

Name: \_\_\_\_\_

# Earth Science 11



A cluster of quartz crystals

## Minerals & Rocks Handouts

# 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    | HORNBLLENDE | 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)**

_____	<ul style="list-style-type: none"> <li>- Made up of protons (p) and neutrons (n) in the center with electrons (e-) orbiting around;</li> <li>- If the atom has a charge (has lost or gained an electron), then this is called an _____.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- The _____ complex of all materials naturally occurring on earth;</li> <li>- The _____ particle of an element is the atom;</li> <li>- Oxygen and Silicon make up _____ of crustal rocks (and Aluminum makes up makes up the next 8%);</li> <li>- Example: Na, Cl , periodic table</li> </ul>
_____	<ul style="list-style-type: none"> <li>- When different atoms join together they make a molecule;</li> <li>- Example : NaCl</li> </ul>
_____	<ul style="list-style-type: none"> <li>- Chemical combination of elements;</li> <li>- The _____particle of a compound, that still retains all the properties of the compound, is a molecule;</li> <li>- Example: NaCl = salt = the mineral halite.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- A <u>naturally occurring, inorganic, element or compound</u> in a <u>solid, crystalline</u> state;</li> <li>- Defined by it's <u>chemical composition</u> and <u>internal crystal structure</u> – but only observable with special equipment in the lab;</li> <li>- Example: chalcopyrite, gold, calcite, ice;</li> <li>- Non-examples: water (not a solid), pearl (organic), glass (not a crystalline state).</li> </ul>
_____	<ul style="list-style-type: none"> <li>- A solid, cohesive aggregate of one or more minerals;</li> <li>- A _____of minerals;</li> <li>- Examples: granite, sandstone, marble.</li> <li>- Bedrock is solid rock firmly attached to earth; outcrops of it can sometimes be seen at the surface.</li> </ul>

**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**

_____	<ul style="list-style-type: none"> <li>- Helps but many _____ minerals have the _____ (calcite and quartz can both be white.)</li> <li>- Many minerals come in a _____ of colors (quartz, fluorite).</li> <li>- Some minerals _____ (silver)</li> <li>- Some people are _____</li> <li>- Must _____ take the grey out.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- Defined as the _____.</li> <li>- Is either metallic or non metallic.</li> <li>- If _____, it shines like a polished metal; may be flecks rather than a large smooth mirror-like metal</li> <li>- If non-metallic, it can be _____, _____, pearly, resin (waxy), silky, greasy.</li> <li>- See quartz (vitreous) and galena (metallic) samples.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- The shape of crystal if there is _____ and _____ for it to grow as the rock is forming;</li> <li>- How the arrangement of the atoms in a crystal is visible to us</li> <li>- 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.</li> <li>- If there is no space or time for large, visible crystals to form, then only small, _____ ones form and this is called _____.</li> <li>- See Calcite (rhombohedral) and galena (cubic) samples.</li> </ul>

**B. Simple Tests**

_____	<ul style="list-style-type: none"> <li>- The _____ of the mineral's _____</li> <li>- Made by drawing a line on a ceramic _____</li> <li>- Mineral's color may change between samples but the streak rarely does (more _____ than color for id purposes.)</li> <li>- Metallic minerals streaks usually are at least as _____ as the mineral sample's colour.</li> <li>- Non-metallic minerals' streaks are _____.</li> <li>- Hematite is one to know – many colours but always a _____ streak.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- The tendency to split easily or separate along _____ surfaces</li> <li>- 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).</li> <li>- Easy to see cleavage occurs in calcite, feldspar, mica.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- Break along other than cleavage surfaces.</li> <li>- Occurs in the mineral quartz and the volcanic rock obsidian.</li> </ul>

