Name: _____

Tuesday Wednesday (circle lab day)

CEEES/SC 10110-20110 Planet Earth Laboratory

Laboratory #3: Identification of Minerals (99 points total)

Readings: Chapters 1 & 2, Laboratory Manual (from the web), Chapter 5 of the Textbook.
See the laboratory web site: http://www.nd.edu/~cneal/PhysicalGeo
Objective: Learning diagnostic physical properties and how to identify minerals in hand specimen.
Introduction: In last weeks' lab you learned to distinguish between different minerals based on their physical properties. This week you will use this knowledge to identify the 25 minerals from last week's lab. A mineral's physical properties are dependant on both its crystal structure and chemical composition. For a scientist the chemical composition is more significant than the mineral name. **For the mid-term exam**, *you must be able to identify (name) these minerals by describing their physical properties*.
Important: How to Identify Minerals (Pages 23-24; Fig. 2.18 in your Lab Manuals).

Part I Identification of Minerals

A) Physical Property Tables: **Identification of Minerals by Diagnostic Properties**.

(1 point for each correct diagnostic property, 2 properties per mineral: 50 points total)

In the blank spaces in the tables attached to the back of this handout, provide the diagnostic physical properties for each specimen, using Tables 2.2a-g & 2.3 in your lab manual as a guide. You MUST fill in all applicable information. Then use these diagnostic physical properties to ensure you can identify each of the 25 minerals. **NOTE**: *You will be able to bring these tables with you to the first lab exam, but nothing else.*

B) **Mystery Specimens** (see pages 18, 20, 25 of Lab Manual)

Question (3 points each): Identify the following mystery specimens and note two (2) ***diagnostic*** physical properties for each:

	NAME	PROPERTY 1	PROPERTY 2
Specimen #41:	_____	_____	_____
Specimen #42: (ASK!)	_____	_____	_____
Specimen #43:	_____	_____	_____
Specimen #44:	_____	_____	_____

Part II Diagnostic Physical Properties

Question (2 points each): How would you differentiate between the following minerals? Give one (or more) **diagnostic** physical properties that will permit you to distinguish between the minerals. Look at the mineral descriptions in Tables 2.2 & 2.3 in your lab manual for assistance, as well as the mineral identification sheet you just completed. **Specify the property(ies) associated with each mineral and note the differences**. It is essential that you note only those properties that can be ***easily*** used to identify the mineral.

1) Amphibole #10 from Pyroxene #11 _____

_____

_____

2) Calcite #21 from Dolomite #22 _____

_____

3) Galena #19 from Graphite #25 _____

_____

4) Halite #24 from Fluorite #14 _____

_____

5) Chalcopyrite #20 from Pyrite #18 _____

_____

6) Talc #13 from Kaolinite #2 _____

_____

7) Plagioclase #1 from K-feldspar #3 _____

_____

8) Hematite #15 (& #28) from Magnetite #16 _____

_____

9) Gypsum #23 from Talc #13 _____

_____

10) Limonite #17 from Hematite#15 (& #28) _____

_____

11) Fluorite #14 from Calcite #21 _____

_____

12) Biotite #7 from Chlorite #9 _____

_____

13) Quartz #5 (& #4) from Fluorite #14 _____

_____

Part III Questions of Understanding

Question (3 pts): What is a *crystal face*? What is the difference between a *cleavage plane* and a crystal face?

Question (6 pts): Referring to the chemical compositions of the minerals you studied today, identify three minerals (name and number) that may have significant economic importance. Identify the element(s) or physical properties of these minerals that make them economically significant.

Question (2 pts.): A paleontologist is trying to separate diatoms (microscopic single-cell algae with silica cell walls) from a matrix of dolomite and calcite. How should the paleontologist remove the matrix?

Assignment:
For next week: Read Chapter 3 in your lab manual.

