UR GEOLOGY: Literature Review

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!**

12 pts Pass - All elements present, professional and satisfactory
10 pts Small Improvement needed - One element weak
8 pts Improvement needed - Two elements weak
6 pts somewhat unsatisfactory - Three elements weak and/or some omissions
4 pts unsatisfactory - Several elements weak and/or omissions
2 pts very unsatisfactory - multiple elements weak, major 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 and a minimum of 3 paragraphs which include accreditation of researchers, brief summary of the research, how the published work pertains to your research, how your research will be different from or expound on these published approaches, critique of previous work identifying controversies or limitations, and an accurately formatted Reference Page with a minimum of 6 publication & 4 web based references!

/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.

2 pts Pass - satisfactory
1 pts Improvement needed - Some elements weak
0 pts Fail - unsatisfactory / missing

ACCREDITATION OF RESEARCHERS

A short qualifier within a sentence showing education, current employment affiliation, and/or other pertinent contributions for researchers cited

2 pts Pass - satisfactory
1 pts Improvement needed - Some elements weak
0 pts Fail - unsatisfactory / missing

BRIEF RESEARCH SUMMARIES

The summaries are very brief but concise enough to give the gist of the research, literally a summary of the abstract.

2 pts Pass - satisfactory
1 pts Improvement needed - Some elements weak
0 pts Fail - unsatisfactory / missing

CONNECTION TO OWN RESEARCH

Brief, but concise explanation on how each of the published works cited may pertain to your research

2 pts Pass - satisfactory
1 pts Improvement needed - Some elements weak
0 pts Fail - unsatisfactory / missing

DIFFER / EXPOUND IN RELATION TO OWN RESEARCH

Brief, but concise explanation on how your research will expound, be better or differ from the published works cited.

/30

CITATIONS REFERENCE PAGE - one or multiple point deduction per infraction. -3 per missing

Correctly formatted USGS style reference page with a minimum of 6 publication & 4 web based references. Deduction -3 points for each missing reference.

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 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.

YOU WILL NEED TO FIND, IMPORT INTO ZOTERO AND REPORT ON REFERENCES PERTAINING TO YOUR UNDERGRADUATE RESEARCH FOR THIS ASSIGNMENT AS FOLLOWS:

☐ 6 Publication References, such as peer-reviewed journal articles, books, data bases or other printed and vetted publications. Use you Auraria Library Login and Auraria's Google Scholar search, which will allow you to use / download many print references.
NOTE: In general, textbooks are NOT accepted as citable sources unless they are specific (upper division graduate type with citations). Neither are popular magazines, such as National Geographic! Stick with peer-reviewed geoscience publications.

☐ 4 vetted web based references, software, or data bases, e.g. MinDat.org or RRUFF.org
NOTE: Wikipedia is NOT an acceptable source. But it can be used to find credible sources in the Wikipedia References section on the bottom of each Wikipedia article.

WRITING A LITERATURE REVIEW

A scientific literature review is a critical account of what has been published on a topic by accredited researchers. It should improve your topic knowledge, provide new insight on your topic to others, demonstrate your literature searching abilities, demonstrate your critical analysis skills, and demonstrate your communication/writing skills. Your literature review will become part of your final course product.

A scientific literature review is a preamble and introduction to your own research and is an integral part of your final product. Thus, it should be explicitly pertinent to your research and explain why. A citation page is a large part of your literature research. An example of a literature review as part of a publication is given below.

Understand that a literature review is NOT an (English) essay. It is likewise NOT just a summary of each research article that you read, even though a brief summary is a small part of the whole assignment. Furthermore, a scientific literature review is NOT based on your personal opinion or is biased towards your opinion. This is a frequent danger when addressing environmentally related issues. Moreover, it is NOT a chronological history of events in your research area or just a list of references or sources you have found!

Literature Review Outline

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

☐ Body: Use Headings! Paragraphs are to consist of a minimum of 3 sentences. Use citations!

- ☐ Address the following:
  - ☐ A short synopsis / introduction of your research topic / question
  - ☐ Brief (very brief) summary of the cited research (Literally a summary of the Abstract)
  - ☐ Accreditation of researchers
  - ☐ How the published work pertains to your research
  - ☐ How your research may be different from or expound on these published approaches
  - ☐ Possibly critique the work, identify controversies or limitations!

