Name: _____

Earth Science 11

A cluster of quartz crystals

Minerals & Rocks Handouts

Name _____

Mineral Names

K H K L O J D A A M D J P Y R R H O T I T E Q
L G S W P O T A S S I U M V J L V E T G X S L
E E U P H E B G G R V V U P D C B D W J Y X M
H G V X T T R E G E T I R E L A H P S U C B I
M A E J V I C T Q R X L S E P G A R N E T O C
R P I C B L V I I J A L K W W Z Z A S R A V A
S A E S X A B R P Z J P W W H G B B Y A L M H
K T T E I H A Y V L Z Y H J I R S S K N C J E
J I I T M M E P K A A Y K I S R O P D G B F T
T T C Y Q F W O G H M G H C T M O E O Y L E I
D E L Y U Y E C H Q G Q I V Z E V W R P Y T N
V Z A Q A E T L R G X S R O I V Y W R S Q I O
C O C U R T I A P W U P P P C Z M S R U K T M
P X C P T I T H Z N V Y E F D L R W T M N E I
N L M Y Z N A C A U R A G T J A A B W X V N L
M X V E F E M U S I S N O Y J V X S W X M G J
P E J T J D E W T S F E L V R E X P E N D A I
X N X I Y B H E D P O L D H X F W V G H Q M V
U F D N M Y E Q H J N A E D N E L B N R O H C
J Y N R S L Q P S L L G A S B E S T O S N S A
N K X O T O G I V V F L U O R I T E Q O N M D
S C S B E M G C Z K B W L M D S G D I Y A Q J
N Y Z H R U U G T J K W Z E F B U X Z G N J U

APATITE ASBESTOS BORNITE CALCITE CHALCOPYRITE

FLUORITE GALENA GARNET GOLD GRAPHITE

GYPSUM HALITE HEMATITE HORNBLENDE LIMONITE

MAGNETITE MICA MOLYBDENITE PLAGIOCLASE POTASSIUM

PYRITE PYRRHOTITE QUARTZ SPHALERITE TALC

Name:_____

Rocks and Minerals Unit
Day 1 Notes

Chapter 3 – Chemistry Review (as Related to Minerals and Rocks)

_____	- Made up of protons (p) and neutrons (n) in the center with electrons (e-) orbiting around; - If the atom has a charge (has lost or gained an electron), then this is called an _____.
_____	- The _____ complex of all materials naturally occurring on earth; - The _____ particle of an element is the atom; - Oxygen and Silicon make up _____ of crustal rocks (and Aluminum makes up makes up the next 8%); - Example: Na, Cl , periodic table
_____	- When different atoms join together they make a molecule; - Example : NaCl
_____	- Chemical combination of elements; - The _____particle of a compound, that still retains all the properties of the compound, is a molecule; - Example: NaCl = salt = the mineral halite.
_____	- A naturally occurring, inorganic, element or compound in a solid, crystalline state; - Defined by it's chemical composition and internal crystal structure – but only observable with special equipment in the lab; - Example: chalcopyrite, gold, calcite, ice; - Non-examples: water (not a solid), pearl (organic), glass (not a crystalline state).
_____	- A solid, cohesive aggregate of one or more minerals; - A _____of minerals; - Examples: granite, sandstone, marble. - Bedrock is solid rock firmly attached to earth; outcrops of it can sometimes be seen at the surface.

Chapter 4 – Minerals

- ~_____ minerals make up all the crustal rocks
- _____ minerals make up more then 90% of the crustal rocks
- Minerals are identified in the lab using special _____ but in the field (outside as you walk along the beach) we must observe physical properties via _____, _____, and _____

A. Inspection

_____	- Helps but many _____ minerals have the _____ (calcite and quartz can both be white.) - Many minerals come in a _____ of colors (quartz, fluorite). - Some minerals _____ (silver) - Some people are _____ - Must _____ take the grey out.
_____	- Defined as the _____. - Is either metallic or non metallic. - If _____, it shines like a polished metal; may be flecks rather than a large smooth mirror-like metal - If non-metallic, it can be _____, _____, pearly, resin (waxy), silky, greasy. - See quartz (vitreous) and galena (metallic) samples.
_____	- The shape of crystal if there is _____ and _____ for it to grow as the rock is forming; - How the arrangement of the atoms in a crystal is visible to us - Usually_____ to find; we'll only look for it on the samples on the _____-- our sets don't show crystal shape in the majority of cases. - If there is no space or time for large, visible crystals to form, then only small, _____ ones form and this is called _____. - See Calcite (rhombohedral) and galena (cubic) samples.

B. Simple Tests

_____	- The _____ of the mineral's _____ - Made by drawing a line on a ceramic _____ - Mineral's color may change between samples but the streak rarely does (more _____than color for id purposes.) - Metallic minerals streaks usually are at least as _____ as the mineral sample's colour. - Non-metallic minerals' streaks are _____. - Hematite is one to know – many colours but always a _____ _____ streak.
_____	- The tendency to split easily or separate along _____ surfaces - Can be observed by looking for flat, _____ surfaces that reflect light. Don't be fooled by flat sides that were cut that way by a saw (they aren't shiny anyway). - Easy to see cleavage occurs in calcite, feldspar, mica.
_____	- Break along other than cleavage surfaces. - Occurs in the mineral quartz and the volcanic rock obsidian.

Simple Test continued...