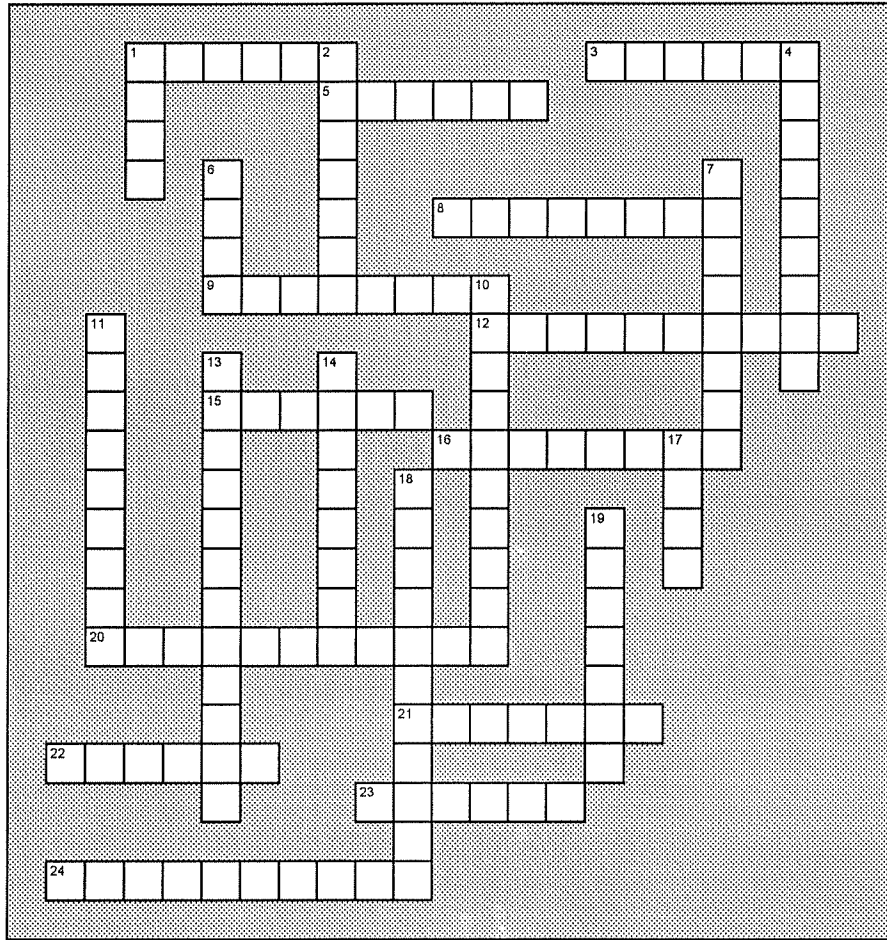
**Simple Test continued...**

_____	<ul style="list-style-type: none"> <li>- The resistance to being _____</li> <li>- Hardness is different than brittleness (which means easily broken)</li> <li>- A real scratch can be felt by your _____ (where a line can't)</li> <li>- _____ is the hardest (10); _____ is the softest (1); _____ is the hardest common mineral (7).</li> <li>- We use _____ scale of harness (pg 50 in text)</li> <li>- A simplified version is : _____ if fingernail scratches it; _____ if penny scratches it; _____ if steel nail scratches it; _____ if IT scratches the glass.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- Density or the mass per volume (how heavy does it feel for its size?)</li> <li>- _____ 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.</li> </ul>
_____	<ul style="list-style-type: none"> <li>- A drop of HCl fizzes if _____ is present to react with.</li> <li>- _____ fizzes in the minerals</li> <li>- _____ fizzes and dolomite's powder fizzes in sedimentary rocks.</li> <li>- _____ fizzes in metamorphic rocks.</li> </ul>