☐ The last page in your **Literature Review should be an accurately formatted Reference Page**! Cited literature should be in alphabetical order, sorted by first author. Use a hanging indent style format as shown in the example below. This literature review should contain a minimum of 6 publication & 4 web based references! **It must be in USGS citation format!**

☐ SUBMIT COMPLETED PAPER THROUGH THE CANVAS COURSE PORTAL IN PDF FORMAT

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=9.8m/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

GRADING and NOTATIONS

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	|	Isometric crystals are also isotropic Here light propagates at the same speed.
words, transpositions	| |	Rocks are composed of many ~~many~~ minerals mixed.
Style:		
incl. paragraph,	*|Para.*	... in the geologic sciences.¶Near the end of the 19th a new theory ...
repetitive expressions / words	*|||rep*	... is a light colored mineral. These light colored minerals are often light...
erroneous expression / words,	|	Stalactites hang from the sealing? of a limestone cave.
sub- or superscription,	*|sup*	The density of quartz is 2.65 g/cm3.
unprofessional style,	| |	I was investigating the outcrop with my group.
word insertion	|	Sodium sulfate forms a chalky, ~~incoherent~~ precipitate. *amorphous?*
Sentence:		
incl. grammar,	|	The density of gold is greater then? the density of silver.
run-on,	|	Pyrite has a symmetrical crystal structure, it is cubic.
strings of nouns	| |	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~~

Example of a Literature Review in Geology:

The Geologic Barrier of Landfills

Surface and subsurface geology as a natural restraint for contaminant transport is of primary importance when selecting landfill and waste disposal sites. While most landfills are developed as multi barrier systems, the geologic barrier represents the final contact between the landfill and the environment. A geologic barrier should in its broadest sense seal the landfill and impede the transport of pollutants. The general requirements for effective barriers are: (a) low permeabilities, (b) high retardation capacities regarding mobile contaminants, and (c) sufficient vertical and lateral extent.

Clays and mudstones are generally selected because they appear to be ideally suited as waste disposal barriers. They naturally occur with a sufficient vertical and lateral extent. Further favorable characteristics are relatively low hydraulic conductivities often coupled with high plasticity, which leads to self healing of fractures. Undesired secondary flow along fissures within rock units may also be inhibited by the self healing properties. Furthermore, clays generally exhibit high sorption capabilities, thus retarding the transport of a variety of pollutants.

However, while the indicated physical requirements seem to be adequate in describing an effective geologic barrier, current observations indicate possible barrier failures under certain circumstances. Wilfried Schneider and Jan-Jürgen Göttner (1991), both subsurface contaminant migration experts at the Bundesanstalt für Geowissenschaften und Rohstoffe, Germany, conclude that landfills may contaminate the groundwater even with optimal natural and engineered barriers. They further explain that quantitative predictions of contamination as a function of space and time appears to be extremely difficult, because interfering physical, chemical and biological processes exhibit very complex subsurface transport conditions of contaminants. Geotechnical experiences over the last few years have shown that physical criteria of soils and rocks are inadequate to evaluate landfill barriers.

Today, geochemical investigations of chemical reactions in clay units in conjunction with various test substances are the preferred approach as indicated by Schneider and Göttner (1991) and Eva Ustrich (1991), a Ph.D. student at the University of Regensburg, Germany. Therefore, estimation of long term retardation stabilities of clays depends highly on sorption and structural properties of the clay mineralogy. For example, clay samples containing high amounts of illite-kaolinite exhibit poor sorption capabilities but are chemically resistant. Ustrich (1991) further explains that samples with higher proportions of smectites display good sorption characteristics but are chemically unstable in the presence of certain contaminants. This fact is also recognized by Ruth Hassenpath (1988) in her doctoral dissertation at the Eidgenössische Technische Hochschule (ETH) Zürich, a public research university in Zürich, Switzerland. Therefore, hydraulic conductivity can no longer be considered the single criteria to determine transport and retardation of contaminants within such geologic units.

Charles Shackelford (1991), a professor at the department for Civil & Environmental Engineering at Colorado State University, Fort Collins, CO, argues that diffusion could be a significant, if not a dominant transport process in many waste disposal situations. His findings strongly indicate that in the absence of coupled flow processes, the best contaminant barrier that can be built is one in which diffusion controls the transport of the contaminant. An earlier research by Shackelford in conjunction with David Daniel, a researcher at the University of Texas, Department of Civil Engineering, Austin, TX also underlines diffusion control parameters in subsurface contaminant transport systems [Daniel & Shackelford (1988)]. Thus processes of sorption and diffusion do play an important part in contaminant transport through geologic barriers.

