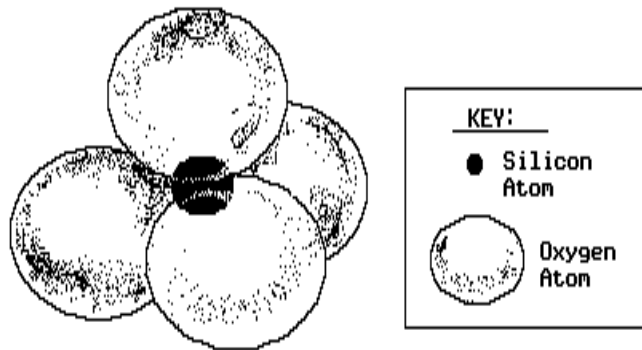
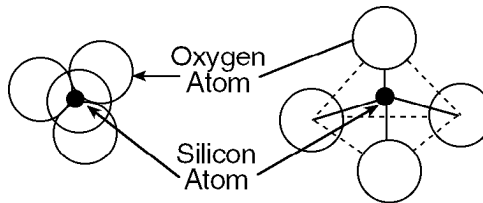


Name: \_\_\_\_\_

- 1) The diagram below represents a single silicon-oxygen tetrahedron unit. Two different minerals have these same units arranged in different patterns. How will the minerals differ?



- A) One mineral will have some physical properties different from the other.  
 B) One mineral will be more radioactive than the other.  
 C) One mineral will have the silicon atom outside the tetrahedron while the other will have it inside the tetrahedron.  
 D) One mineral will have larger silicon atoms than the other.
- 2) The diagram below represents top and side views of a model of the silicate tetrahedron.

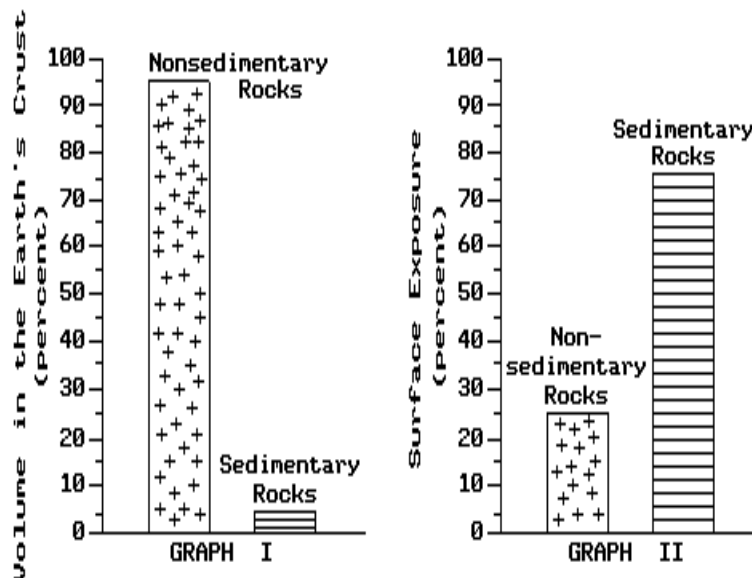


This tetrahedron is found in large amounts in the Earth's

- A) lithosphere                      B) stratosphere                      C) hydrosphere                      D) troposphere

Questions 3 and 4 refer to the following:

Graph I below represents the percentage of sedimentary and nonsedimentary rock which makes up the Earth's crust by volume. Graph II represents, of those rocks that are exposed at the surface (outcrops), the percentage that are sedimentary rocks and nonsedimentary rocks.



- 3) Which is the most abundant element present in the rocks shown in graph I? [Refer to the *Earth Science Reference Tables*.]  
 A) silicon                      B) nitrogen                      C) oxygen                      D) hydrogen

4) According to the *Earth Science Reference Tables*, all of the rocks represented in graph I must contain

- A) intergrown crystals  
 B) fossils  
 C) minerals  
 D) sediments

Questions 5 through 8 refer to the following:

The table of minerals below shows the physical properties of nine minerals.

