

STATION 1, ROCKS AND MINERALS Name: _____

Task: Answer as many questions as you can in 9 minutes! When you are done, check your work with the answer key.

1) Use the Earth Science Reference Table Rock Cycle chart (pg 6) and the notes sheet to complete the following chart

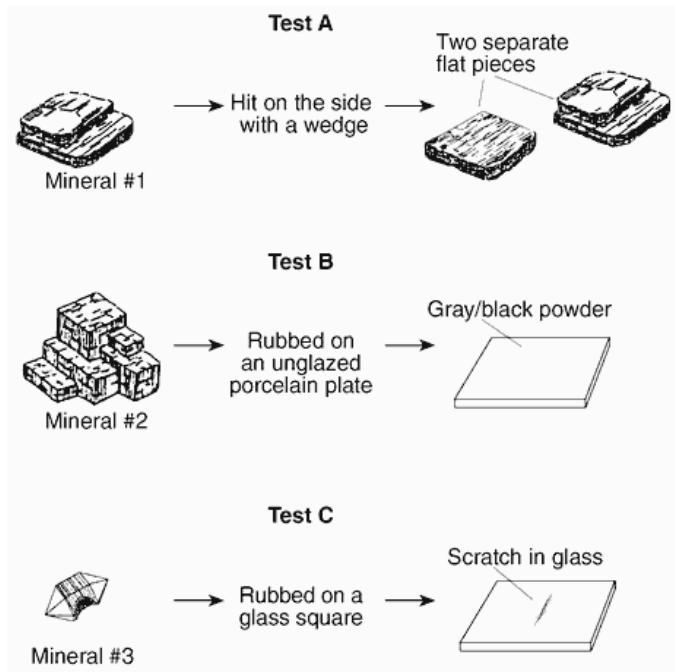
Origin	Characteristics you might SEE in this type of rock
Metamorphic rock forms....	
Igneous rock forms....	
Sedimentary rock forms...	

2) Identify two rocks in the envelope. Write the letter of the rock you identified.

Rock ___ is _____ How do you know? _____

Rock ___ is _____ How do you know? _____

3) Use the diagram below and the notes sheet to answer the following questions:



Does mineral #1 have cleavage or fracture? Explain.

What does test B tell you about the mineral?

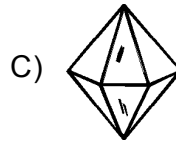
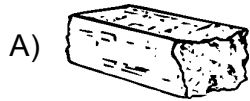
Is mineral #3 hard or soft? How do you know?

CHALLENGE QUESTIONS! Use the ESRT pages 6, 7, and 16 to help you answer the following questions.

- 1) The table below shows some characteristics of a rock-forming mineral.

Mineral	Cleavage	Hardness	Density (g/cm ³)	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?



- 2) According to the *Earth Science Reference Tables*, an igneous rock containing large, visible crystals of pyroxene is *best* described as
- A) felsic and formed deep within the Earth's crust
 - B) mafic and formed near the Earth's surface
 - C) mafic and formed deep within the Earth's crust
 - D) felsic and formed near the Earth's surface
- 3) Analysis of a granite pebble would probably show that the pebble consists mostly of the
- A) elements iron and magnesium
 - B) minerals quartz and feldspar
 - C) minerals calcite and gypsum
 - D) elements carbon and hydrogen

IGNEOUS ROCKS

Rock	Description	Minerals in Rock	Method of Formation	Use
Granite	Light colored, gray to pink	A	Intrusive	Building stone, monuments
Pumice	Light to gray	Feldspar and quartz	Extrusive	Scouring powders and soaps
B	Dark colored, gray to black, coarse grained	Feldspar and pyroxene	Intrusive	Building stone
Basalt Scoria	Dark colored, fine grained	Feldspar and pyroxene	Extrusive	Building stone, railway ballast
Obsidian (volcanic glass)	Dark colored	Feldspar and quartz	Extrusive	Ornaments, arrowheads

- 4) Based on the information given in the "Igneous Rocks" table, which rock is represented by the letter *B*?
- A) gabbro
 - B) granite
 - C) rhyolite
 - D) basalt

