Lab 13: Common Ore Minerals (100 pts)

Introduction

Humans depend on many different natural resources including foods, building materials, metals and chemicals. Ore deposits are an important natural resource. Simply put, an "ore' is an occurence of minerals containing a sufficient concentration of desirable elements so that they can be extracted profitably. Therefore an ore deposit usually has a much higher concentration of a desired element or elements as compared to normal rocks of the earth's crust.

Ore deposits are unquestionably produced by the same physical and chemical processes that produce other rocks, however, these processes may reach unusual stages of evolution or take place in unusual environments. Although ore deposits are relatively rare in the earth's crust, a great variety of ore minerals are possible because of concentrations of unusual *combinations* of elements. However, relatively few of these ore minerals produce the majority of the mineral extraction. We will concern ourselves with only a few of the more common types of ore minerals in this laboratory exercise.

Preparation & Procedure

To complete these study questions, you will need your Mineral Identification Table. You will also want to refer to your set of mineral unknowns, available in the classroom or study room. You should be thoroughly familiar with the common ore minerals found in your mineral set (# 33-45), and have read the chapter in your textbook on economic minerals.

Part 1 (20 pts): Correctly identify the mineral unknowns in your lab set (be sure your instructor has checked them over before proceeding!)

Part 2 (60 pts): Once you have correctly identified the mineral unknowns for this lab exercise, answer the following questions. Note that to answer these questions, you will probably need to make use of your Mineral Identification table, your book and possibly the internet!

Questions

1. Complete the table on the next page by placing the name or names of the ***ore minerals*** you have studied in the right hand column. Use your mineral identification tables to check the chemical formulas for the desired element. If you are unsure about the chemical symbol of a given element, refer to a periodic table of the elements available in the classroom or in your textbook.

Question 1 Table (*24 pts*)

Element	Origin of Mineral Deposit	Ore Mineral
Iron	Most of the iron mined today was deposited as iron-rich sedimentary rock in the oceans of Proterozoic time (1-2 b.y. ago). These rocks are called banded iron formations (BIF) and consist of interlaminated hematite and chalcedony. One of the world's great outcrops of BIF crops out in the Lake Superior region. Most of the iron ore that is actually mined is taken from the weathered zone where weathering processes have further enriched the material in the element iron.	_____ _____ _____
Aluminum	Aluminum is one of the most common elements in the earth's crust. However, it is exceedingly expensive to extract aluminum from most of the minerals in which it is common. Under tropical conditions, weathering breaks down feldspars and other aluminum bearing minerals into aluminous clay minerals, which in turn become hydrous oxides of aluminum and iron under extreme conditions of tropical weathering. The soils produced by this extreme tropical weathering are known as *laterites*.	_____
Copper	Most copper deposits consist of copper-rich minerals deposited by hydrothermal solutions. Hydrothermal vein deposits, however, are usually too small to be profitably worked on a large scale. Some of the major copper deposits of the world are the "*porphyry coppers*" which are relatively large, shallow intrusive bodies which have been permeated by hydrothermal solutions from which copper bearing minerals have been deposited, producing a bulk rock content ranging from less than 1% to as much as 5-6% copper.	_____ _____ _____ _____
Lead & Zinc	Some of the world's major deposits of lead and zinc are found in the midwestern U.S. The ore minerals are found disseminated in low grade deposits in limestone, chert, and sometimes dolomite. Apparently, these minerals were deposited by solutions circulating through the original rock and replacing it with the ore minerals.	_____ **(lead)** _____ **(zinc)**
Antimony & Barium	These minerals are also common in hydrothermal veins and are usually associated with the ores of other metals.	_____ **(antimony)** _____ **(barium)**

2. Of the ***ore minerals*** you studied, which two do you suppose would be the best for pigments in paint? **(8 pts)**

_____ _____

Why

_____

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3. Of ***all*** the minerals you have studied in this course, which three do you suppose would make the best abrasives, (that is, which would be best for making sandpaper)? **(10 pts)**

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Why did you pick these three minerals? (think carefully about your answer!)

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4. If you wish to ballast (weight down) a ship with material of the least possible volume which mineral ***in this lab*** exercise would you use? **(2 pts)** _____

5. Of ***all*** the minerals you have studied in this course, which mineral is used in the manufacture of cement? **(2 pts)** _____

6. Of ***all*** the minerals you have studied in this course, which mineral is used in the manufacture of plaster? **(2 pts)** _____

7. Which one of the minerals you have ***previously studied*** is an important source of fertilizer (phosphate)? **(2 pts)** _____

8. Both iron and aluminum can be found in nearly all rocks, and both are very abundant in many of the common rocks. Why then are their ores nearly always of one type only (banded iron formations and laterite soils? **(10 pts)**

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#	Hard-ness	Luster	Color	Streak	Specimen Structure	Cleavage or Fracture	Heft	Misc. Properties	Name & Chemical Formula
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									

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#	Hard-ness	Luster	Color	Streak	Specimen Structure	Cleavage or Fracture	Heft	Misc. Properties	Name & Chemical Formula
45									