

Ministry of Higher Education and Scientific research



Department of: Earth Sciences and Petroleum

College of: Science

University of: Salahaddin

Subject: Ore Deposits

Course Book: Year 4

Lecturer's name: Idrees Nadir Ahmed (Ph.D.)

Academic Year: 2023/2024

Course Book

1. Course name	Ore deposits
2. Lecturer in charge	Idrees N. Ahmed (Ph.D.)
3. Department/ College	Department of Earth Science and Petroleum/ College of Science
4. Contact	e-mail: idrees.ahmed@su.edu.krd Tel: 07504643955
5. Time (in hours) per week	Theory: 2 Practical: 8
6. Office hours	3-4 hours
7. Course code	
8. Teacher's academic profile	<p>I graduated from University of Salahaddin on 2002, and then I got the M.Sc. in geochemistry from the same university. I was engaged to work as an assistant Lecturer on 2010 at geology department. I hold Ph.D. in geochemistry/ore deposits on 2020 from salahaddin University. During my work I carried out tens of published researches and scientific reports.</p> <p>From 2010 till now I gave many courses in the Department of Geology such as Optical Mineralogy, Petrology (Ign. And metamorphic rocks), Geochemistry, Ore Geology.</p>
9. Keywords	Ore, Fluids, Texture
10. Course overview:	
<p>The course will give students a better understanding of ore bearing fluids, migration of these fluids then the deposition of the ores, wall rock alteration and gangue, paragenetic sequence and zoning, geothermometry to understanding the genesis of the mineral deposits, and finally the classification of ore deposits.</p>	
11. Course objective:	
<p>The principal objective of the course is to provide an overview of geology of metallic mineral deposits.</p> <p>The course will give students a better understanding of ore bearing fluids, migration of these fluids then the deposition of the ores, wall rock alteration and gangue, paragenetic sequence and zoning, geothermometry to understanding the genesis of the mineral deposits, and finally the classification of ore deposits.</p>	
12. Student's obligation	
<p>The student's obligation during the course is attendance in the class for two hours for studying the theoretical part of the course the he applied it in the laboratory (about two hours). There are many tests before the beginning of the labs.</p>	
13. Forms of teaching	
<p>Different forms of teaching will be used to reach the objectives of the course: power point presentations for the titles and definitions and summary of conclusions, all figures that related to the lectures. Furthermore, students will be asked to prepare research papers on selective topics, these topics need to be from printed</p>	

media or internet. There will be classroom discussions at the last ten minutes of the lecture.

To get the best of the course, it is suggested that you attend classes as much as possible, read the required lectures before the time of lecture, teacher's notes regularly as all of them are foundations for the course. Try as much as possible to participate in classroom discussions.

14. Assessment scheme

The students are required to do an exam after each five lectures. The exam has 50 marks (practical 35, theory 15), the attendance, classroom activities, and home works are very important. There will be a final exam on 50 marks (theory) so the final grade will be upon the following criteria:

Mid-semester exam: 15 Theoretical+ 35 Practical

Final exam: 50 Theoretical

15. Student learning outcome:

In the last years many oil companies come to Kurdistan Region for oil exploration and production, in a wide areas along the region, so several geologist are followed these companies and others are work with the geological survey where the mineral resources are available in the region. Some of the students after graduation they employed in water resources companies in public and private sectors.

16. Course Reading List and References:

Required books:

Park, F. P. Jr. and Mac Diarmid, R.A., 1975: ***Ore deposits***, Freeman and Company, San Francisco, 530p.

Guilbert, J. M. and Park, F. P. Jr., 1986: ***The geology of ore deposits***, Freeman and Company, New York, 985p.

Evans, A.M., 1987: ***An introduction to ore geology***, 2nd Edition, Blackwell Scientific Publications, 358p.

Evans, A.M., 1993: ***ore geology and industrial minerals, An introduction***, 3rd Edition, Blackwell Scientific Publications, 339p.

The core materials of the course consist of the above books and lectures notes.

Students are encouraged to search for the Journals that may help them in this course, such as:

Economic Geology, Geochemical Exploration, Chemical Geology and Mineralum Deposita.