While recognized by science, there is currently no acknowledged standardized procedure for geotechnical investigations using diffusion and absorption as evaluation for subsurface contaminant transport. A promising attempt was made by R. Kerry Rowe and his research team [Rowe *at al.* (1999)] in the Civil Engineering program at the department of Engineering and Applied Science at Queens University, Kingston, Ontario, Cananda as their research suggested assessment limits to geosynthetic clay liners. They indicate that current testing approaches for lithologic samples from natural geologic barriers are needed.

Considerable research in diffusive contaminant transport has focused on clay and clay minerals. However, the majority of studies dealt with disturbed samples, e.g. compacted or artificially engineered clay liners in waste disposal sites. Only a very limited number of researchers tackled studies with undisturbed samples, such as Kurt Czurda and Jean-Frank Wagner (1986), researchers at the Department of Applied Geology, Karlsruhe University, Karlsruhe, Germany; A.J. Cook (1988), a member of the Fluid Process Research Group at the Department of Environment at the British Geological Survey, Keyworth, UK; and Schneider and Göttner (1991). Other research teams that have attempted testing of diffusive contaminant transport through undisturbed clay samples is indicated by F.S. Barone *et al.* (1992) at the University of Western Ontario, Canada and the European team of B. Allard *et al.* (1991) from the Department of Water and Environmental Studies, Linköping University, Linköping, Sweden.

In addition, analyses of pollutant diffusion through clays often focus on single ionic components or organic compounds in unrealistically elevated concentrations (Barone *et al.*, 1992). Very few investigations (Shackelford *et al.*, 1989; Shackelford & Daniel, 1991) attempted the use of artificial leachates in representative concentration, incorporating the probable interactions of various chemical components in true leachates.

Bibliography

Allard, B., Håkansson, K., Karlsson, S., and Sigas, E., 1991, A field study of diffusion controlled migration of copper, zinc and cadmium in a clay formation. Water, Air, and Soil Pollution 57-58, p. 259-268.

Barone, F.S., Rowe, R.K., and Quigley, R.M., 1992, A laboratory estimation of diffusion and adsorption coefficients for several volatile organics in a natural clayey soil. Journal of Contaminant Hydrology 10 (3), p. 225-250.

Cook, A. J., 1988, A desk study of surface diffusion and mass transport in clay. British Geological Survey Technical Report WE/88/34.

Czurda, K., and Wagner, J.F., 1986, Duffusion und Sorption von Schwermetallen in tonigen Barrieregesteinen. In: Rentz, O., Steirth, J., Zillox, L (Eds.). Premiere colloque scientifique des Universities du Rhin superieur; Recherches sur l'environnement dans la region. P. 785-793.

Daniel, D.E. and Shackelford, C.D., 1988, Disposal barriers that release contaminants only by molecular diffusion. Nucl. Chem. Waste Manage., 8, p. 299-305.

Hassenpath, R., 1988, Bodenmechanische Veränderungen reiner Tone durch Adsorption chemischer Verbindungen (Batch- und Diffusionsversuche). Mitteil. Inst. Grundbau & Bodenmechanik, Nr. 134, ETH Zürich.

Rowe, K.R., Lake, C.B., and Petrov, R.J., 1999, Apparatus and procedures for assessing inorganic diffusion coefficients for geosynthetic clay liners. Geotechnical Research Centre Report, GEOT-2-99.

Schneider, W. & Göttner, J.J., 1991, Schadstofftransport in mineralischen Deponieabdichtungen und natürlichen Tonschichten. Geol. Jb., C 58, Hannover Schweizbart.

Shackelford, C.D., 1991, Laboratory diffusion testing for waste disposal - A review. J. Contam. Hydrol., 7, p. 177-217.

Shackelford, C.D., 1993, Contaminant Transport. In: Daniel, D.E. (Ed.), Geotechnical Practice for Waste Disposal, Chapmann & Hall, p. 31 - 65.

Shackelford, C.D., and Daniel, D.E., 1991, Diffusion in saturated soils: I. Background. ASCE J. Geotech. Eng., Vol. 117(3), p. 467-484.

Shackelford, C.D., Daniel, D.E., and Liljestrand, H.M., 1989, Diffusion of inorganic chemical species in compacted clay soils. Journal of Contaminant Hydrology, Vol. 4, No. 3, p.241-273.

Ustrich, E., 1991, Geochemische Untersuchungen zur Bewertung der Dauerbeständigkeit mineralischer Abdichtungen in Altlasten und Deponien. Geol. Jb., C 57, Hannover Schweizbart.