Sample #	Mineral I.D.	Chemical Composition	Luster	Color(s)	Streak (color)	S.G.	Habit/ Form	Cleavage/ Fracture	Hard -ness	Diagnostic Features
1	Plagioclase	$NaAlSi_3O_8$ $CaAl_2Si_2O_8$		Usually white to off-white or dark grey	White	2.6-2.8	Prismatic, tabular, massive	2 good/ uneven		Twin lamellae (striations on crystal faces), hardness, luster
2	Kaolinite	$Al_2Si_2O_5(OH)_4$		White to grey	White to grey	2.6	Massive	Basal, perfect		"Plastic" or greasy feel, hardness, luster
3	K-feldspar	$KAlSi_3O_8$	Vitreous		White	2.6-2.8	Tabular to Prismatic	2 good to perfect/conchoidal to uneven		Color, habit, mineral association, hardness
4	Massive Quartz	SiO_2	Vitreous	Variable (clear, milky, white purple, grey, pink)	None	2.7	Massive			Conchoidal fracture, hardness (scratches glass)
5	Quartz	SiO_2	Vitreous	Variable (clear, milky, white purple, grey, pink)	None	2.7	Prismatic			Conchoidal fracture, hardness (scratches glass)
6	Muscovite	$KAl_3Si_3O_{10}(OH,F)_2$	Vitreous		White	2.8-2.9	Micaceous, tabular		2-2.5	Perfect basal cleavage, color, luster
7	Biotite	$K(Mg,Fe)_3AlSi_3O_{10}(OH,F)_2$	Vitreous		White to grey	2.8-3.2	Micaceous, tabular		2.5-3	Perfect basal cleavage, color, luster
8	Garnet	$(Ca,Mg,Mn,Fe)_3(Al,Cr,Fe)_2$ Si_3O_{12}		Variable (reddish brown to yellowish tan)	None	3.6-4.3	Equant, rarely massive	None/ subconchoidal		Habit, hardness, luster
9	Chlorite	$(Mg,Fe,Al)_6(Si,Al)_4O_{10}(OH)_8$	Vitreous to earthy		White/ faint green-yellow	2.6-3.3	Micaceous, tabular, massive		2-2.5	Perfect basal cleavage, color, habit
10	Amphibole (Horneblende)	$(Ca,Mg,Fe,Na,K,Al)_7$ $(Si,Al_8)0_{22}(OH)_2$	Vitreous to silky	Black, green	White to grey or greenish black to black	3-3.4			5-6	Cleavage angle, habit
11	Clinopyroxene (Augite)	$(Ca,Mg,Fe)_2(Si,Al)_2O_6$	Vitreous	Dark green, black	White to grey	3.2-3.4			5-6	Cleavage angle, habit

Sample #	Mineral I.D.	Chemical Composition	Luster	Color (s)	Streak (color)	S.G.	Habit	Cleavage/ Fracture	Hard-ness	Diagnostic Features
13	Talc	$Mg_3Si_4O_{10}(OH)_2$	Dull, pearly	White, grey, apple or pale green		2.7-2.8	Granular & foliated masses	Basal, perfect		Hardness, greasy feel, streak
14	Fluorite	CaF_2	Vitreous	Variable (purple, green, blue, yellow, clear)	White	3.2	Equant, cubic, octahedral			Habit, hardness, cleavage
15	Hematite	Fe_2O_3		Black to brownish-black; red-brown		5	Massive, granular	None/Uneven	1.5-5.5	Weakly magnetic, streak, luster, color
16	Magnetite	Fe_3O_4	Metallic to dull		Black		Octahedra, massive, granular	None/subconchoidal to uneven	6	Strongly magnetic, color, specific gravity
17	Limonite/ Goethite	FeO(OH)	Dull			3.6-4.0	Bladed, prismatic, usually massive	None	1.5-5.5	Color & streak. Crystallinity distinguishes goethite from limonite
18	Pyrite	FeS_2	Metallic	Brass-yellow/ Pale yellow		5	Cubes, octahedral massive, granular	Indistinct/ cocnhoidal to uneven/ none		Color, streak, hardness
19	Galena	PbS	Metallic		Black, greenish black, brownish black, or grey		Blocky, cubes, octahedral	3 Perfect, cubic	2.5	High specific gravity, habit, luster, color
20	Chalcopyrite	$CuFeS_2$	Metallic		Black, greenish black, brownish black, or grey	4.2	Massive, granular	Very poor/ uneven/ none		Color, hardness
21	Calcite	$CaCO_3$	Vitreous	Variable, usually colorless or white	White	2.7	Variable			Reacts with cold, dilute HCl, luster, cleavage, hardness
22	Dolomite	$CaMg(CO_3)_2$	Vitreous to pearly, dull		White	2.8-2.9	Curved rhombohedrons, massive		3.5-4	Reacts with warm HCl or cold if powdered, color, cleavage, habit

Sample #	Mineral I.D.	Chemical Composition	Luster	Color (s)	Streak (color)	S.G.	Habit	Cleavage/ Fracture	Hard-ness	Diagnostic Features
23	Gypsum	$CaSO_4.2H_2O$	Vitreous to pearly	Colorless to white or light grey	White	2.3		One perfect, two poor		Hardness, cleavage, habit
24	Halite	NaCl	Vitreous	Colorless to white (usually), red	White	2.2	Cubes, s/t with curved faces			Salty taste, cleavage, hardness
25	Graphite	C	Dull metallic		Black	2.5	Massive, tabular	Basal, perfect		Greasy feel, soils paper & fingers, hardness, luster, color