_____	- The resistance to being _____ - Hardness is different than brittleness (which means easily broken) - A real scratch can be felt by your _____ (where a line can't) - _____ is the hardest (10); _____ is the softest (1); _____ is the hardest common mineral (7). - We use _____scale of harness (pg 50 in text) - A simplified version is :_____ if fingernail scratches it; _____ if penny scratches it; _____ if steel nail scratches it; _____ if **IT** scratches the glass.
_____	- Density or the mass per volume (how heavy does it feel for its size?) - _____ the mineral compared to quartz (# 1-1 in set) – if it is heavier than quartz we say it has a _____ density; if it is about the same, then _____density; if it is less, then _____density.
_____	- A drop of HCl fizzes if _____ is present to react with. - _____ fizzes in the minerals - _____ fizzes and dolomite's powder fizzes in sedimentary rocks. - _____ fizzes in metamorphic rocks.

C. Special Properties

_____	- Ex. _____ is attracted to a magnet
_____	- Ex. _____taste like salt
_____	- Ex. _____ bends light so we see two images
_____	- Ex. Some calcite and fluorite glow in _____ light
_____	- Ex. Potassium feldspar emits _____ particles which would activate a Geiger counter (an instrument used to measure radioactivity)

Earth Science
Mineral Lab

Name:_____

Colour

Remember to mentally wash the gray off, and then what colour do you see?

Mineral #	Mineral Name	Colour
1-2	Potassium (K) Feldspar	
4-1	Galena	
4-4	Chalcopyrite	
4-12	Hematite	
5-15	Sulphur	

Lustre

The main choices are: metallic, vitreous (glassy), earthy (dull)

Mineral #	Mineral Name	
1-1	Quartz	
1-14	Garnet	
4-10	Pyrite	
counter	Graphite	

Crystal Shape

What shape is the crystal: prismatic/hexagonal, rhombohedral, cubic, flakes, fibrous

Mineral #	Mineral Name	
Counter & 4-1	Galena	
Counter & 5-2	Asbestos	
Counter & 5-8	Mica	
Counter & 1-1	Quartz	
Counter & 1-11	Calcite	

Streak

Draw a line on the streak plate and write down the colour of it.

Mineral #	Mineral Name	Streak
4-12	Hematite	
4-2	Sphalerite	
1-14	Garnet	
5-3	Fluorite	

Cleavage/Fracture

How many non-parallel flat, shiny sides are there? If there are none then "fracture."

Mineral #	Mineral Name	Cleavage or fracture
1-1	Quartz	
1-3	Plagioclase Feldspar	
1-4, 1-5	Mica	
1-11	Calcite	

Hardness

Scratched by fingernail = 1-2, penny = 3, steel nail = 4-5; scratches glass = 6-7

Mineral #	Mineral Name	Hardness value
1-2	K feldspar	
1-4, 1-5	Mica	
5-3	Fluorite	
5-4	Gypsum	
5-5	Talc	

Specific Gravity or Density

Heft the mineral compared to quartz (#1-1)

Mineral #	Mineral Name	Specific Gravity (High, avg, low)
1-11	Calcite	
4-1	Galena	
4-3	Boronite	
4-10	Pyrite	

Special Properties

Taste, magnetic, double refraction, radioactive, fizzes with acid, fluorescence

Mineral #	Mineral Name	Special Property
1-2	K feldspar	
1-11	Calcite	
4-6	Magnetite	
Counter	Halite	
Counter & 5-3	Fluorite	

Uses

All minerals are mined for a reason. Find a reason for each of these minerals:

Mineral #	Mineral Name	Use
1-1	Quartz	
1-14	Garnet	
Counter	Graphite	
Counter	Halite	
Counter & 5-2	Asbestos	
5-4	Gypsum	
4-1	Galena	
4-2	Sphalerite	
4-3	Boronite	
4-4	Chalcopyrite	

Lab Questions

1. Restate, in your own words, the observations and tests used in the lab to determine a mineral's properties.

2. Identify the mineral being described:
   a. It has a rhombohedral crystal shape, is vitreous, has 3 cleavage planes and double refracts.

   b. It has a hardness of 1-2, is metallic and used as pencil lead.

   c. It has a hardness of 6-7, is peachy-pink coloured and has 2 cleavage planes.

3. Examine the relationship between the colour of a mineral's streak and the lustre it has (metallic or non-metallic.) Test other minerals in your set to determine this relationship.

Mineral # & Name	Lustre	Streak
	Metallic	
	Metallic	
	Metallic	
	Non-metallic (vitreous)	
	Non-metallic (vitreous)	
	Non-metallic (vitreous)	

Relationship observed:

