EARTH SCIENCE
Fox Lane High school

Name:_____Date: _____

UNIT FIVE

Identify minerals and their chemical groups

*Dedicated to: _____

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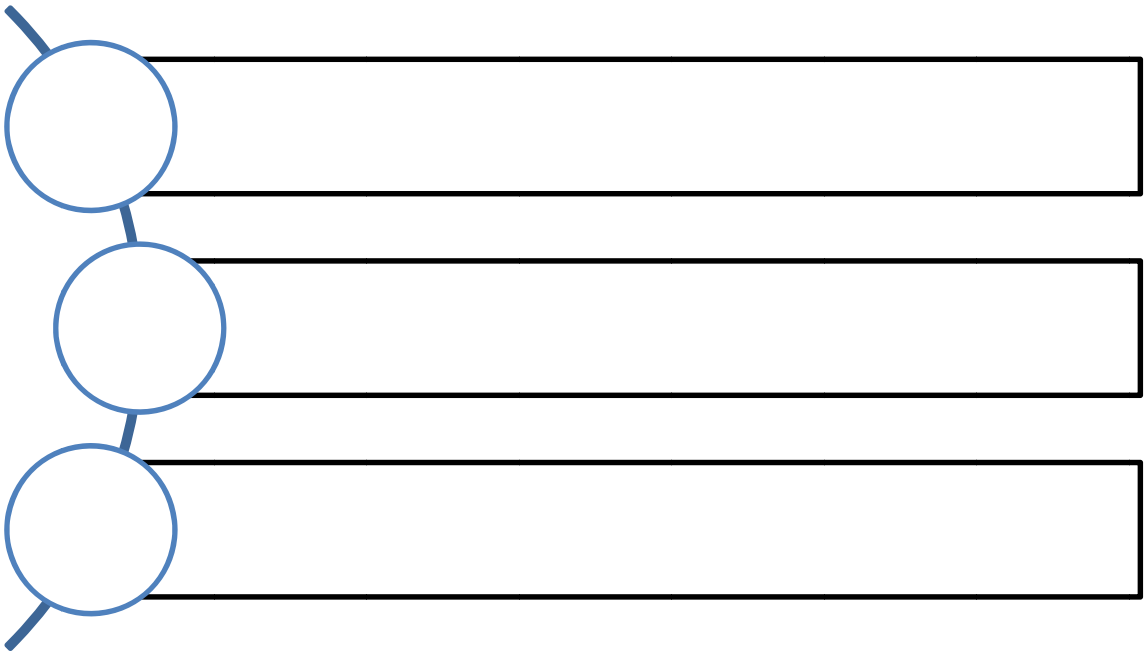
ABSTRACT AND RATIONALE

There is some overlap in the use of the term mineral and gemstone. Strictly speaking a "mineral" is a crystalline substance that has been "mined" – dug out of the earth. A "gem" is a crystalline substance that has substantial monetary value. A mineral may or may not be a gem. A mineral is a neutrally occurring, inorganic solid with a certain structure and chemical composition. Gems are typically materials that are beautiful enough to use in applications like jewelry and often have increased value because of their aesthetics. Birthstone is another term that is often mistakenly interpreted. All birthstones are minerals.

TASK STATEMENT/PROBLEM BASED LEARNING/REAL WORLD PROBLEM:

After this short unit, you are going to research on the name of your birthstone and complete a mineral quest. You are going to create a mini poster to convince your classmates why your birthstone should be used in the school ring. The assignment should include: the month, birthstone type, historical significance, physical properties, chemical formula, place of origin [geographic and geologic], economic value and uses of your birthstone.

What do we need to know about minerals?



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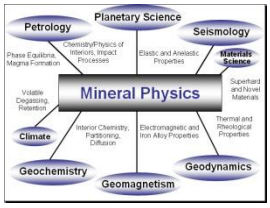
Read page #96 to 102 in your Earth Science textbook. Answer the questions below (specifically for each section of the reading). All section should be answers.

Page #96



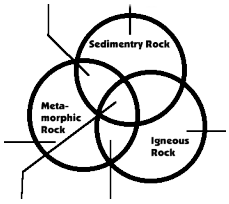
List 5 characteristics of a mineral

1. _____
2. _____
3. _____
4. _____
5. _____

Write down three things you learned from the general description of a mineral besides the characteristics from above.

_____
_____
_____
_____

Page#97



Write down a brief description in your words about how minerals from

_____
_____
_____

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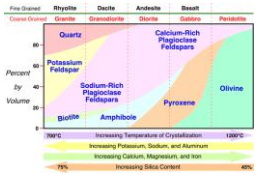
Page 98



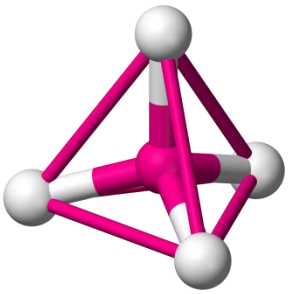
Write down two questions you have (YOU MUST FORM QUESTIONS)

_____

_____

_____

Page 100



Write down two things you learned after the section called “silicates.” What did you learn about silica tetrahedron?

_____

_____

_____

Write down three vocabularies you stumbled on while reading the text

_____

_____

_____

_____

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KEY CONCEPT#2

HOW MINERALS ARE IDENTIFIED

1. **Luster**:_____
   a. Metallic Luster: _____
   b. Nonmetallic Luster:_____

Different types of nonmetallic luster

a) _____
b) _____
c) _____
d) _____

2. **Hardness** :_____

3. **Cleavage**: _____

4. **Fracture**: _____

5. **Color**: _____

6. **Streak:** _____

   a. Metallic Minerals: _____
   b. Nonmetallic Minerals: _____

7. **Density**: _____

8. **Special Property for exclusive minerals:**

_____ _____ _____ _____

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KEY CONCEPT#1

Mineral Identification – Indicate if the image shows mineral or non-mineral

Picture A

Picture B

What considers a mineral?