MINERAL	COLOR	LUSTER	STREAK	HARD- NESS	DENSITY (g/mL)	CHEMICAL COMPOSITION
biotite mica	black	glassy	white	soft	2.8	$K(Mg, Fe)_3(AlSi_3O_{10})(OH)_2$
diamond	varies	glassy	colorless	hard	3.5	C
galena	gray	metallic	grey-black	soft	7.5	PbS
graphite	black	dull	black	soft	2.3	C
kaolinite	white	earthy	white	soft	2.6	$Al_4(Si_4O_{10})(OH)_8$
magnetite	black	metallic	black	hard	5.2	$Fe_3O_4$
olivine	green	glassy	white	hard	3.4	$(Fe, Mg)_2SiO_4$
pyrite	brass yellow	metallic	greenish- black	hard	5.0	$FeS_2$
quartz	varies	glassy	colorless	hard	2.7	$SiO_2$

**Definitions:**

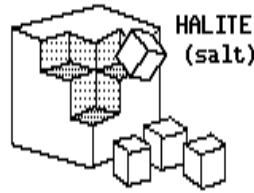
- LUSTER:** the way a mineral's surface reflects light  
**STREAK:** color of a powdered form of the mineral  
**HARDNESS:** resistance of a mineral to being scratched (soft-easily scratched; hard-not easily scratched)

**Chemical Symbols**

Al - Aluminum	Pb - Lead
C - Carbon	Si - Silicon
Fe - Iron	K - Potassium
H - Hydrogen	S - Sulfur
Mg - Magnesium	O - Oxygen

- 5) Which mineral would most likely be weathered most after being placed in a container and shaken for 10 minutes?  
 A) magnetite                      B) kaolinite                      C) quartz                      D) pyrite
- 6) Which mineral contains iron, has a metallic luster, is hard, and has the same color and streak?  
 A) galena                      B) kaolinite                      C) magnetite                      D) biotite mica
- 7) Which mineral has a different color in its powdered form than its original form?  
 A) kaomite                      B) pyrite                      C) magnetite                      D) graphite
- 8) Why do diamond and graphite have different physical properties, even though they are *both* composed entirely of the element carbon?  
 A) The minerals have different arrangement of carbon atoms.  
 B) Only diamond contains radioactive carbon.  
 C) Only graphite consists of organic material.  
 D) The minerals have undergone different amounts of weathering.
- 9) Which element combines with silicon to form the tetrahedral unit of structure of the silicate minerals?  
 A) nitrogen                      B) potassium                      C) oxygen                      D) hydrogen
- 10) According to the *Earth Science Reference Tables*, what is the approximate percentage by volume of oxygen in the crust of the Earth?  
 A) 30%                      B) 20%                      C) 90%                      D) 70%

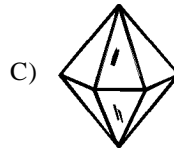
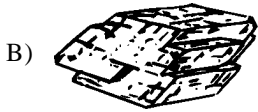
- 11) What causes the characteristic crystal shape and cleavage (Breaking along flat surfaces) of the mineral halite as shown in the diagram below?



- A) the internal arrangement of the atoms in halite  
 B) the amount of erosion the halite has undergone  
 C) the shape of the other minerals located where the halite formed  
 D) metamorphism of the halite
- 12) The table below shows some characteristics of a rock-forming mineral.

Mineral	Cleavage	Hardness	Density (g/cm <sup>3</sup> )	Other Properties
Pyroxene (a complex family of minerals; augite is most common)	Two flat planes at nearly right angles	5-6	3.2-3.9	Found in igneous and metamorphic rocks; augite is dark green to black; other varieties are white to green

Which diagram *best* represents a sample of pyroxene?



- 13) An unidentified mineral that is softer than calcite exhibits a metallic luster and cubic cleavage. This mineral most likely is
- A) pyrite                      B) halite                      C) galena                      D) pyroxene

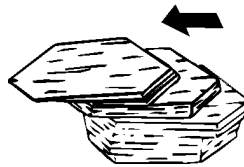
Questions 14 and 15 refer to the following:

The diagrams below represent *Moh's Mineral Hardness Scale* and a chart showing the approximate hardness of some common objects.