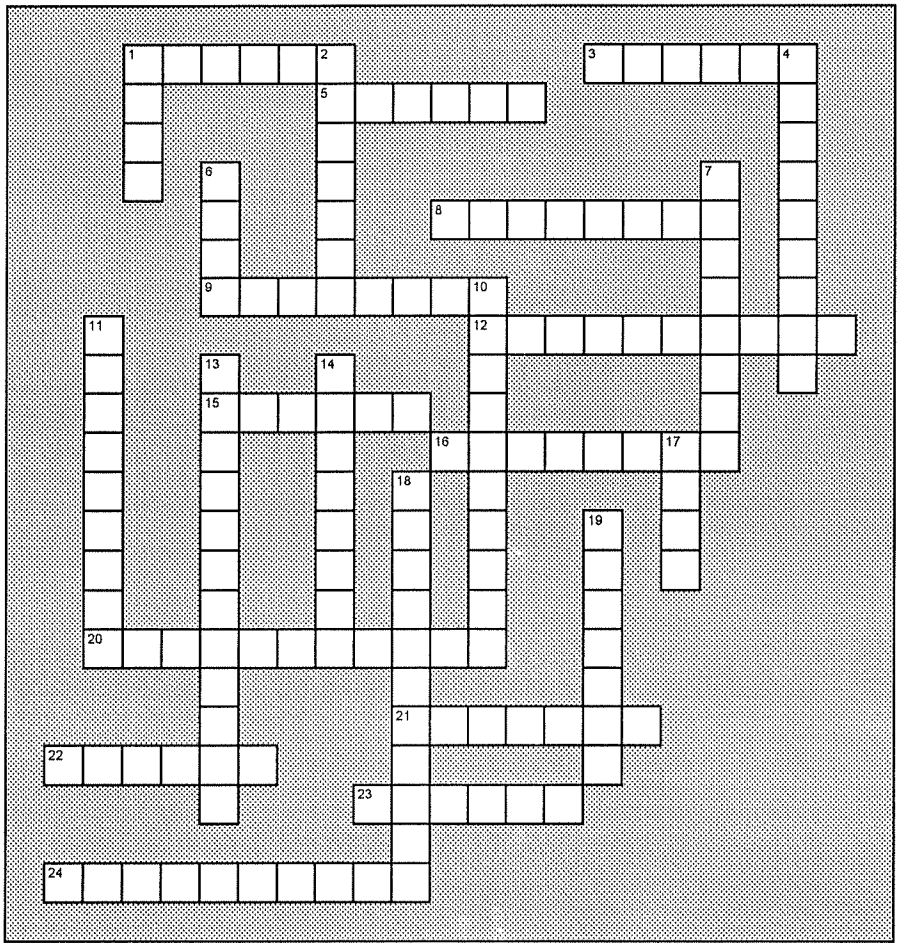
4. Propose a way to distinguish between the following minerals:

Mineral #1	Mineral #2	Test used	Result for #1	Result for #2
1-3 Plagioclase Feldspar	1-2 Potassium Feldspar			
1-1 Quartz	1-11 Calcite			
4-10 Pyrite	4-4 Chalcopyrite			

5. Design another activity that would help you learn how to identify minerals using the mineral properties from this lab.

Name _____

Using the Mineral Data Sheet



Across

1. lead-grey, metallic, cubes or massive, 3 cleavage planes, specific gravity = 7.6
3. colourless to white, vitreous to pearly, hardness = 2
5. brass yellow, fool's gold, cubic crystals, hardness 6-6.5
8. black, metallic, massive form, pencil lead
9. usually green, waxy, cancer-causing
12. bronze yellow, grey black streak, metallic, no cleavage, specific gravity = 4.6
15. cubic, salty
16. variable colour, cubic crystals, 4 cleavage planes
20. lead grey bluish tinge, metallic, hardness = 1-1.5
21. vitreous, rhombohedral, double refraction, fizzes with acid
22. white streak, vitreous, no cleavage, prismatic crystals, hardness = 7
23. red, vitreous, 12 or 24 faced crystals, hardness = 7
24. dark green to black, form = long crystals, grains, 2 cleavage planes at 56 degrees, hardness = 6