**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)

# 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

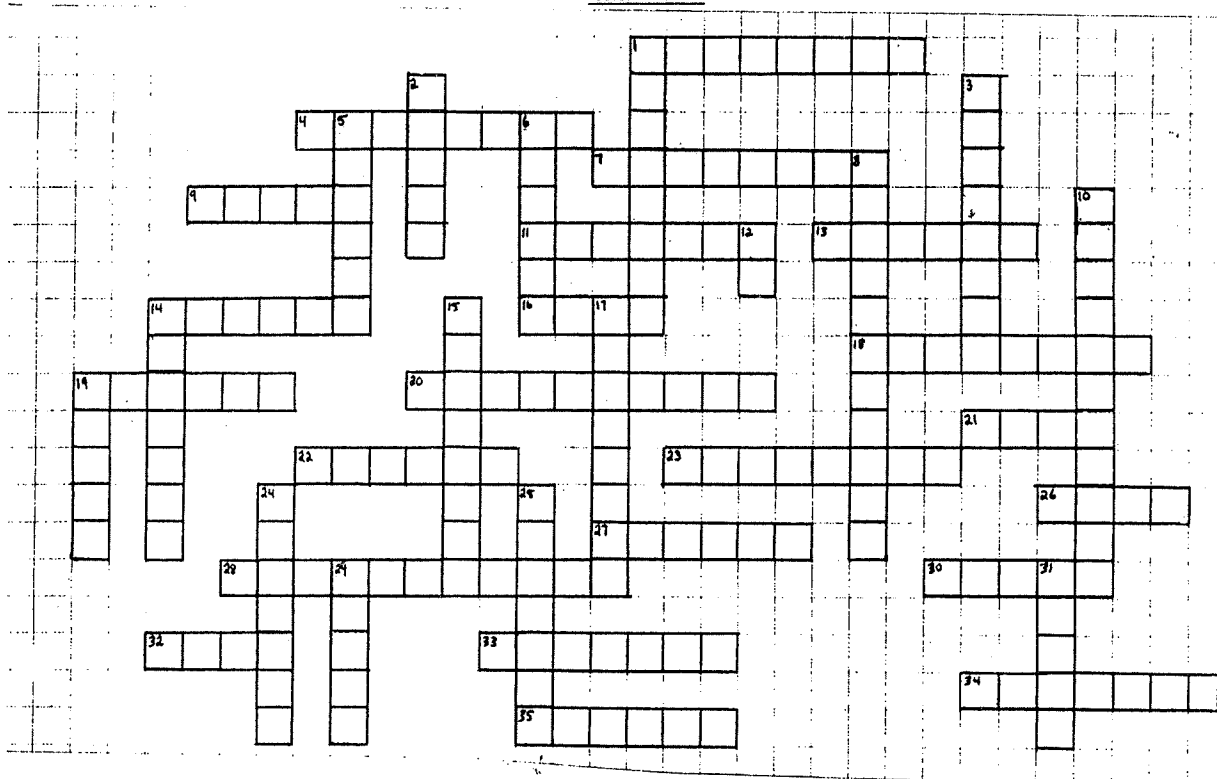
## Down

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 <sup>3</sup> )
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

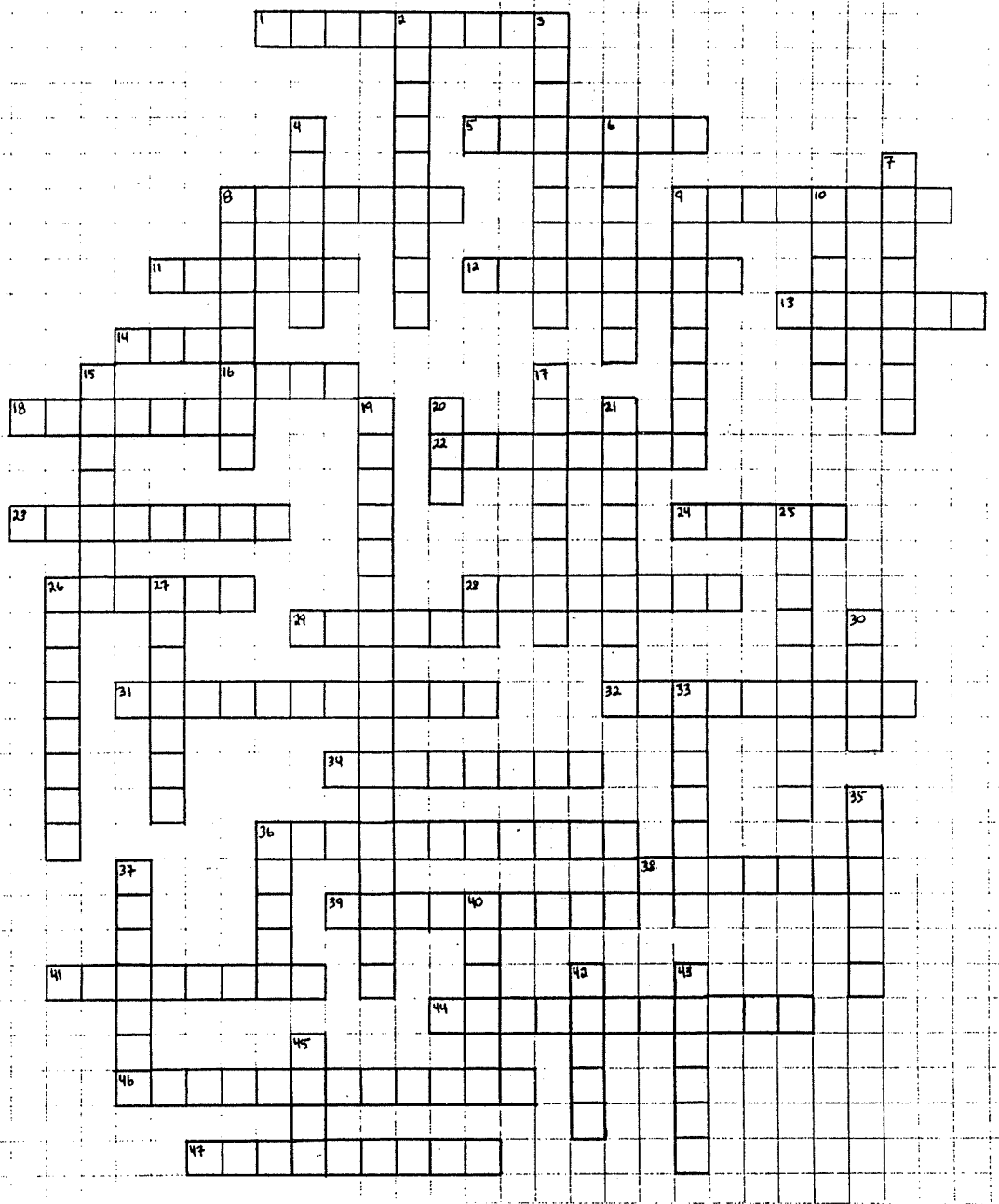
### Down

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



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