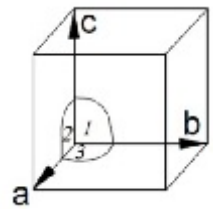


GEL 3050 - Mineralogy - Optical Mineralogy

Disclaimer: These reviews are courtesy of the instructor. While care has been taken to include everything that might be tested, omissions or oversights may have occurred. The instructor shall NOT be liable for any missed answer on your part just because the topic is not explicitly mentioned. It is still the STUDENT'S RESPONSIBILITY to know and be able to use concepts addressed during lectures, labs, or required texts.

Crystallography Exam Review Sheet: *(Things I need to know....)*

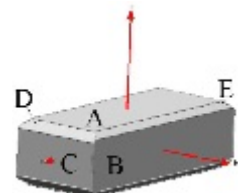
1. Know the definition of ALL the crystal classes: Isometric, Tetragonal, Orthorhombic, Monoclinic, Triclinic, Hexagonal, Hexagonal-Rhombohedral
 - a. Sample question: If a crystal has the following attributes, $a = b \neq c$ and $I = 2 = 3 = 90^\circ$, to which crystal system does it belong?
2. Be able to identify crystal classes from models, pictures and real life specimens.
3. Understand "coordination numbers". How are they derived? How are they used to predict unit cell geometry?
4. Be able to identify basic unit cell shapes.
5. Be able to predict unit cell geometries using appropriate tables and simple calculations.
 - a. Sample question: Use the depicted tables to solve the following: The mineral Galena would have what unit cell geometry?

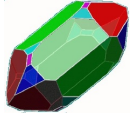


Element	ppm	Valence	IR	Element	ppm	Valence	IR	Element	ppm	Valence	IR
O	445 000	-2	1.40	Pb	13	+2	1.32	Ca	46 600	+2	0.99
Al	83 000	+3	0.54	SO ₄		-2	2.30	CO ₃		-2	1.50
Na	22 700	+1	1.02	Cl	127	-1	1.81	S	340	-2	1.84
F	544	-1	1.33	Mg	27 640	+2	0.72	Si	272 000	+4	0.40

Coordination Crystal Packing	Radius Ratio - R_{cation} / R_{anion}	CN
Hexagonal or Cubic	> 1.000	12 (closest packing)
Cubic	0.732 - 1.000	8
Octahedral	0.414 - 0.732	6
Tetrahedral	0.255 - 0.414	4
Triangular	0.155 - 0.255	3

6. Be familiar with Miller indices.
7. Be able to name crystal faces using the h,k,l designations from pictures and models.
 - a. Sample question: *Crystal axis a is to the left, axis b is to the right and axis c is up.* Which of the pictured crystal faces has the designation 011?

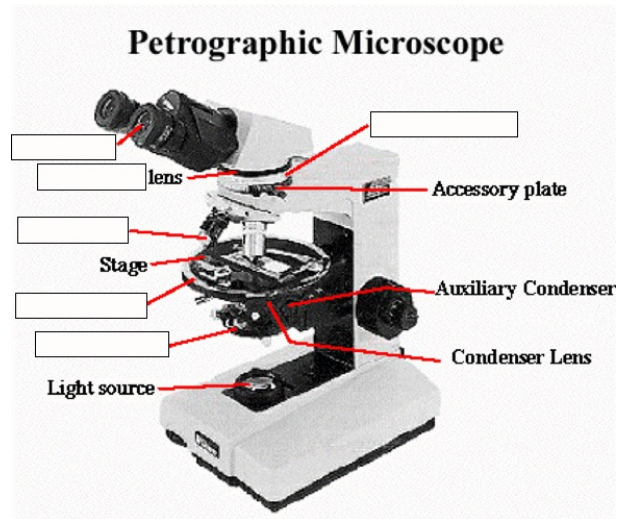




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8. Understand Steno's law and know how to measure crystal face angles using the optical microscope and goniometer.
9. Know how to use a vernier to read exact goniometer angles.
10. Understand the chemistry and conditions of crystal growth such as temperature dependant over and under saturation of the growing medium.
11. Be familiar with thin sectioning procedures and standards of thin section thickness.

12. Be familiar with the PLM and know all its parts and pieces. *(Fill in the blanks in the graphic for practice)*



13. Know the rules when operating the PLM!

14. Be able to explain "polarized" light. Why are there two polarizers on the PLM, what is their purpose?

15. Why is it possible to identify minerals in thin section?

16. Be able to define Index of Refraction.

17. What are interference colors? How are they produced? Is there a difference between "1st order", 2nd order, 3rd order" and so forth interference colors? Why?

18. What is birefringence? How and why is it produced?

a. **Sample Question:** In an anisotropic medium the fastest light ray has an n of 1.321 and the slowest an n of 1.400, what is the birefringence of the optical material?

19. How can you identify an "isotropic" crystal structured mineral in thin section under the PLM?

20. Be able to identify quartz, plagioclase and orthoclase in a thin section (Use the graphic as an identification guide)

Mineral Name	Mineral Name	Mineral Name
<input style="width: 100px; height: 20px;" type="text"/>	<input style="width: 100px; height: 20px;" type="text"/>	<input style="width: 100px; height: 20px;" type="text"/>
<small>Plane Polarized Light View</small>	<small>Plane Polarized Light View</small>	<small>Plane Polarized Light View</small>
<small>Crossed Polarizers View</small>	<small>Crossed Polarizers View</small>	<small>Crossed Polarizers View</small>