ROCKS

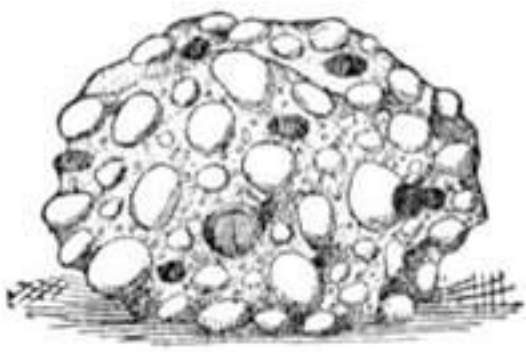
A



B



C



D



E



F



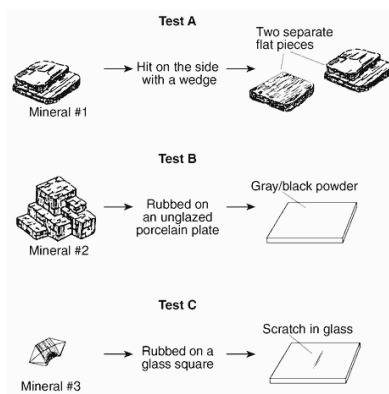
STATION 1: Answer Key

Origin	Characteristics you might SEE in this type of rock
Metamorphic rock forms... by heat and pressure	foliation or banding
Igneous rock forms... from cooling lava or magma	glassy texture, [gas pockets, vesicular texture, holes], visible crystals
Sedimentary rock forms... from compacted, cemented sediments	fossils, sediments, sand, pebbles, layers

2) Identify two rocks in the envelope. Write the letter of the rock you identified.

Rock **A** is **igneous (obsidian)** How do you know? **it's glassy**
 Rock **B** is **metamorphic (gneiss)** How do you know? **Alternating light and dark/banding**
 Rock **C** is **sedimentary (conglomerate)** How do you know? **It has pebbles**
 Rock **D** is **igneous (pumice)** How do you know? **Gas pockets/holes/vesicular**
 Rock **E** is **igneous (granite)** How do you know? **Visible interlocking crystals**
 Rock **F** is **sedimentary (shale)** How do you know? **It has a fossil**

3) Use the diagram below and the notes sheet to answer the following questions:



Does mineral #1 have cleavage or fracture? Explain.
It breaks into flat surfaces, so it has cleavage.

What does test B tell you about the mineral?
This is the streak test. This mineral (galena) has a gray/black streak.

Is mineral #3 hard or soft? How do you know?
The mineral scratches glass, so it is hard

CHALLENGE ANSWERS:

- 1) A
- 2) C
- 3) B
- 4) A

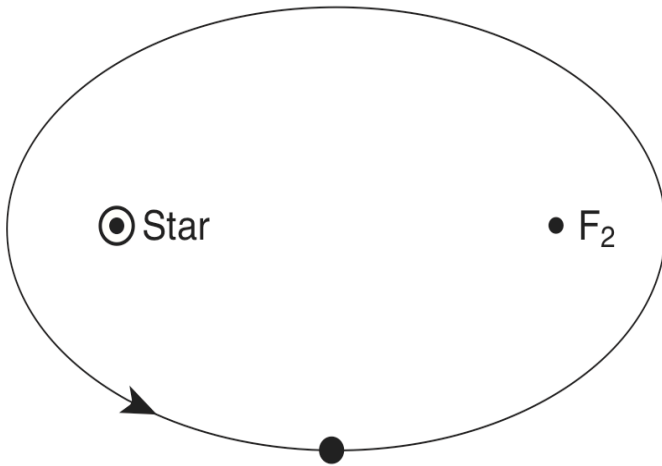
STATION 2: FINDING THE ECCENTRICITY OF AN ORBITAL PATH / MEASUREMENT

DIRECTIONS: Using the ruler, the calculator, and the Earth Science Reference Table, answer as many questions as you can. When you are done, check your work with the answer key. Please put all materials back in the folder before going to the next station!

Name: _____

1) Define eccentricity in your own words:

2) On the diagram below, LABEL the two foci and DRAW the major axis



3) What is the distance between the foci?

_____ . ____ cm

4) What is the length of the major axis?

_____ . ____ cm

5) Draw an X on the diagram where the planet traveling along its orbit would travel the FASTEST

6) Calculate the eccentricity of the ellipse.

CHALLENGE: Use the Solar System Data Table on pg 15 of the ESRT and your knowledge to help you answer the following questions.

7) Which orbit is more elliptical, that of the planet above or the Earth's? Explain your answer!

8) Compared to Jupiter, state how Venus's equatorial diameter and density are different.