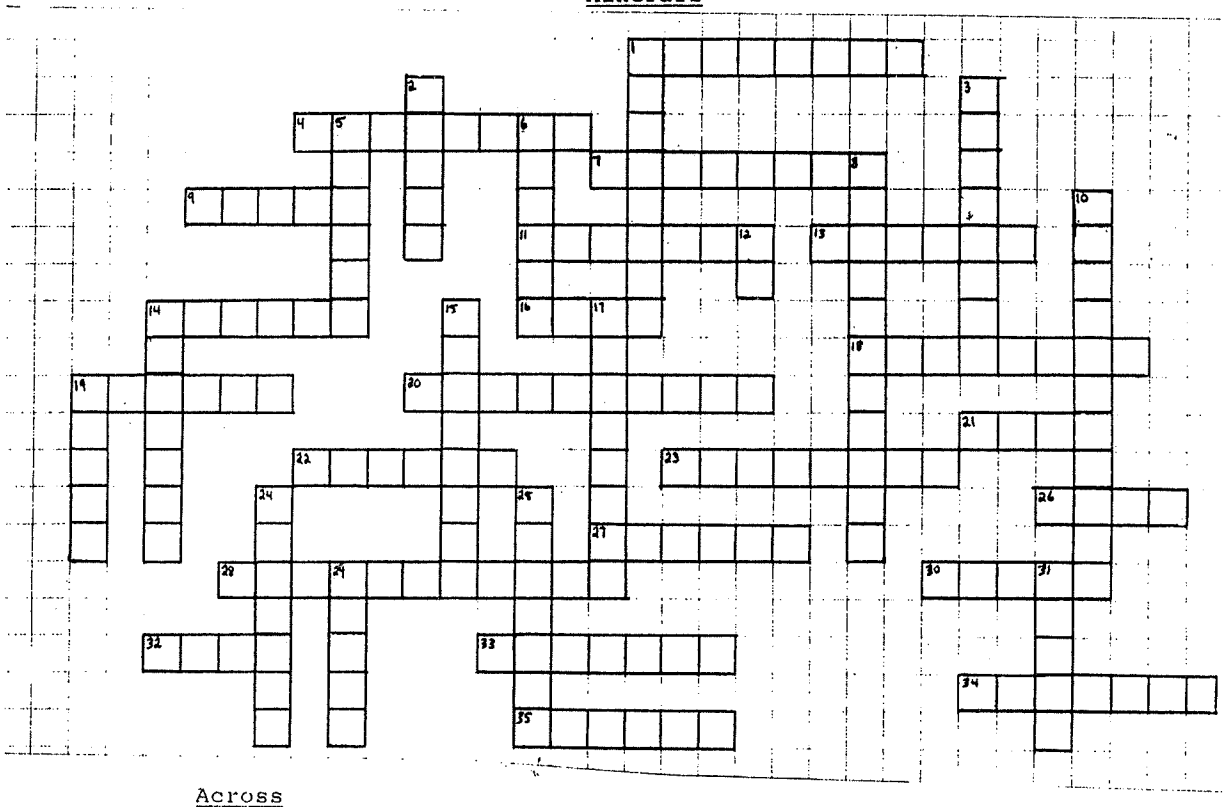
Down

1. yellow streak, metallic, no cleavage, specific gravity = 19
2. usually green, vitreous, hardness = 5, specific gravity = 3.1
4. black, metallic, magnetic
6. one cleavage plane, light or dark, vitreous, flakes
7. red brown streak no matter the colour
10. mined for zinc, 6 perfect cleavage planes
11. pink feldspar, stubby crystals
13. golden-brassy yellow, tetrahedral crystals, specific gravity = 4.2
14. brownish yellow, earthy, hardness = 5.5 to 6
17. pearly white, softest mineral, waxy or greasy lustre
18. white feldspar, tabular crystals
19. iridescent blue, metallic, no cleavage, hardness=3

Properties of Common and Important Minerals

Mineral	Colour	Streak	Lustre	Form and Other Properties	Cleavage	Hardness	Density (g/cm^3)
Amphibole (hornblende)	dark green to black	white-grey	vitreous	long crystals, grains	2 excellent at 56°	6	3.0 – 3.4
Apatite	usually green	white	vitreous	hexagonal crystals	1 poor, conchoidal fracture	5	3.1
Asbestos	green or black	none to white	waxy	fibrous or silky masses	none	2.5 – 5.0	3.1
Azurite	blue	pale blue	earthy–vitreous	earthy mass or tiny crystals, fizzes in acid	seldom visible	3.5 – 4.0	3.8
Bornite	iridescent blue, purple	grey-black	metallic	dense brittle masses	none	3	5.0
Calcite	white, pink or yellow	white-grey	vitreous	rhombohedral crystals, granular, fizzes in acid	3 perfect, not at 90°	3	2.7
Chalcopyrite	golden-brassy yellow	black	metallic	tetrahedral crystals or fine-grained masses	1 poor	3.5 – 4.0	4.2
Chlorite	green to dark green	pale green	vitreous-earthy	scaly masses	1 perfect	2.5	2.6 – 3.3
Feldspar (plagioclase)	white to grey	white	vitreous	tabular crystals, grains	2 excellent at 90°	6	2.6 – 2.8
Feldspar (potassium)	white or pink	white	vitreous-pearly	stubby crystals, grains	2 excellent at 90°	6	2.7
Fluorite	variable: green, purple	white	vitreous	cubic crystals, massive, fluorescent	4 excellent, octahedral	4	3.0 – 3.3
Galena	lead-grey	grey-black	metallic	cubes or massive	3 perfect at 90°	2.5	7.6
Garnet	variable: commonly red	white/pale red	vitreous	12 or 24 faced crystals	none	7	3.6 – 4.0
Gold	gold yellow	yellow	metallic	flakes, grains, malleable	none	2.5 – 3.0	19
Graphite	black	dark grey	metallic	scaly masses, finely crystalline	1 perfect	1 – 2	2.1
Gypsum	colourless or white	white	vitreous to pearly	tabular crystals or finely crystalline	1 excellent, 2 good	2	2.3
Halite	colourless, white	white	vitreous	cubes, finely crystalline, granular, salty taste	3 excellent at 90°	2.5	2.2
Hematite	steel grey, earthy red	red brown	metallic or earthy	scaly or earthy masses	none	1 – 6	5.2
Limonite	brown to yellow	brown	earthy	earthy masses, granular	seldom visible	1 – 5.5	3.0 – 4.0
Magnetite	black	black	metallic	commonly finely crystalline, magnetic	seldom visible	5.5 – 6.5	5.0
Malachite	bright green	pale green	earthy	flakes or earthy masses, fizzes in acid	seldom visible	3.5 – 4.0	3.6 – 4.0
Mica (muscovite)	white, yellow	white	vitreous	flakes, scaly masses	1 perfect	2.0 – 2.5	2.8
Mica (biotite)	black or brown-black	grey, brown	vitreous	flakes, scaly masses	1 perfect	2.5	2.9 – 3.4
Molybdenite	lead grey, bluish tinge	bluish grey	metallic	scaly masses, flakes	1 perfect	1.0 – 1.5	4.7
Olivine	olive green, olive brown	white, grey	vitreous	granular masses, grains	none	6.5	3.3
Pyrite	brass yellow	greenish black	metallic	cubic crystals or finely crystalline	1 very poor	6.0 – 6.5	5.0
Pyroxene (augite)	dark green to black	white-grey	vitreous	stubby crystals	2 excellent at 90°	6	3.3
Pyrrhotite	bronze yellow	grey-black	metallic	finely crystalline, granular, weakly magnetic	none	3.5 – 4.5	4.6
Quartz family includes amethyst, flint, agate	variable: clear, white	white	vitreous	prismatic crystals, granular, some forms are microcrystalline	none – conchoidal fracture	7	2.6
Sphalerite	brown to yellow	yellow to brown	resinous/metallic	tetrahedral crystals, finely crystalline	6 perfect	3.5 – 4.0	4.0
Talc	white	white	silky, greasy	microcrystalline masses, fibrous	1 perfect	1	2.7 – 2.8