1._____

2. _____

3. _____

4. _____

5. _____

Picture C

Picture D

Picture E

Picture F

Polymineralic: _____

Monomineralic: _____

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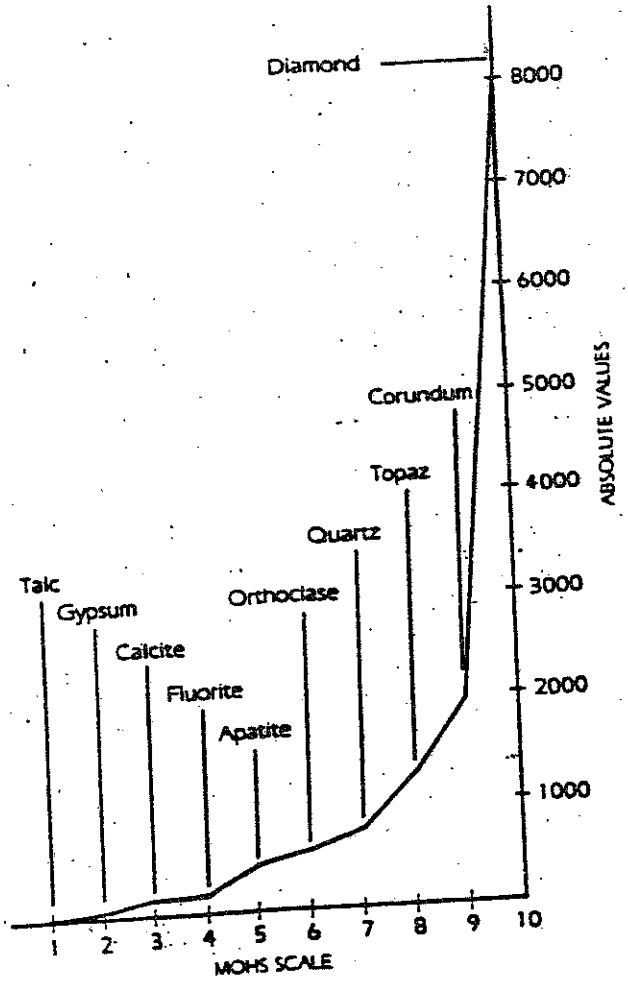
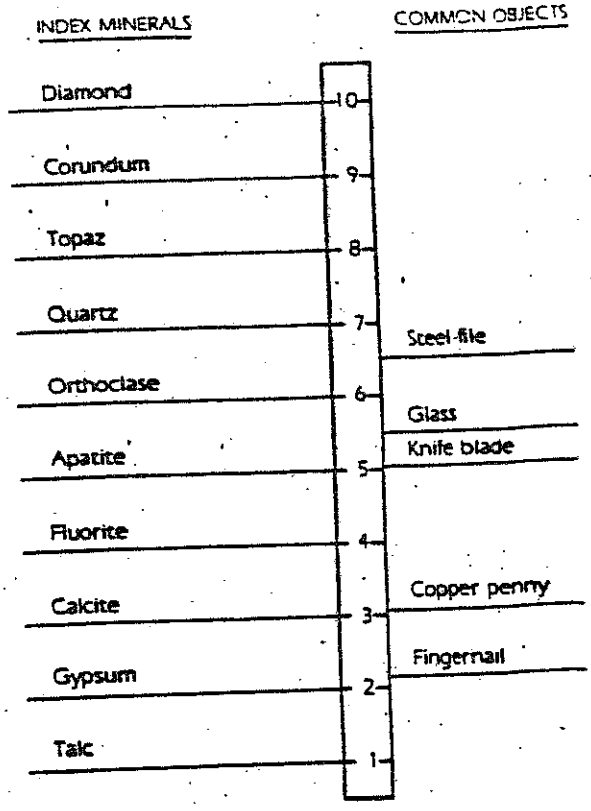


A. MOHS HARDNESS SCALE COMPARED WITH AN ABSOLUTE HARDNESS SCALE.



B. MOHS HARDNESS SCALE COMPARED WITH THE HARDNESS OF SOME COMMON EVERYDAY OBJECTS.

FIGURE 2.3 HARDNESS SCALES.

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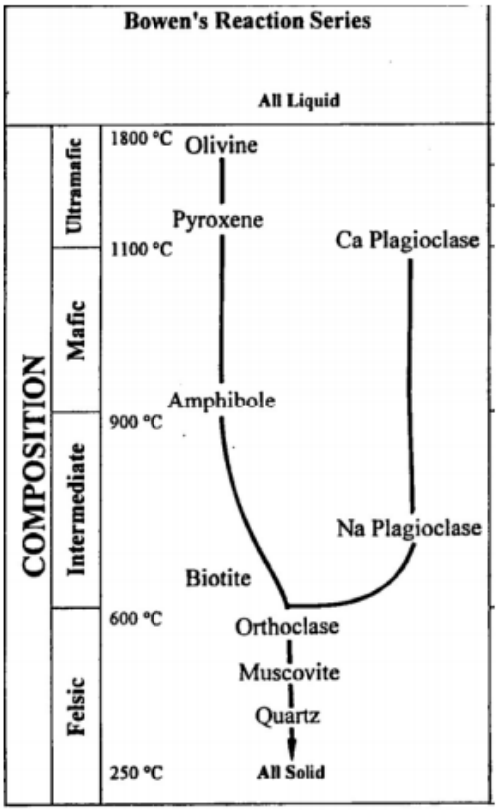
NOTES ON BOWEN'S REACTION SERIES



Composition	Formation Temperature	Dominant minerals	Silica content

Date _____ Per. ____

Nearly all rocks are composed of the elements, compounds and mixtures that we know as minerals. A **mineral** can be defined as a natural chemical solid of inorganic origin, with well defined properties and a specific range of composition. There are thousands of minerals, but most of them are rare. The bulk of the rocks that we see day by day are composed of only about a dozen of the most common minerals.

There are some rocks that contain no minerals at all. For example, coal is made of carbon from the fossil accumulation of plant remains. Because of its organic origin, coal contains no minerals. Some limestone is derived from the hard parts of shell fish and coral. This kind of limestone may therefore contain no minerals. On the other hand, ice is a mineral because it fits the definition above. Yet, no rocks contain ice.

Some rocks contain only a single mineral. Quartzite is composed of quartz, either pure or with minor impurities. Limestone is totally or almost totally made of calcite. But most rocks contain a variety of minerals. Granite usually has feldspar, quartz, mica, and amphibole. Other minerals, like magnetite and pyroxene, may also be present.