Students are encouraged to search for the Journals and internet that may help them in this course, such as:

1) Journal of *Mineralum Deposita*.

2) Journal of *American Mineralogists*

3) The Image: <http://www.theimage.com/index.html>

4) The mineral gallery: <http://mineral.galleries.com.default.html>

5) The mineralogical society of America: [http://www. Minsocam.org/](http://www.Minsocam.org/)

17. The Topics:

Lecturer's

	name
<p><i>Week 1:</i> Introduction, course outline.</p> <p><i>Week 2:</i> What is an ore deposit?</p> <p><i>Week 3:</i> Shapes of Ore Bodies and their Host Rocks</p> <p><i>Week 4:</i> ore genesis</p> <p><i>Week 5 and Week 6</i> Textures and wall rock alteration</p> <p><i>Week 7</i> Examination</p> <p><i>Week 8, 9, 10 and 11</i> <i>The Classification of Ore Deposits</i></p> <p><i>Week 12</i> Geothermometry: Fluid inclusion studies, synthesis of minerals, determination of melting points, and determination of inversion points and stability ranges.</p> <p><i>Week 13</i> Geothermometry: Determination of exsolution points, studies of mineral textures and habits, determination of the conditions necessary for ionic substitutions for ionic substances, and stable isotope studies.</p>	<p>Dr. Idrees N. Ahmed 2 hours 1/10/2023</p>
18. Practical Topics	
<p><i>Week 1:</i> Definition the components of the reflected (ore) microscope.</p> <p><i>Week 2:</i> Preparation of polished sections.</p> <p><i>Week 3, 4, 5:</i> Study of optical properties of ore minerals under plane polarized light; reflectivity, color of reflection, bireflectance, internal reflection, hardness.</p>	<p>Dr. Idrees N. Ahmed M.Sc. Sawsan N. Abdulrahman (2hrs* 4groups) 1/10/2023</p>

Week 6: Examination

Week 7, 8, 9: Study of optical properties of ore minerals under crossed polars.

Week 10, 11: Study the replacement textures of the ore minerals.

Week 12, 13: Study the open space filling textures of the ore minerals.

Week 14: Study the colloform growths of the ore minerals.

Examination

a) Ore minerals, b) Supergene processes, c) Skarn, d) Dolomitization, e) Ladder veins

Q2: Give the reason for the following: (16 marks)

- a)** The mobile elements (H₂O, CO₂, O₂, H₂) play an important role in the transportation of metals.
- b)** Meteoric waters are important in the ore formation.
- c)** The migration of ore-bearing fluids at depth through dense materials to be more difficult by colloidal theory.
- d)** The first crystals that form along the sides of an open vein are fine grained.

Q3: List with illustrations the more reliable criteria of the open space filling textures (only six). (9 marks)

Q4: Complete the following sentences with a proper words or statements. (34 marks)

- a)** Ore bearing fluids can be divided into many categories some of them are:
1..... 2..... 3.....
- b)** The study of inclusion can give acknowledge to: 1.
2.....
- c)** Imperfections of solid phase may result from 1.....

2.....

d) The type of ground preparation depends on 1.....

2.....

e) The minor movement along curved or irregular fault surfaces cause and.....

f) There are many reasons to study the temperature of ore deposition 1.....

2.....

g) Texture interpretation can assist in 1..... 2.....

3.....

h) During differentiation, more mafic parts of magma are enriched in elements.

Q5: The following sentences are either true or false. Mark (/) in front of the right and (X) in front of the false, and correct the false. (21 marks)

a) Connate waters contain lower percentages of heavy isotopes of S and O than magmatic water.

b) All thermal springs have relation with volcanic activity.

c) Magma generally moves upward areas of lower pressure and temperature.

d) In epigenetic ore deposits, there are premineralization changes.

e) The lower sulfur ratio seems to have favored the stability of the simple Cu and Fe sulfides.

f) The study of inclusions is easier and quicker in opaque minerals than in transparent minerals.

g) Light colored octahedral crystals of fluorite are produced at high temperature.

20. Extra notes:

None

21. Peer review

Assistant Prof. Dr. Hikmat S. Mustafa