Minerals



Across

1. special property of magnetite
4. the tendency to split along flat surfaces
7. shines like a metal
9. aggregates of minerals
11. real one can be felt by a fingernail
13. fool's gold
14. helpful but not perfect
16. ___ scale of hardness
18. used for insulation in the past
19. quite a dense mineral
20. mineral is soft if scratched by this
21. softest mineral
22. hardest common mineral
23. glassy
26. flaky layers
27. colour of mineral's powder
28. streak, hardness, cleavage, etc
30. a form of quartz
32. method of determining density
33. hardest of all minerals
34. specific gravity
35. dull

Down

1. natural, inorganic, solid, element or compound
2. special property of halite
3. break along other than cleavage surfaces
5. shine or lack of
6. hardness = 2
8. the shape of minerals if formation conditions were favourable
10. observed with Geiger counter
12. short for Hello
14. has the special property of double refraction
15. carbonates fizz
17. resistance to being scratched
19. is a 6 or 7 if mineral scratches this
24. not to be confused with hardness
25. if crystal form can't be seen
29. is a 3 if mineral scratched by this
31. Mrs. Della's first name

EARTH SCIENCE 11
GEOLOGY

ROCKS 1. Chapter 5 page 62 - 79

1. Name the three main types of rocks. Describe how each type is formed.

omit 2. Igneous rock are of two types. Name and describe each. What are some possible differences between them?

3. What is the difference between magma and lava?

4. What are the characteristics of felsic rocks? Name one rock that is of this type. Where does the name, felsic, derive from?

5. What are the characteristics of mafic rocks? Name one rock that is of this type. Where does the name, mafic, derive from?

6. What does the texture of an igneous rock depend upon? Name the possible textures of igneous rocks.

7. A porphory is a special type of igneous rock. Describe it's texture.

8. You will be learning to describe igneous rocks as intrusive (plutonic) or extrusive (volcanic). What are the characteristics of these two types?

9. What characteristic of sedimentary rocks separates them from the other two types of rocks?

10. You will be learning to identify clastic sedimentary rocks only. What defines as rock as a clastic sedimentary rocks?

11. There are three main types of clastic rocks. Name them and give their particle size.

12. Using figure 5.9 on page 70, indicate the speed at which the water is likely to be moving at when it deposits the particles to form each of the three clastic types.

13. Deposition of the particles is not enough to form a sedimentary rock. What else must happen?

14. Stratification is a special feature of sedimentary rocks. What is it?

15. What is the origin of the word metamorphic?

16. What actions can cause metamorphic rocks to form?

17. Name the three main types of metamorphic rocks in order from that formed first with little heat and pressure to that formed last with a great deal of heat and pressure.

18. Foliation is a feature of metamorphic rocks. What is foliation?

Igneous Lab

Part A

For each of the 15 samples in the igneous rock set do the following and record your results in a table like the example below:

1. Note the crystal size: none, small (can't see), or large (can see different colours interlocking)
2. State the texture: glassy, frothy, small crystals, large crystals or porphyry(large crystals surrounded by small), pegmatite(very large crystals)
3. Describe how the rock likely formed [intrusive with slow cooling=large crystals, or extrusive with fast cooling=small crystals, glassy or frothy]
4. Is the rock felsic (light) or mafic (dark)? If large crystals, list the colours you can see. [grey=quartz, white,pink=feldspar, dark=ferromagnesian]

NOTE: Page 68 in the text will help!!

PLEASE:

- Check each box before and after use to ensure all samples are present.
- Stack the boxes neatly in the cupboard and ensure that the lid is properly closed.

Part B (Don't forget this part!!)

Explain igneous rocks in a paragraph, chart or point form. Include how the following are related: where the rock formed, cooling rate, crystal size, and texture. **Also** include example igneous rocks for each situation.

When you are finished the lab do Rocks 1 Worksheet #1-8

Igneous Table: (note 2-2, 2-5, 2-8, 2-10 and 2-15 are omitted)

Number	Name	Crystal Size	Texture	Where/ How Formed	Colours	Minerals
2-1	Granite	Large	Large crystals	Intrusive, Slow cooling	Felsic - white - dark - pink - gray	=Plag. Feldspar =Ferromagnesian =K Feldspar =Quartz (glassy)
2-3	Diorite					
2-4	Gabbro					
2-6	Pegmatite	Very large	pegmatite			
2-7	Feldspar Porphyry					
2-9	Rhyolite					Same minerals as granite
2-11	Basalt					Same minerals as gabbro
2-12	Obsidian					
2-13	Pumice					
2-14	Tuff			Pyro-clastic, volcanic ash glued		

Sedimentary Lab

Part A

For each of the first six samples in the box (3-1 to 3-6) do the following:

1. Identify the type: clastic (grains glued together), chemical (crystals of the same colour), or organic (very smooth)

2. State the texture: if clastic, is it silty, sandy or course grained? if chemical it has interlocking crystals and if organic we'll call it smooth.