1. What are nearly all rocks made of? _____
2. How many different minerals are there? _____
3. Of the thousands of minerals, how many are very common? _____

Minerals are identified on the basis of their observable properties.

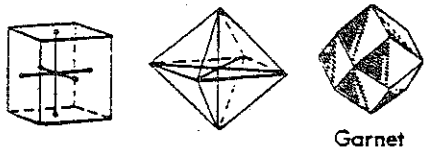
Color is one of the most readily observed characteristics. Some minerals are easy to identify on the basis of their colors. Almandine (garnet) is always dark red. Magnetite is gray or black. Unfortunately, many light colored minerals can be discolored by minor impurities. Quartz may be colorless (clear), white, pink, green, brown, or even black. Care must be used in identifying light colored minerals by their colors.

4. What problem might we find if we try to use color to identify all minerals?

_____

Luster is the way that light behaves at the surface of the mineral. We usually characterize luster as metallic (shiny with no light entry) or non-metallic. It is important to note that light does not penetrate a metallic luster at all. Minerals with this kind of luster look like they are made of a hard metal. Transparent or translucent surfaces cannot have a metallic luster. Non metallic lusters include glassy, pearly, waxy, and earthy (dull). It takes a little practice and a very fresh mineral surface to correctly identify luster, yet, it can be one of the most useful properties in mineral identification.

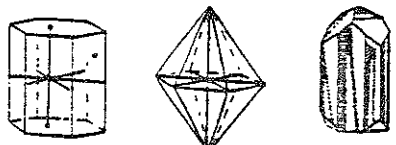
5. What do we mean by luster? _____
6. What is the luster of fresh aluminum foil? _____
7. What three types of luster are shiny, but not metallic? _____



Garnet

Isometric or Cubic System: Three axes of equal length intersect at 90° angles. Ex. galena, pyrite, halite.

Two of the Six Systems of Crystals applied in Mineralogy



Quartz

Hexagonal System: Of the four axes, the three horizontal axes intersect at 60° angles. The vertical axis is longer or shorter. Ex. quartz, calcite, apatite, hematite.

Due to their symmetry and rare beauty, crystals are sometimes called the "flowers" of the physical world. Most mineral samples do not contain perfectly shaped crystals, but when a sample does contain them, **crystal shape** can be very useful in identifying minerals. Both calcite and quartz are commonly clear with a glassy luster. However, quartz forms hexagonal (six sided) crystals, while calcite forms rhombihedral crystals that look like a cube pushed over toward one corner.

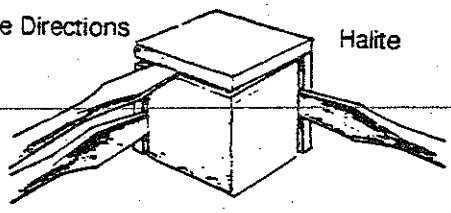
Geologists have classified crystals into six crystal systems according to their symmetry. Two of them are shown above, (cubic and hexagonal) with common minerals of each system.

8. What name is given to the geometric and symmetric forms of minerals? _____

9. What do crystals of table salt look like? _____

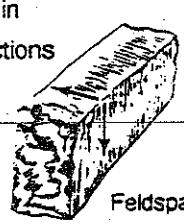
10. What is the crystal shape of quartz? _____

Cleavage in Three Directions



Halite

Cleavage in Two Directions

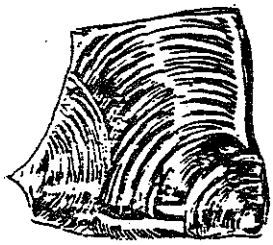


Feldspar

Cleavage in One Direction

Mica

Cleavage is the way a mineral splits along flat planes. It depends upon the arrangement and bonding of the molecules. Minerals tend to split parallel to the planes of weak bonding. In specifying the cleavage properties of a mineral, we count the number of non-parallel planes of cleavage, and the angles between those cleavage planes. Many minerals cleave parallel to the crystal faces. However, some, like quartz, do not split parallel to the crystal faces.



Obsidian

Asbestos

Fracture is a more uneven breakage. Asbestos breaks into thin fibers. Quartz fractures along curved surfaces; a property known as concoidal fracture. The fracture of garnet produces surfaces that are flat enough to look like cleavage planes, even though they are not true cleavage surfaces. Curiously, the fracture of garnet is more even than the cleavage of talc.

11. Why do minerals cleave only in certain directions? _____

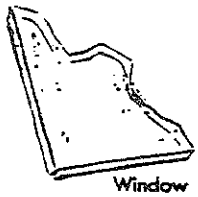
12. What test is similar to cleavage, but usually produces curved surfaces? _____

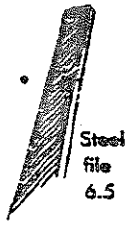
MOHS' SCALE OF HARDNESS

1. Talc	6. Feldspar
2. Gypsum	7. Quartz
3. Calcite	8. Topaz
4. Fluorite	9. Corundum
5. Apatite	10. Diamond


Fingernail 2.5


Penny 3


Window glass 5.5



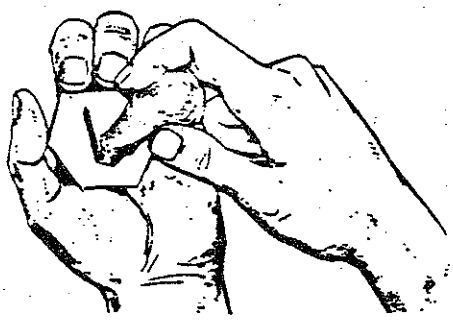
Hardness is determined by trying to scratch other objects of known hardness.We test hardness by drawing a pointed edge of the unknown mineral across a clean surface of a known substance. If the known substances is scratched, the mineral is harder. If the index material is not scratched, but it does scratch the unknown mineral, the unknown mineral must be the softer of the two. The box above shows Mohs' scale of hardness. You might note that not only is a diamond the hardest natural substance, it is actually much, much harder than corundum, which is the second hardest mineral. The diagrams above illustrate the hardness of several common materials.