Moh's Mineral Hardness Scale		Approximate Hardness of Common Objects
Talc	1	Fingernail (2.5)
Gypsum	2	Copper penny (3.5)
Calcite	3	Iron nail (4.5)
Flourite	4	Glass (5.5)
Apatite	5	Steel file (6.5)
Feldspar	6	Streak plate (7.0)
Quartz	7	
Topaz	8	
Corundum	9	
Diamond	10	

- 14) Which statement is *best* supported by this scale?
- A) A piece of glass can be scratched by calcite, but not by quartz.  
 B) A piece of glass can be scratched by quartz, but not by calcite.  
 C) A fingernail will scratch calcite, but not quartz.  
 D) A fingernail will scratch quartz, but not calcite.

- 15) The hardness of these minerals is most closely related to the
- A) mineral's abundance in nature  
B) mineral's color  
C) amount of iron the mineral contains  
D) internal arrangement of the mineral's atoms
- 16) Which element in the Earth's crust makes up the *largest* volume of most minerals?
- A) nitrogen  
B) oxygen  
C) hydrogen  
D) iron
- 17) Differences in hardness between minerals are most likely caused by the
- A) number of cleavage planes  
B) external arrangement of flat surfaces  
C) number of pointed edges  
D) internal arrangement of atoms
- 18) Which mineral is white or colorless, has a hardness of 2.5, and splits with cubic cleavage?
- A) pyrite  
B) calcite  
C) mica  
D) halite
- 19) Which property is most useful in mineral identification?
- A) texture  
B) color  
C) hardness  
D) size
- 20) What mineral is an ore of iron and has a characteristic reddish brown streak?
- A) magnetite  
B) hematite  
C) pyrite  
D) olivine
- 21) The physical properties of a mineral sample are most closely related to the
- A) size of the mineral sample  
B) age of the mineral sample  
C) temperature of the mineral sample  
D) arrangement of the mineral's atoms
- 22) The diagram below shows how a sample of the mineral mica breaks when hit with a rock hammer.



This mineral breaks in smooth, flat surfaces because it

- A) is very dense  
B) is very hard  
C) has a regular arrangement of atoms  
D) contains large amounts of iron
- 23) The relative hardness of a mineral can *best* be tested by
- A) determining the density of the mineral  
B) breaking the mineral with a hammer  
C) scratching the mineral across a glass plate  
D) squeezing the mineral with calibrated pliers

Questions 24 through 27 refer to the following:

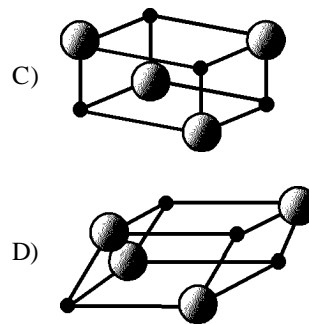
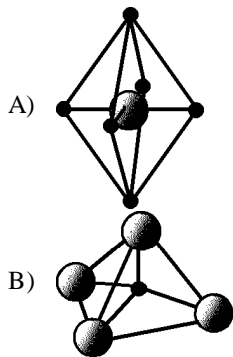
**MINERAL HARDNESS**

Moh's Hardness Scale		Approximate Hardness of Common Objects
Talc	1	
Gypsum	2	Fingernail (2.5)
Calcite	3	Copper Penny (3.5)
Flourite	4	Iron nail (4.5)
Apatite	5	Glass (5.5)
Feldspar	6	Steel file (6.5)
Quartz	7	Streak Plate (7.0)
Topaz	8	
Corundum	9	
Diamond	10	

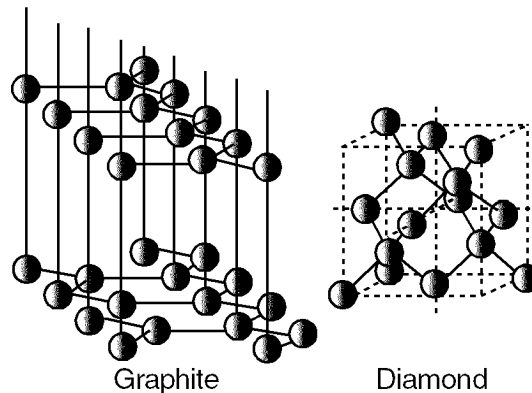
- 24) Which statement is *best* supported by the data shown?
- A) An iron nail contains fluorite.  
B) A streak plate is composed of quartz.  
C) Apatite is softer than a copper penny.  
D) Topaz is harder than a steel file.