9) Explain why the Moon has a greater influence than the Sun on Earth's tides, even though the Sun is much bigger.

STATION 2: FINDING THE ECCENTRICITY OF AN ORBITAL PATH / MEASUREMENT

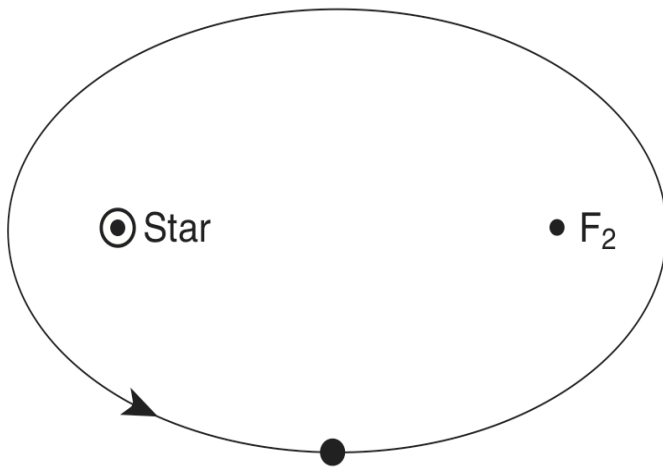
ANSWER KEY

1) Define eccentricity in your own words:

A number that tells you how flat an ellipse is, OR

The ratio between the distance between the foci and the length of the major axis

2) On the diagram below, LABEL the two foci and DRAW the major axis



3) What is the distance between the foci?

_____ . ____ cm

4) What is the length of the major axis?

_____ . ____ cm

5) Draw an X on the diagram where the planet traveling along its orbit would travel the FASTEST

6) Calculate the eccentricity of the ellipse.

CHALLENGE: Use the Solar System Data Table on pg 15 of the ESRT and your knowledge to help you answer the following questions.

7) Which orbit is more elliptical, that of the planet above or the Earth's? Explain your answer!

Earth's eccentricity is 0.017, which is much less than the eccentricity of the planet in the diagram.

Therefore, the orbit of the planet above is much more elliptical than the orbit of the Earth.

(The orbit of the Earth around the Sun is *almost* a perfect circle.)

8) Compared to Jupiter, state how Venus's equatorial diameter and density are different.

Venus's diameter is smaller than Jupiter's, but its density is greater.

9) Explain why the Moon has a greater influence than the Sun on Earth's tides, even though the Sun is much bigger.

The Moon is much closer to the Earth than the Sun is, so its gravity affects the Earth more strongly.

STATION 3: Earthquake location

DIRECTIONS: Using the notes and the Earth Science Reference Table, answer as many questions as you can. When you are done, check your work with the answer key. Please put all materials back in the folder before going to the next station!

Name: _____

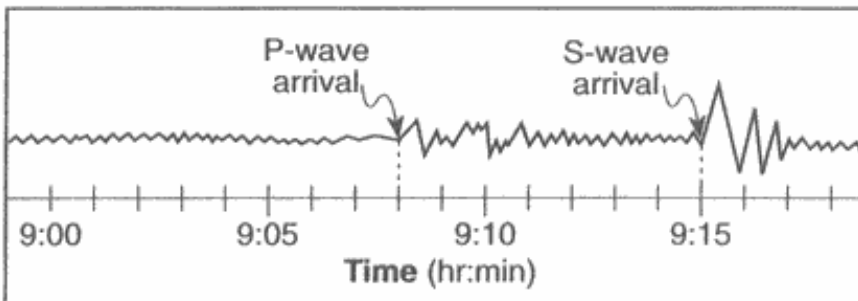
- 1) What is the difference in arrival times between the P-wave and the S-wave at Station A?
- 2) What is the difference in arrival times between the P-wave and the S-wave at Station B?
- 3) Using the ESRT pg 11, find the distance from each station to the epicenter of an earthquake.