13. What is the softest mineral on Mohs' scale? _____

14. How hard is window glass on Mohs' scale? _____

15. What is the hardest mineral? _____

16. How is hardness usually tested? _____


Testing for Streak with a Streak Plate

The **streak** test shows us the color of the powder of a mineral. We test the streak by rubbing a corner of the mineral across a white, unglazed porcelain streak plate. Minerals with a metallic luster often have a streak that looks very different than the surface of the sample. For example, pyrite is shiny gold. But the streak of pyrite is green to black.

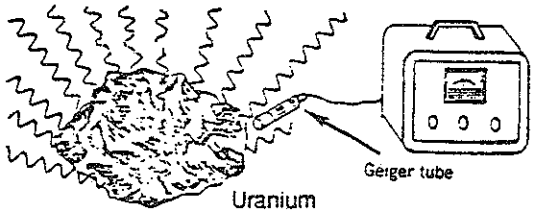
Specific gravity is the ratio of the density of the mineral to the density of water. As a ratio, specific gravity has no units. However, specific gravity is the same number as the density in grams per cubic centimeter. Many common minerals have a specific gravity (density) of about 2.5–3.

17. What test allows us to observe the color of the powder of a metallic mineral? _____

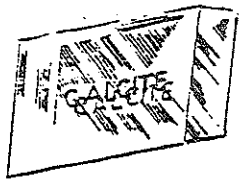
18. Specific gravity compares the density of a mineral with the density of... _____

19. Minerals of what kind of luster are often identified with the streak test? _____

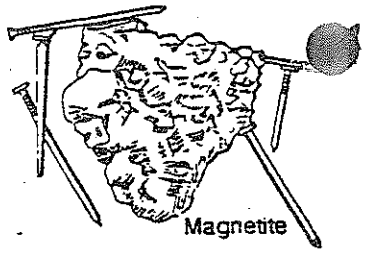
20. Why doesn't spcific gravity include units of measure? _____



Radioactivity



Double Refraction



Magnetism

There are a number other properties that are only found in a few minerals. But these special properties make those minerals very easy to identify.

For example, uranium (uranite) is one of the few minerals that shows **radioactivity**.

Transparent crystals of calcite can break light into two images (**Double Refraction**) as shown above. Calcite also bubbles in **acid reaction** when a drop of strong acid solution is applied.

Magnetite is the only common mineral that is strongly attracted by a magnet. (**Magnetism**)

Halite (rock salt) has a salty **taste**. (In general, you should *not* taste substances in the science laboratory

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20. What property makes magnetite very easy to identify? _____

21. What property makes an image look double through calcite? _____

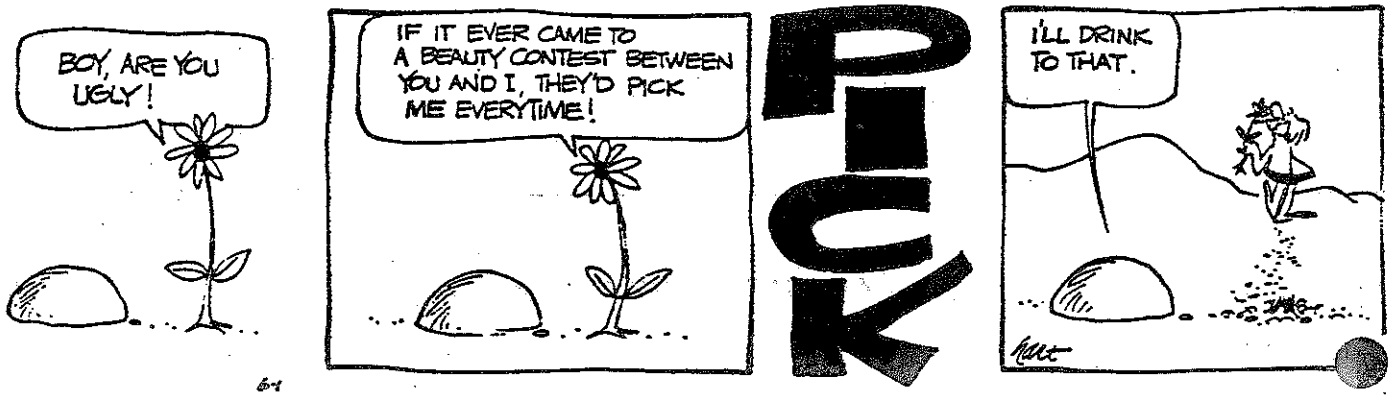
22. What rock is composed of pure, or nearly pure, halite? _____

23. Words are to sentences as minerals are to... _____

23. What is the complete definition of a mineral?

_____

_____



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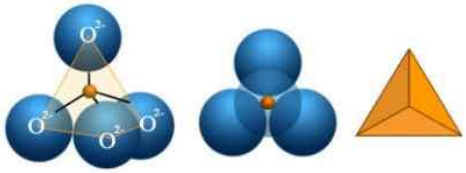
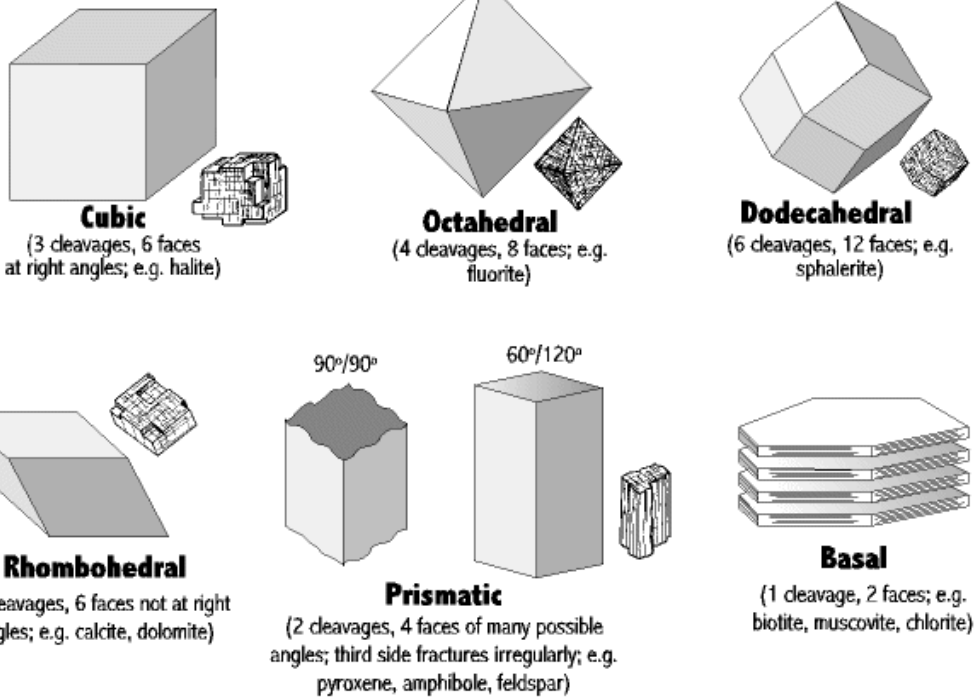
KEY CONCEPT#3

What two elements, by mass, make up the greatest percentage of the Earth's crust?