- 25) The durable gemstones ruby and sapphire are valuable due to their color and hardness. These gemstones would most likely be located on Moh's scale at the hardness level of
- A) 1                                      B) 9                                      C) 3                                      D) 4
- 26) Moh's scale arranges minerals according to their relative
- A) resistance to breaking                                      C) specific gravity  
B) specific heat                                      D) resistance to scratching
- 27) Moh's scale would be most useful for
- A) finding the density of a mineral sample  
B) counting the number of cleavage surfaces of a mineral sample  
C) finding the mass of a mineral sample  
D) identifying a mineral sample
- 28) Which model *best* represents the silicon-oxygen tetrahedron?

**KEY:**



- 29) According to the *Earth Science Reference Tables*, which element is most abundant by mass in the Earth's crust?
- A) nitrogen                                      B) silicon                                      C) iron                                      D) oxygen
- 30) The diagrams below represent the arrangements of carbon atoms in the minerals graphite and diamond.



Which conclusion about graphite and diamond is *best* supported by these diagrams?

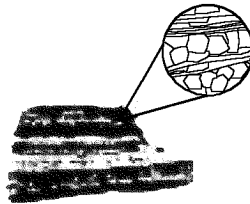
- A) They have similar crystal shapes because of their similar compositions.  
B) They have different physical properties due to the difference in their atomic arrangements.  
C) They have different chemical compositions due to the difference in their atomic arrangements.  
D) They have a similar color because of their similar compositions.
- 31) According to the *Earth Science Reference Tables*, which element is most abundant in the Earth's crust?
- A) nitrogen                                      B) silicon                                      C) hydrogen                                      D) oxygen
- 32) According to the *Earth Science Reference Tables*, what are the four most abundant elements, by volume, in the Earth's crust?
- A) aluminum, calcium, hydrogen, and iron                                      C) aluminum, iron, silicon, and magnesium  
B) hydrogen, oxygen, nitrogen, and potassium                                      D) oxygen, potassium, sodium, and calcium

- 33) The data table below shows the composition of six common rock-forming minerals.

MINERAL	COMPOSITION
Mica	$KAl_3Si_3O_{10}$
Olivine	$(FeMg)_2SiO_4$
Potassium feldspar	$KAlSi_3O_8$
Plagioclase	$NaAlSi_3O_8$
Pyroxene	$CaMgSi_2O_6$
Quartz	$SiO_2$

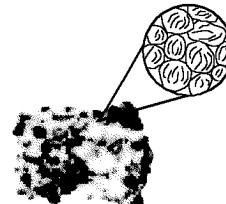
The data table provides evidence that

- A) all elements are found in all minerals  
 B) the same elements are found in all minerals  
 C) a few elements are found in many minerals  
 D) all elements are found in only a few minerals
- 34) The physical properties of a mineral are largely due to its  
 A) melting point  
 B) internal arrangement of atoms  
 C) organic composition  
 D) volume
- 35) Magnified views of the pictures of four rocks below are shown in the circles.



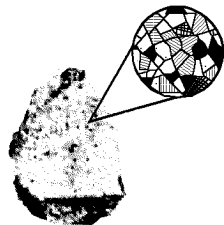
**Rock 1**

Bands of coarse  
intergrown crystals  
of various sizes



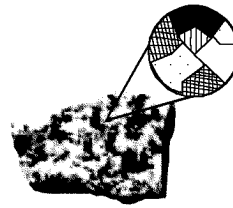
**Rock 2**

Particles of  
0.01-cm to 1.0-cm size  
cemented together



**Rock 3**

Intergrown crystals  
less than 0.1 cm in size

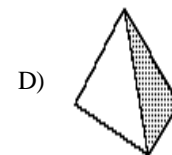
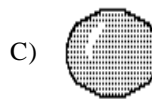
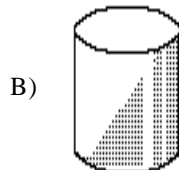
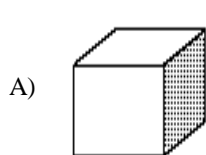