3. Describe the environment/place where the rock may have formed. Be specific. Think about it, read pp. 69-74, look at the texture.

4. What minerals are present? Can you even tell? Why or why not? Consider how/where each formed.

NOTE: See page 74 for more information.

When you are finished the lab, continue Rocks 1 Worksheet #9-14

Sedimentary Table (note it is different than the igneous one):

Number	Name	Type	Texture	Formation	Minerals
3-1	Shale				
3-2	Sandstone				
3-3	Conglomerate				
3-4	Chert				
3-5	Limestone				
3-6	Dolomite				

Part B (Don't forget this part!!)

1. One rock will fizz if a drop of HCl is put on it. Which one? Try it. (Make sure you **dry the rock** before returning it to the set.)

2. One rock's *powder* will fizz with HCl (how do we get a powder?) Which one? Try it.

3. What compound and mineral must be present in these rocks?

Metamorphic Lab

Part A

For samples 3-7 to 3-14 (omit 3-9 and 3-15) do the following:

1. Determine the texture:
   foliated (peely-aparty look or mica flakes),
   large crystals, or
   compositional banding.

2. Explain how the rock might have formed. Use the text. Include
   what it used to be before it was metamorphosed,
   what type of metamorphism happened (heat and/or pressure), and
   the grade of metamorphism (high, medium, or low).

   NOTE: heat usually forms crystals, pressure forms foliation and banding.

3. Note any minerals present. Again use the text and think about it. (IE what rock did it used to be?) If you see foliation, there is mica present.

NOTE: Use the text pg 78

When you are finished the lab, finish Rocks 1 Worksheet #15-18

Metamorphic Table: (note it is different than the previous two)

Number	Name	Texture	How Formed	Minerals
3-7	Slate	Foliated	Shale under low grade pressure	Mica, clay, others? Shale was clastic so it's hard to tell
3-8	Quartzite			
3-10	Gneiss			
3-11	Chlorite Schist			
3-12	Sericite Schist			
3-13	Garnet Muscovite Schist			
3-14	Marble			

Part B **(Don't forget this part!!)**

1. One of these rocks will fizz with HCl too. Which one? Try it.

2. What rock was it before it was metamorphosed? (Is this logical?!)

3. What compound and mineral does it contain to make it fizz?

Name:_____

Rock Project - A Local Rock Collection

1. Collect at least 5 rock samples locally. The samples should be approximately fist size.

2. Identify each sample for its rock type (ie igneous, sedimentary, metamorphic) and explain why you chose that type. Also try to name it (ie granite, etc). Ensure that the name you choose is in the rock type category you chose (ie if you say a rock is granite you should have said the rock type is igneous).

3. Label each sample and provide a key in the written portion of your project to identify the sample by.

4. Split at least 2 of your samples using a hammer and chisel on pavement. You will be able to see a fresh face which will enable you to identify the rock (step 2 above) much more easily. **BE CAREFUL - USE GOGGLES! Put the rock in a sock before breaking it.**

Your samples must be in a box or sturdy bag labeled with your name on it. They will not be marked if they are loose. You may work in partners (no more).

Your project will be marked as follows:

/2	5 fist size samples
/5	5 labeled samples
/2	at least 2 broken
/5	rock type (ig, sed, meta)
/5	rock name(granite,sandstone…)
/5	reason for type/how formed
/1	in box or bag

Total /25

Due Date: _____

Written portion should be set up as follows:

Local Rock Collection

Sample #	Rock Type	Specific Name	Reason/ How Formed
1 (example)	Igneous	Pumice	Frothy, floats, formed in volcanic eruption where bubbles got trapped
2			
3			
4			
5			

Summary Chart of Rock Types

Igneous	Sedimentary	Metamorphic
- Forms by magma or lava; cooling and crystallizing - Intrusive- cools slowly, large crystals form, Ex. Granite, Gabbro - Extrusive – cools quickly, small or no crystals form. Ex. Obsidian = Glassy Pumice = frothy Porphyry = 2 sizes of crystals from 2 stages of cooling Basalt = Small Crystals - Mafic – dark, ferromagnesians Ex. Basalt, gabbro - Felsic – light coloured, granite, rhyolite.	- Clastic- eroded sediments glued together Ex. Shale (small particles), sandstone, conglomerate (larger particles). - Chemical – precipitates out of solution – crystals of light colour. Ex. Limestone, dolomite. - Biological – made by plants and animals; often see fossils Ex. Some limestones, chert	- Forms from heat and/or pressure, changes a rock - Heat causes: Sed. Meta Limestone → Marble Sandstone→ Quartzite (see interlocking crystals of same colour, larger than sedimentary chemical crystals) - Pressure causes: - Sed. Meta. Meta. Shale → Slate→Phyllite → Meta. Meta. Schist → Gniess - Ig. Meta. Granite → Gneiss

To look for when ID'ing rock types:

Igneous	Sedimentary	Metamorphic
- Interlocking crystals (large or small) of different colours or dark colours - Glassy, frothy, porphyry	- Clastic – rounded particles glued together; fossils - Chemical – interlocking crystals of light colours	Heat – interlocking, larger crystals of light colour Pressure – Folliation, compositional banding

Name: _____

Rocks and Minerals Review Points

TEST BREAK DOWN: Written: /6, Multiple Choice /24, Practical /9 = Total /39

What to specifically study: STUDY these points plus your labs and fill-in-the-blank notes (from the beginning of this unit.)