SiO_4 _____



KEY CONPECT#4: What cause minerals to have different physical properties?

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Use the ESRT (last page) to help you identify the following minerals based on the descriptions.

1. This mineral is attracted by a magnet _____
2. This mineral bubbles with acid _____
3. This mineral is used in talcum powder and soapstone_____
4. This mineral leaves a green-black streak and is brassy yellow _____
5. This mineral can be categorized as metallic and nonmetallic _____
6. This mineral has a 2 hardness and fractures when broken _____
7. This mineral is used in jewelry and abrasives _____
8. This mineral has the chemical equations f CaF_2 _____
9. This mineral is also known as hornblende _____
10. This mineral is commonly known as augite _____
11. This mineral has visible striations _____
12. This mineral has a hardness of 1-2 with metallic luster _____
13. This mineral is easily scratched by a fingernail _____
14. This mineral cleaves in 2 direction at 90° _____
15. This mineral has a hardness of 6.5 and is nonmetallic _____
16. This mineral is a source of magnesium _____
17. This mineral tastes easily _____
18. This mineral is flexible in thin sheet and is dark in color _____

mineral practice #1

Name: _____ Date: _____

1. Base your answer(s) to the following question(s) on the two tables below and on your knowledge of Earth science. Table 1 shows the composition, hardness, and average density of four minerals often used as gemstones. Table 2 lists the minerals in Moh's Scale of Hardness from 1 (softest) to 10 (hardest).

Table 1

Gemstone Mineral	Composition	Hardness	Average Density (g/cm^3)
emerald	$Be_3Al_2(Si_6O_{18})$	7.5{8	2.7 4.0
sapphire	Al_2O_3	9	3.8 4.7
spinel	$MgAl_2O_4$	8	
zircon	$ZrSiO_4$	7.5	

KEY	
Al = aluminum	O = oxygen
Be = beryllium	Si = silicon
Mg = magnesium	Zr = zirconium

Table 2

Moh's Scale of Hardness	
1	talc
2	gypsum
3	calcite
4	uorite
5	apatite
6	feldspar
7	quartz
8	topaz
9	corundum
10	diamond

Which gemstone minerals contain the two most abundant elements by mass in Earth's crust?

A. emerald and spinel B. emerald and zircon

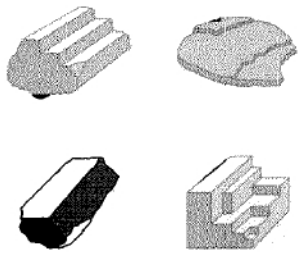
C. sapphire and spinel D. sapphire and zircon

2. Which mineral property is illustrated by the peeling of muscovite mica into thin, at sheets?

A. luster B. streak

C. hardness D. cleavage

3. The diagrams below represent fractured samples of four minerals.



Which mineral property is best illustrated by the samples?

A. harness B. streak

C. cleavage D. density

4. Base your answer(s) to the following question(s) on the Earth Science Reference Tables, the diagram and table below, and your knowledge of Earth science.

Mineral Sample A

Mass = 210 grams

Mineral Density Table

Mineral	Density (g/cm^3)	Mineral	Density (g/cm^3)
Gypsum	2.3	Hornblende	3.2
Orthoclase	2.6	Chalcopyrite	4.2
Quartz	2.7	Pyrite	5.0
Calcite	2.7	Magnetite	5.2
Dolomite	2.9	Galena	7.5
Fluorite	3.2	Copper	8.9

If the volume of mineral sample A is 28 cubic centimeters, sample A is most likely

A. copper B. galena

C. chalcopyrite D. dolomite

5. The original shape of mineral sample A was altered when it was hit with a rock hammer. Which physical property caused the mineral to break as it did?

A. hardness B. luster

C. cleavage D. streak

6. A student measured the mass of a sample of quartz three times. The mass was the same the first and second times, but was less the third time. This decrease in mass could have occurred before the third measurement if the sample had been

A. heated and expanded

B. cooled and extracted

C. soaked in water

D. dropped and a piece was lost

7. Under identical conditions, several samples of the mineral pyrite are measured, and their densities are compared. The values obtained should show that

A. rounded samples are more dense than rough samples

B. large samples are more dense than small samples

C. small samples are more dense than large samples

D. all the pyrite samples have the same density

8. When a sample of the mineral calcite is heated, it expands, causing its density to be

A. less than 2.7 g/cm^3

B. exactly 2.7 g/cm^3

C. between 2.7 and 3.0 g/cm^3

D. greater than 3.0 g/cm^3

9. Which property of the mineral diamond allows diamond powder to be used to shape gems for jewelry?

A. crystal shape B. cleavage

C. luster D. hardness

10. Base your answer(s) to the following question(s) on the Earth Science Reference Tables and on your knowledge of Earth science.

The accompanying data table shows the mass and volume of four di erent minerals.

Mineral Sample	A	B	C	D
Mass	50 g	60 g	55 g	40 g
Volume	20 mL	15 mL	10 mL	5 mL

Which mineral has the greatest density?

A. A B. B C. C D. D

11. A mineral's crystal shape and cleavage are a direct result of the mineral's

A. hardness

B. abundance in nature

C. arrangement of atoms

D. exposure to the hydrosphere and atmosphere

12. Base your answer(s) to the following question(s) on the table below, which shows the characteristics of four di erent mineral samples.