**Rock 4**

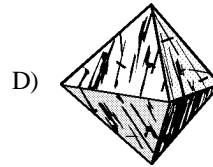
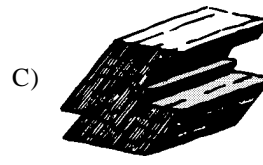
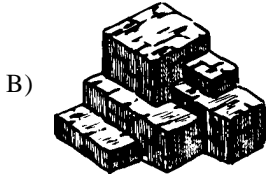
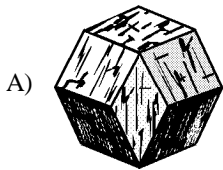
Intergrown crystals  
mostly 2.0 cm in size

What do *all* four rock samples have in common?

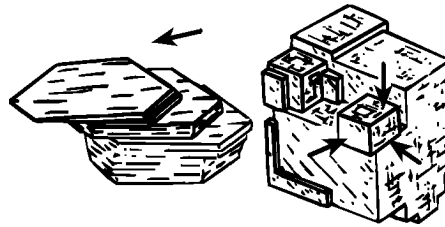
- A) They show cleavage.  
 B) They contain minerals.  
 C) They are organically formed.  
 D) They formed on Earth's surface.
- 36) Which object is the best model of the shape of a silicon-oxygen structural unit?



- 37) Halite has three cleavage directions at 90° to each other. Which model *best* represents the shape of a broken sample of halite?

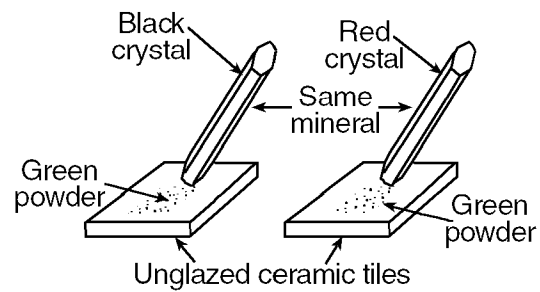


- 38) The diagrams below illustrate a specific property of certain minerals.



This property is most closely related to the

- A) arrangement of atoms in the mineral  
 B) impurities found in the mineral  
 C) density of the mineral  
 D) softness of the mineral
- 39) The diagram below shows the results of one test for mineral identification.

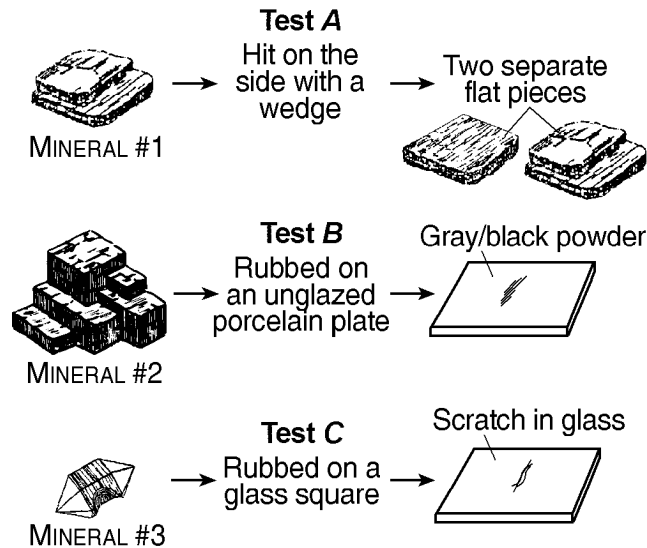


Which mineral property is being tested?

- A) streak  
 B) fracture  
 C) density  
 D) luster

Questions 40 and 41 refer to the following:

The diagram below shows three minerals with three different physical tests, A, B, and C, being performed on them.



