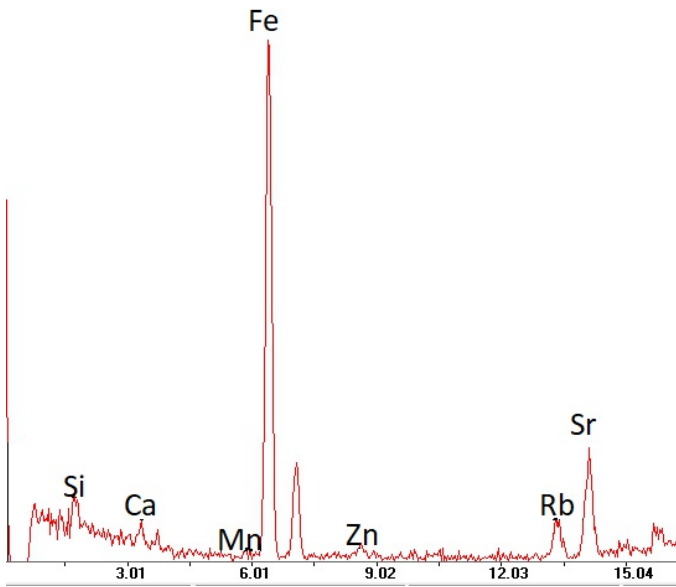
6. Once completed, save your graphic as a .bmp or .tiff file. These are considered “loss-less” graphic formats. Try to avoid .jpg, because the compression algorithms will lose a little resolution every time you edit and re-save a jpg file. Your final product should be of a good enough resolution (min. 300dpi) to look crisp when printed.

40.00kV 0.035Amps

Example of a finished graphic.

Note: The x-axis labels should have been edited as well to show at least a 10pt font size when printed.

Comparison: 12pt 10pt 8pt 6pt



TABLES, FIGURES and 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.

Using existing graphics from other publications

Citation Language in Captions

“Modified after” or “after” = possible redrafting, but no information change

“Modified from” = some changes to original graphic

“Adapted from” = radical changes to original graphic

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

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.

GRADING and NOTATIONS

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</u> at the same speed. Rocks are composed of many <u>many</u> <u>minerals</u> <u>mixed</u> .
Style: incl. paragraph, repetitive expressions / words, erroneous expression / words, sub- or superscription, unprofessional style, word insertion	<i>Para.</i> ... in the geologic sciences.¶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 . I was <u>investigating</u> 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> , it is 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>