Mineral Characteristics

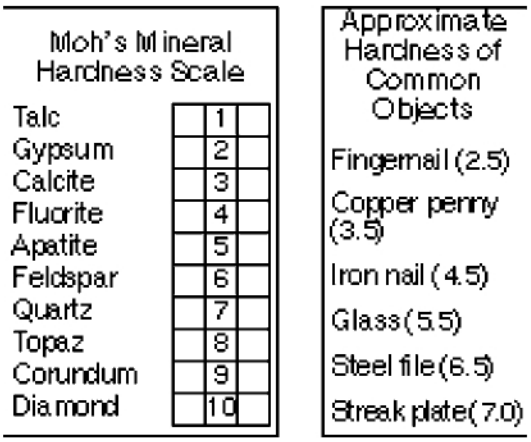
Mineral Sample	Color	Luster	Streak	Breakage Pattern
Galena	gray	metallic	gray	breakes into cubes
Halite	colorless	nonmetallic	colorless	break into cubex
Quartz	colorless	nonmetallic	colorless	irregular breakage
Gold	yellow	metallic	yellow	irregular breakage

Which two mineral samples would be most di cult to distinguish from each other based on their color, luster, and streak?

A. halite and quartz B. halite and gold

C. galena and quartz D. galena and gold

13. Base your answer(s) to the following question(s) on Moh's mineral hardness scale and the chart below showing the approximate hardness of some common objects..



Which statement is best supported by this scale?

A. A ngernail will scratch calcite, but not quartz.

B. A ngernail will scratch quartz, but not calcite.

C. A piece of glass can be scratched by quartz, but not by calcite.

D. A piece of glass can be scratched by calcite, but not by quartz.

14. The hardness of these minerals is most closely related to the

A. mineral's color

B. mineral's abundance in nature

C. amount of iron the mineral contains

D. internal arrangement of the mineral's atoms

15. Base your answer(s) to the following question(s) on the \Properties of Common Minerals" chart in the Earth Science Reference Tables.

Which mineral scratches dolomite and is scratched by olivine?

A. galena B. quartz

C. potassium feldspar D. muscovite mica

16. An unidenti ed mineral that is softer than calcite exhibits a metallic luster and cubic cleavage. This mineral most likely is

A. galena B. pyrite

C. halite D. pyroxene

mineral practice #2

Name: _____ Date: _____

1. Which property of a mineral most directly results from the internal arrangements of its atoms?

A. volume B. color

C. crystal shape D. streak

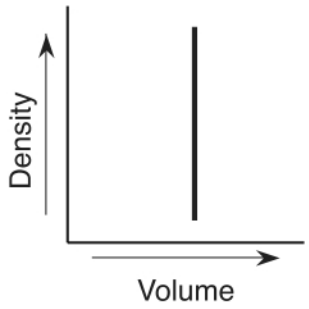
2. The data table below shows the mass and volume of three samples of the same mineral. [The density column is provided for student use.]

Data Table

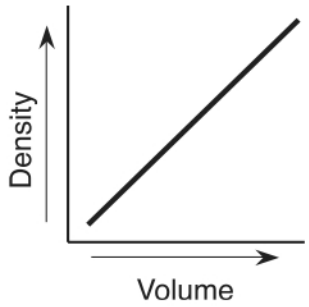
Sample	Mass (g)	Volume (cm^3)	Density (g/cm^3)
A	50	25	
B	100	50	
C	150	75	

Which graph best represents the relationship between the density and the volume of these mineral samples?

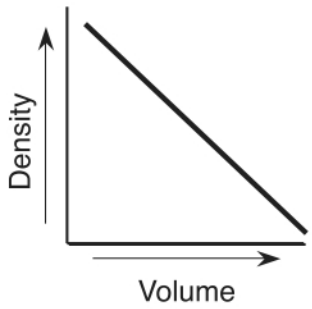
A.



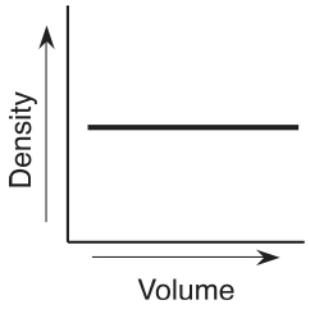
B.



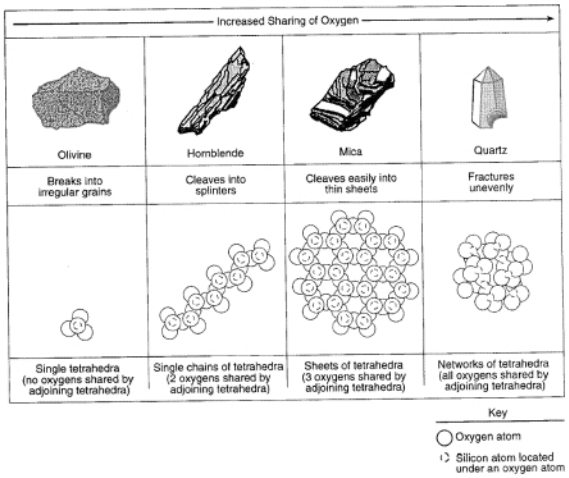
C.



D.



3. The accompanying table provides information about four common silicate minerals.



Which conclusion is best supported by the information in this table?

A. The shape of the tetrahedral unit controls the shape of the broken mineral.

B. The arrangement of the tetrahedral units controls the mineral breakage pattern.

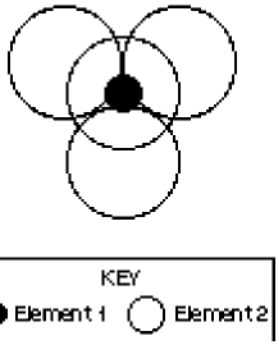
C. The percent of shared oxygen controls the size of the mineral crystal.

D. The type of atoms present controls how much oxygen is shared.

4. The elements contained in four minerals are given in the table below. The basic structural unit of one of the minerals is also shown. The atom of element 1 is surrounded by four atoms of element 2.

Mineral	Element 1	Element 2
Fluorite	calcium	uorine
Halite	sodium	chlorine
Quartz	silicon	oxygen
Galena	lead	sulfur

Basic Structural Unit



In which mineral are the atoms arranged as shown in the basic structural unit?