- Rocks are made up of minerals
- The most common elements in Earth's crust O (50%), Si (25%), Al (8%)
- Refresh yourselves on how to use the Mineral Data Sheet (one will be provided for the test!) Also note that all minerals that you need are listed on the mineral data sheet but no rocks are. You have to memorize the rock names but not the mineral names.
- Fool's gold = pyrite and chalcopyrite
- Go over how to do the mineral tests: hardness, cleavage, streak, acid test, special properties, etc.
- Draw rock cycle diagram with all nine, labeled arrows
- Igneous forms from magma cooling and crystallizing
- Sedimentary forms from sediments being glued together
- Metamorphic forms from pre-existing rocks undergoing heat and/or pressure
- Intrusive rocks – cool inside earth slowly (where there is lots of insulation) forming large crystals, ie granite, gabbro
- Extrusive rocks – cool on surface of earth quickly forming small crystals (ie rhyolite), glassy texture (obsidian), or frothy (pumice)
- Memorize which rocks are what type (see labs): Igneous = granite, basalt, gabbro, obsidian, pumice, etc; Sedimentary =a) clastic: conglomerate (pebbles glued) , sandstone (sand glued), shale (silt and clay glued), chemical: limestone; Metamorphic: slate, phyllite, schist, gneiss, marble, quartzite
- Parent rocks of metamorphic rocks (what did they used to be before heat and pressure changed them?): slate was shale, quartzite was sandstone, marble was limestone, etc.
- Acid test: calcium carbonate is present in calcite (mineral), limestone (sedimentary) and marble (metamorphic)
- As river slows, it drops the largest sediments first then finer and finer as it slows further. So conglomerate will be formed from the first drop, then sandstone, then shale.
- Foliation (mica lines up due to pressure ie in mountain building) in metamorphic rocks such as slate, phyllite, schist, gneiss (has compositional banding too)
- Some general rules to distinguish the three rock types from each other (there is a practical section):
    - Igneous – interlocking crystals (cooled slow if large) or glassy or frothy (cooled quickly) textures
    - Sedimentary – grains glued together
    - Metamorphic – see foliation, obvious mica flakes, folding, compositional banding

Rock Cycle

Part A

Complete the following diagram of the rock cycle. Note there should be nine (9) arrows and they should all be labeled based upon what type of rock it is becoming.

IGNEOUS

SEDIMENTARY **METAMORPHIC**

Part B

Describe the rock cycle in words.

1. Explain in detail what can happen to any rock (3 sentences).

2. Summarize the rock cycle in one sentence.

Name:_____

Rocks & Minerals

1. Explain the difference between a rock and a mineral.

2. Which two elements make up 75% of the earth's crust?

3. Minerals can be identified by inspection and by simple tests.
   a) Name two reasons why colour is not a very good tool of identification.
   b) Luster may be metallic or non-metallic. Name two types of non-metallic luster.
   c) What seems to be the rule for the colour of the streak of metallic and non-metallic minerals?
   d) Describe the method used to test the hardness of a mineral.
   e) A black mineral with a black streak, metallic luster, no visible cleavage, and a hardness of 6 would likely be:
   f) Name three special properties used to identify minerals.

4. a) How are igneous rocks formed?
   b) What are extrusive and intrusive rocks?
   c) How are crystal size and cooling rates related in igneous rocks?

5. a) How are sedimentary rocks formed?
   b) What is the difference between clastic and chemical?
   c) Put these in order of sediment size from largest to smallest: sandstone, conglomerate, shale.

6. a) How are metamorphic rocks formed?
   b) What are thermal and dynamic metamorphism?
   c) When metamorphosed, limestone becomes what?

7. Use the rock cycle (draw it) to show the links between the three types of rocks.

8. Using the following descriptions classify the rock described as <u>igneous</u> (<u>extrusive</u> or <u>intrusive</u>), <u>sedimentary</u> (<u>clastic</u> or <u>chemical</u>), or <u>metamorphic</u>.
   a) black, glassy texture, conical fracture
   b) a mass of rocks and pebbles glued together
   c) a layered, black rock, very compacted, obvious foliation
   d) easily fizzes with acid, gray, fossil visible

9. Describe how a fossil is formed and in what type(s) of rocks.

10. If not already done, now complete the practical rock and mineral test (when it is your turn).

esgr&mrv

Label each of the following as characteristics of: **I – Intrusive Rocks; E – Extrusive Rocks; or N – neither.**