STATION A _____ km

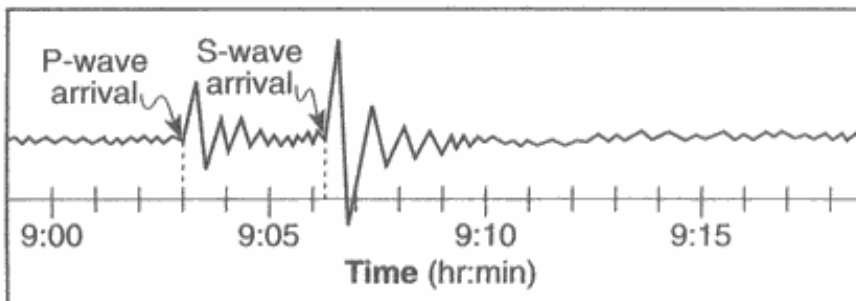
STATION B _____ km

Seismogram Tracings

Station A

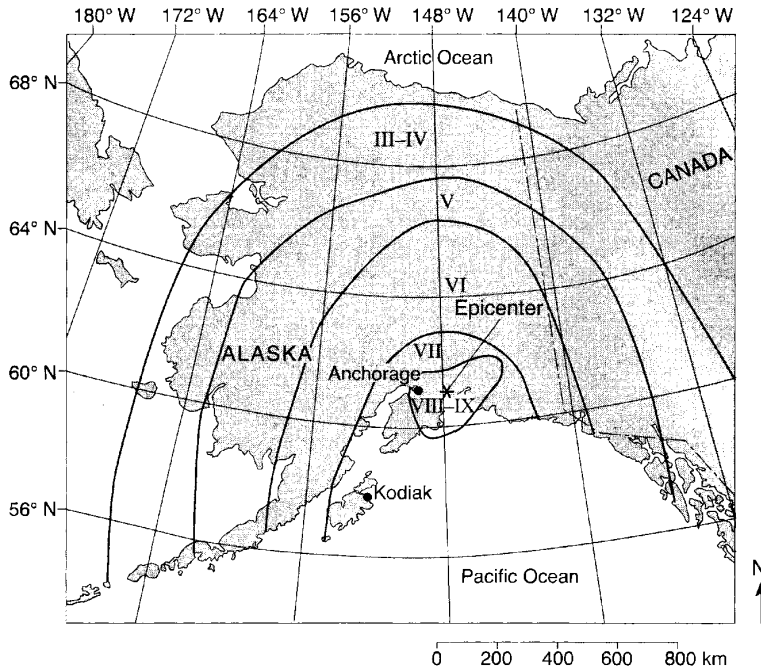


Station B



CHALLENGE: Use the ESRT and the map to help you answer the following questions

Base your answer to questions 1 through 3 on the map and the modified Mercalli intensity scale below. The map shows modified Mercalli intensity scale damage zones resulting from a large earthquake that occurred in 1964. The earthquake's epicenter was near Anchorage, Alaska. The cities Kodiak and Anchorage are shown on the map. The Mercalli scale describes earthquake damage at Earth's surface.



Modified Mercalli Intensity Scale

I	Instrumental: detected only by instruments	VII	Very strong: noticed by people in autos Damage to poor construction
II	Very feeble: noticed only by people at rest	VIII	Destructive: chimneys fall, much damage in substantial buildings, heavy furniture overturned
III	Slight: felt by people at rest Like passing of a truck	IX	Ruinous: great damage to substantial structures Ground cracked, pipes broken
IV	Moderate: generally perceptible by people in motion Loose objects disturbed	X	Disastrous: many buildings destroyed
V	Rather strong: dishes broken, bells rung, pendulum clocks stopped People awakened	XI	Very disastrous: few structures left standing
VI	Strong: felt by all, some people frightened Damage slight, some plaster cracked	XII	Catastrophic: total destruction

Write the name of the *two* converging tectonic plates that caused this earthquake

Describe *one* type of damage that occurred in Anchorage but *not* in Kodiak.

Determine the latitude and longitude of this epicenter. Include the units and compass directions in your answer.

ANSWER KEY STATION 3

1) What is the difference in arrival times between the P-wave and the S-wave at Station A?

S-wave arrival time - P-wave arrival time = 9:15:00 - 9:08:00 = 7 minutes, 0 seconds

2) What is the difference in arrival times between the P-wave and the S-wave at Station B?

S-wave arrival time - P-wave arrival time = 9:06:15 - 9:03:00 = 3 minutes, 15 seconds
(+/- 15 seconds)

3) Using the ESRT pg 11, find the distance from each station to the epicenter of an earthquake.

STATION A: 5400 km (+/- 200) km

STATION B: 1800 km (+/- 200) km

CHALLENGE

1. Tsunami & costal flooding
2. Latitude: any value from 61N to 62 N. Longitude: any value from 147W to 148W
3. North American Plate and Pacific Plate