A. uorite B. halite

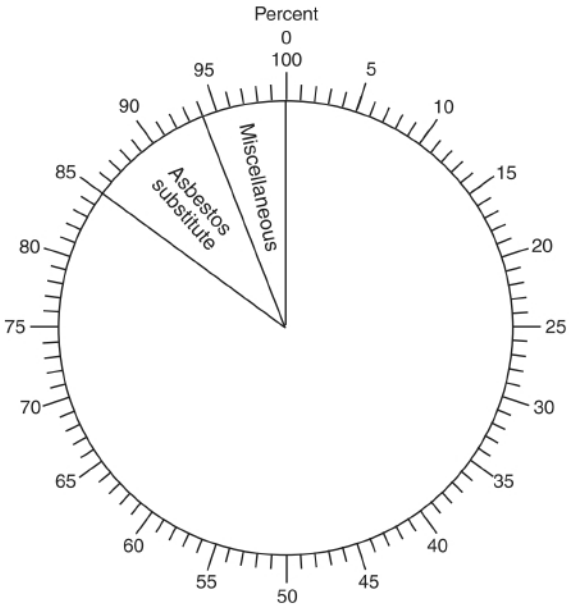
C. quartz D. galena

5. Base your answer(s) to the following question(s) on your knowledge of Earth science and on the data table, which shows the industrial uses of wollastonite, a mineral mined in the eastern Adirondack Mountains of New York State.

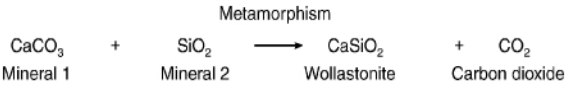
Industrial Uses of Wollastonite in the United States

Industrial Uses of Wollastonite	Percent of Total Use
Plastics	37
Ceramics	28
Metallurgy	10
Paint	10
Asbestos substitute	9
Miscellaneous	6

On the pie graph provided below, complete the graph to show the percent of each industrial use of wollastonite. Label each section of the pie graph with its industrial use. The percent for Miscellaneous and for Asbestos substitute has been drawn and labeled for you.



6. Wollastonite forms during the intense metamorphism of a sandy limestone. The expression below shows part of the process that results in the formation of wollastonite.



a) Name the two minerals involved in the formation of wollastonite.

b) What two conditions normally cause intense metamorphism?

7. Base your answer(s) to the following question(s) on the information, table, and photographs below and on your knowledge of Earth science.

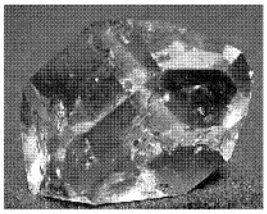
\Herkimer Diamonds"

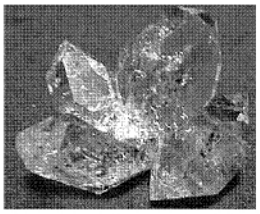
Gem-quality \Herkimer Diamonds" are hexagonal-shaped quartz crystals found in some of the surface bedrock of Herkimer, New York. Herkimer is located at approximately 43 north latitude and 75 west longitude. The oldest of these gemstones are believed to be approximately 500 million years old. These quartz crystals are magni cent works of nature that have a natural diamondlike geometric shape formed when the quartz crystallized. Natural \Herkimer Diamonds" were not cut or shaped by humans. Due to their appearance, \Herkimer Diamonds" are commonly used in jewelry. These quartz crystals are not true diamonds.

Mineral Characteristics of \Herkimer Diamonds" (Quartz) and True Diamonds

Mineral	Color	Chemical Composition	Luster	Hardness	Dominant Form of Breakage
\Herkimer Diamond" (quartz)	Colorless or variable	SiO_2	Glassy	7	Fracture
True diamond	Colorless or variable	C	Glassy	10	Cleavage

Photographs of "Herkimer Diamonds" (Quartz)





List two mineral characteristics that di er between \Herkimer Diamonds" and true diamonds.

8. State one use for \Herkimer Diamonds" (quartz), other than their use in jewelry.

9. Base your answer(s) to the following question(s) on the passage below and on your knowledge of Earth science.

A New Oregon Volcano?

The Three Sisters are 10,000-foot volcanic mountain peaks in Oregon. Volcanic eruptions began building the Three Sisters from andesitic lava and cinders 700,000 years ago. The last major eruption occurred 2000 years ago.

West of the Three Sisters peaks, geologists have recently discovered that Earth's surface is bulging upward in a bull's-eye pattern 10 miles wide. There is a 4-inch rise at its center, which geologists believe could be the beginning of another volcano. The uplift was found by comparing satellite images. This uplift in Oregon may allow the tracking of a volcanic eruption from its beginning, long before the smoke and explosions begin.

This uplift is most likely caused by an up ow of molten rock from more than four miles below the surface. Rock melts within Earth's interior and then moves upward in cracks in Earth's crust, where it forms large underground pools called magma chambers. Magma upwelling often produces signs that help scientists predict eruptions and protect humans. When the pressure of rising magma becomes forceful enough to crack bedrock, swarms of small earthquakes occur. Rising magma releases carbon dioxide and other gases that can be detected at the surface.

Identify one of the minerals found in the andesite rock of the Three Sisters volcanoes.

10. Base your answer(s) to the following question(s) on the passage below.

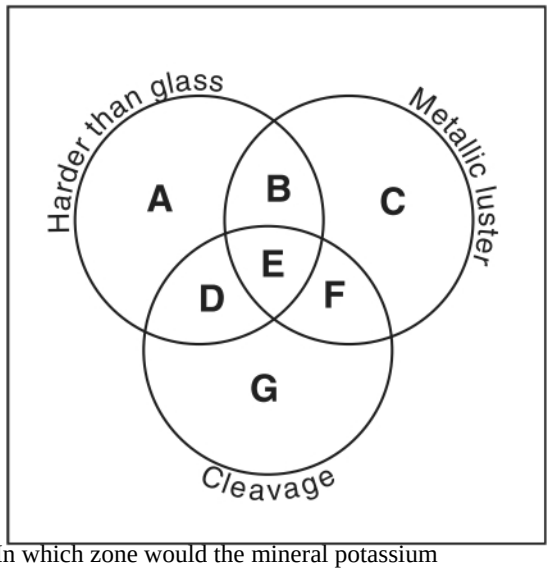
Asbestos

Asbestos is a general name given to the brous varieties of six naturally occurring minerals used in commercial products. Most asbestos minerals are no longer mined due to the discovery during the 1970s that long-term exposure to high concentrations of their long, sti bers leads to health problems. Workers who produce or handle asbestos products are most at risk, since inhaling high concentrations of airborne bers allows the asbestos particles to become trapped in the workers' lungs. Chrysotile is a variety of asbestos that is still mined because it has short, soft, exible bers that do not pose the same health threat.