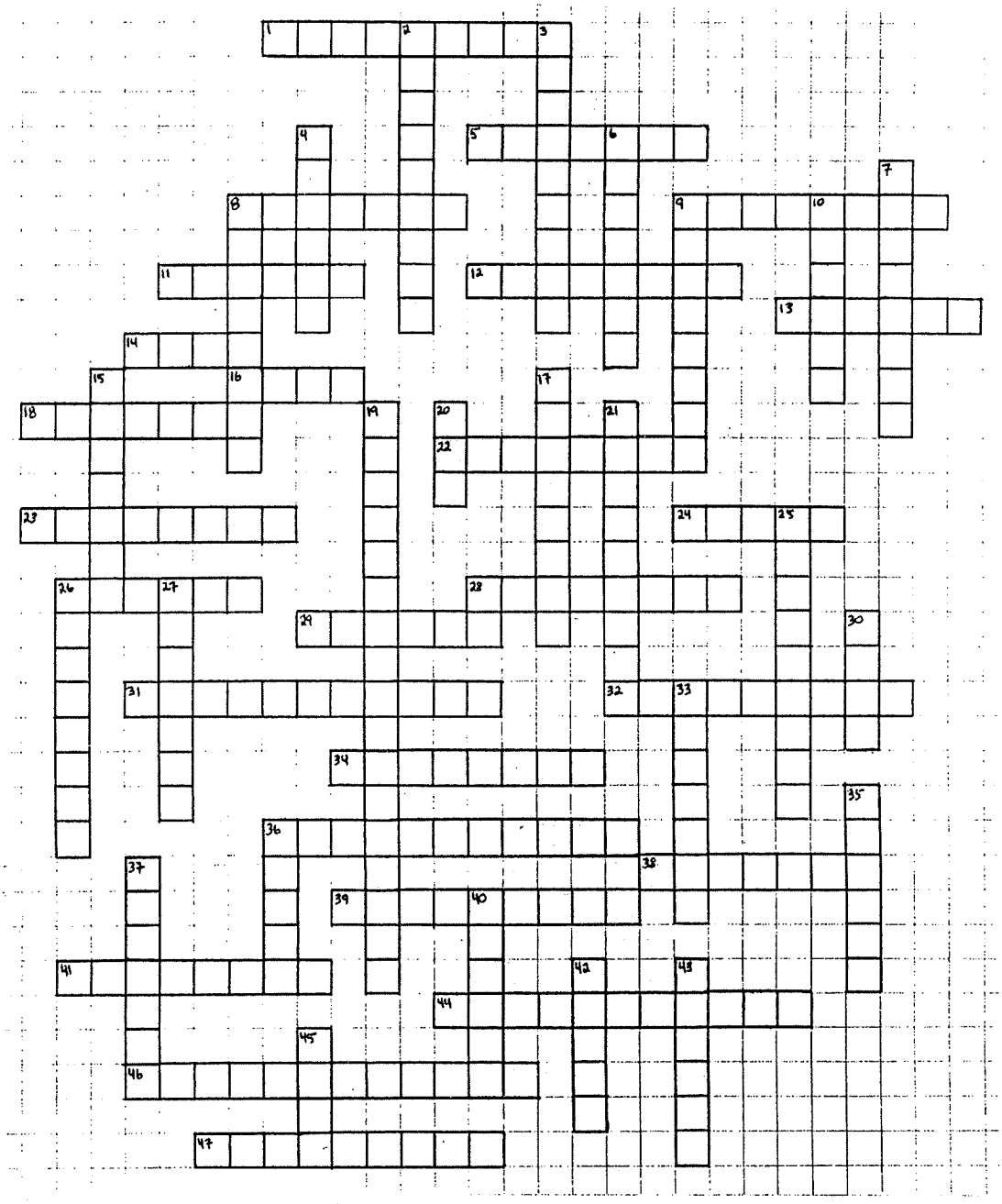
1 _____ Has a long period of crystallization
2 _____ Generally has a coarse texture
3 _____ May have a glassy texture
4 _____ Basalt is an example
5 _____ Cools slowly
6 _____ Sandstone is an example
7 _____ Forms most of the bedrock below the oceans
8 _____ Schist is an example
9 _____ Also known as plutonic rock
10 _____ Granite is an example

Label each of the following as characteristics of: IV – Igneous Volcanic; IP – Igneous Plutonic; S – Sedimentary; Met – Metamorphic Rock; or Min - Mineral

1 _____ Marble
2 _____ Shale
3 _____ Gypsum
4 _____ Gneiss
5 _____ Gabbro
6 _____ Pumice
7 _____ Garnet
8 _____ Limestone
9 _____ Granite
10 _____ Quartzite

Name: _____

Chapters 3 - 5 Rocks and Minerals



Across

1. 90% of minerals in crust are members of this family
5. rock firmly attached to entire mass of earth
8. hardest mineral
9. shines like a metal
11. special property is: tastes like salt
12. elements or compounds, solid, crystalline, natural
13. colour of mineral's powder
14. smallest part of element with same properties
16. positively or negatively charged atom
18. a bunch of the same kind of atoms
22. split along flat surfaces
23. carbonates fizz during this
24. magnesium and iron, dark rocks (opposite = felsic)
26. fool's gold
28. resistance to being scratched
29. floats on water, vesicular texture
31. types are clastic, chemical and organic
32. cooled on surface of earth
34. size determines cooling rate
36. change form from heat and pressure
38. igneous rock with feldspars, quartz, mica, hornblende
39. chemical or organic sedimentary rock, fizz with acid
41. cooled so fast that no crystals formed, volcanic glass
44. a sedimentary feature
46. pebbles and rocks glued together
47. any rock can become any type of rock through appropriate processes

Down

2. compound in rocks that reacts with acid
3. sand cemented together
4. hardest common mineral
6. bedrock seen at the surface
7. shines like glass
8. its powder will fizz
9. smallest part of compound that keeps properties
10. shine or lack of
15. heft compared to quartz
17. break along other than cleavage surfaces
19. the present is the key to the past
20. acid used in acid test
21. in calcite, limestone, dolomite, marble
25. cooled inside earth
26. had two cooling rates
27. formed by lava or magma crystallizing
28. masculine pronoun
30. molten rock on surface of earth
33. depends on size, shape, arrangement of crystals or grains
35. metamorphosed granite
36. molten rock below surface
37. formed from fragments of other rocks
40. med/high grade metamorphosed shale
42. low grade metamorphosed shale
43. metamorphosed limestone
45. mixture of minerals