- 40) Which sequence correctly matches each test, A, B, and C, with the mineral property tested?
- A) A  $\ddagger\ddagger$  cleavage; B  $\ddagger\ddagger$  hardness; C  $\ddagger\ddagger$  streak  
 B) A  $\ddagger\ddagger$  streak; B  $\ddagger\ddagger$  hardness; C  $\ddagger\ddagger$  cleavage  
 C) A  $\ddagger\ddagger$  cleavage; B  $\ddagger\ddagger$  streak; C  $\ddagger\ddagger$  hardness  
 D) A  $\ddagger\ddagger$  streak; B  $\ddagger\ddagger$  cleavage; C  $\ddagger\ddagger$  hardness
- 41) The results of *all* three physical tests shown are *most* useful for determining the
- A) environment where the minerals formed  
 B) identity of the minerals  
 C) rate of weathering of the minerals  
 D) geologic period when the minerals formed
- 42) Which statement about the minerals plagioclase feldspar, gypsum, biotite mica, and talc can *best* be inferred from the *Properties of Common Minerals* Earth Science reference table?
- A) The physical and chemical properties of these minerals determine how humans use them.  
 B) These minerals have the same chemical and physical properties.  
 C) These minerals have different chemical properties, but they have similar physical properties.  
 D) These minerals have different physical and chemical properties, but they have identical uses.
- 43) According to the *Properties of Common Minerals* Earth Science reference table, which mineral scratches dolomite and is scratched by olivine?
- A) quartz  
 B) potassium feldspar  
 C) muscovite mica  
 D) galena
- 44) Two mineral samples have different physical properties, but each contains silicate tetrahedrons as its basic structural unit. Which statement about the two mineral samples must be true?
- A) They have the same density.  
 B) They contain silicon and oxygen.  
 C) They are similar in appearance.  
 D) They are the same mineral.
- 45) Which element comprises most of the Earth's crust *both* by weight and by volume?
- A) silicon  
 B) nitrogen  
 C) hydrogen  
 D) oxygen
- 46) The mineral mica breaks evenly along flat sheets mainly because of its
- A) atomic arrangement  
 B) chemical composition  
 C) hardness  
 D) density
- 47) Certain minerals usually break along flat surfaces, while other minerals break unevenly. This characteristic is due to the
- A) force with which the mineral is broken  
 B) age of the mineral  
 C) luster of the mineral  
 D) internal arrangement of the mineral's atoms
- 48) According to the *Properties of Common Minerals* Earth Science reference table, which mineral leaves a green-black powder when rubbed against an unglazed porcelain plate?
- A) hematite  
 B) galena  
 C) graphite  
 D) pyrite

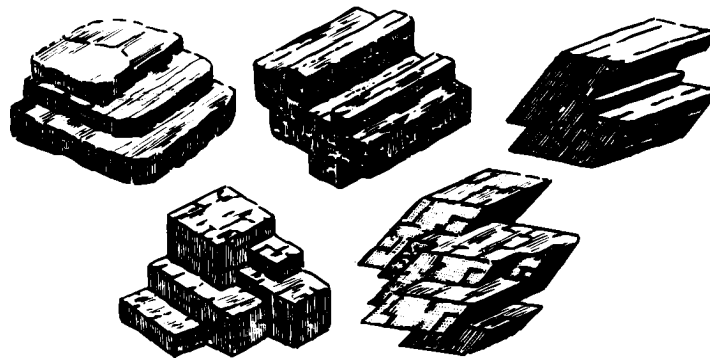


- 49) Which diagram *best* represents the silicon-oxygen tetrahedron of which talc, feldspar, and quartz are composed?

**KEY:**



- 50) One of the most abundant minerals in beach sand is quartz. Which property of quartz could account for its abundance?  
 A) hardness                      B) texture                      C) color                      D) luster
- 51) The diagrams below represent samples of five different minerals found in the rocks of the Earth's crust.



Which physical property of minerals is represented by the flat surfaces in the diagrams?

- A) cleavage                      B) hardness                      C) magnetism                      D) crystal size
- 52) Scratching a mineral against a glass plate is a method used for determining the mineral's  
 A) cleavage                      B) hardness                      C) luster                      D) color