What determines the physical properties of minerals, such as the long, sti bers of some varieties of asbestos?

11. The chemical formula for chrysotile is $Mg_3Si_2O_5(OH)_4$. State the name of the mineral found on the Earth Science Reference Tables that is most similar in chemical composition.

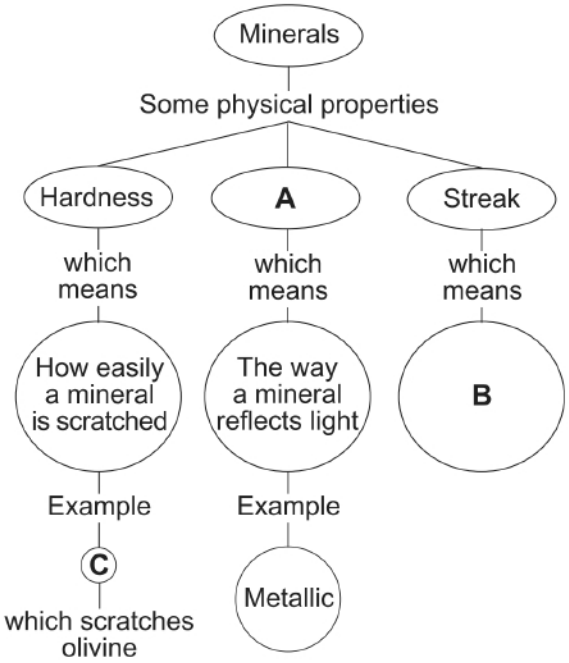
12. Base your answer(s) to the following question(s) on the diagram below of a mineral classi cation scheme that shows the properties of certain minerals. Letters A through G represent mineral property zones. Zone E represents the presence of all three properties. For example, a mineral that is harder than glass, has a metallic luster, but does not have cleavage, would be placed in zone B. Assume that glass has a hardness of 5.5.



In which zone would the mineral potassium feldspar be placed?

13. State the name of one mineral listed on the Properties of Common Minerals Table that could not be placed in any of the zones.

14. Base your answer(s) to the following question(s) on the chart below, which shows some physical properties of minerals and the de nitions of these properties. The letters A, B, and C indicate parts of the chart that have been left blank. Letter C represents the name of a mineral.



Which physical property of a mineral is represented by letter A?

15. Identify one mineral that could be represented by letter C.

16. Base your answer(s) to the following question(s) on the passage below.

Carbon

Carbon may be the most important element on our planet because it is the chemical building block of all living things. The element carbon is formed in dying stars and scattered when the stars explode. Our solar system formed from such star remnants. Pure carbon comes in several forms, which include the minerals graphite and diamond (hardness = 10), and the fossil fuels bituminous coal and anthracite coal. Almost all diamonds are mined from igneous rocks that originate at an approximate depth of 150 kilometers under immense pressure. Most graphite is formed through the metamorphism of organic material in rocks closer to Earth's surface.

Identify two uses for the mineral graphite.

17. Explain why graphite and diamond have di erent properties.

18. Complete the table below to show the properties of the minerals diamond and graphite.

Property	Diamond	Graphite
color	variable	
luster	nonmetallic	
hardness		

Rubric for mineral unit/Learning objectives

INDICATORS	JUST STARTING Novice	GETTING THERE Apprentice	YOU'VE MADE IT Practitioner	ABOVE AND BEYOND Expert
Define a mineral	Identify the characteristics of matter. Understand the relationship of atoms to matter List some characteristics of a mineral	List all the characteristics of a mineral Compare and contrast minerals and non-minerals Understand that rocks are made of one or more minerals	☐ List and explain all the characteristics of a mineral ☐ Give specific examples of these characteristics ☐ Explain how minerals form ☐ Identify the origin of the highest abundance of silicate minerals ☐ Understand the meaning of monomineralic vs. polymineralic.	*Practitioner Plus* Pick 5 minerals. Describe how these minerals are significant in their uses within our homes and society. Describe the geologic environment these minerals are likely to form
Inspect the physical properties of a mineral	List all the physical characteristics of a mineral List all the chemical groups	Name the physical tests used to identify minerals or mineral groups Describe the physical tests used to identify minerals Identify special characteristics of certain minerals like calcite, uranium, fluorite, franklinite, halite and magnetite	☐ Understand that the physical characteristics of minerals are influenced by their crystalline structure ☐ Conduct different mineral tests to describe the physical characteristics of a particular mineral ☐ Compare and contrast the physical characteristics of different minerals through physical tests ☐ Name and describe the crystal structure of calcite, quartz, silicate, halite, and garnet ☐ Describe the properties of the most common minerals silicates and carbonates	*Practitioner Plus* Understand the factors that affect the structures of silicate minerals as they form into variety of crystalline structures even though they are made from the same building blocks. Explain the Bowen's reaction series
Identify and classify minerals	Identify 1-3 common minerals such as sulfur, pyrite and halite through physical inspections.	Identify the difference between halite and calcite List and identify the chemical groups using the ESRT	☐ Identify rock forming minerals by inspection, using physical properties such as color, luster, hardness, streak and crystal shape ☐ Identify rock forming minerals using simple tests that identify both physical and chemical properties such as streak, luster, hardness and acid test. ☐ Describe the properties of the most common minerals, silicates and carbonates ☐ Describe tests used to identify mineral groups	*Practitioner Plus* Identify the types of minerals are common in the region where we live. Speculate the processes by which they might have formed Identify the difference between a rock and a mineral Identify minerals that are not part of the ESRT