

Welcome to Class 5: Earth Geology

Remember: sit only in the
first 10 rows of the room

What's going to happen today?

1. You will learn:
Sublime is more
than a dead heroin
addict's band.

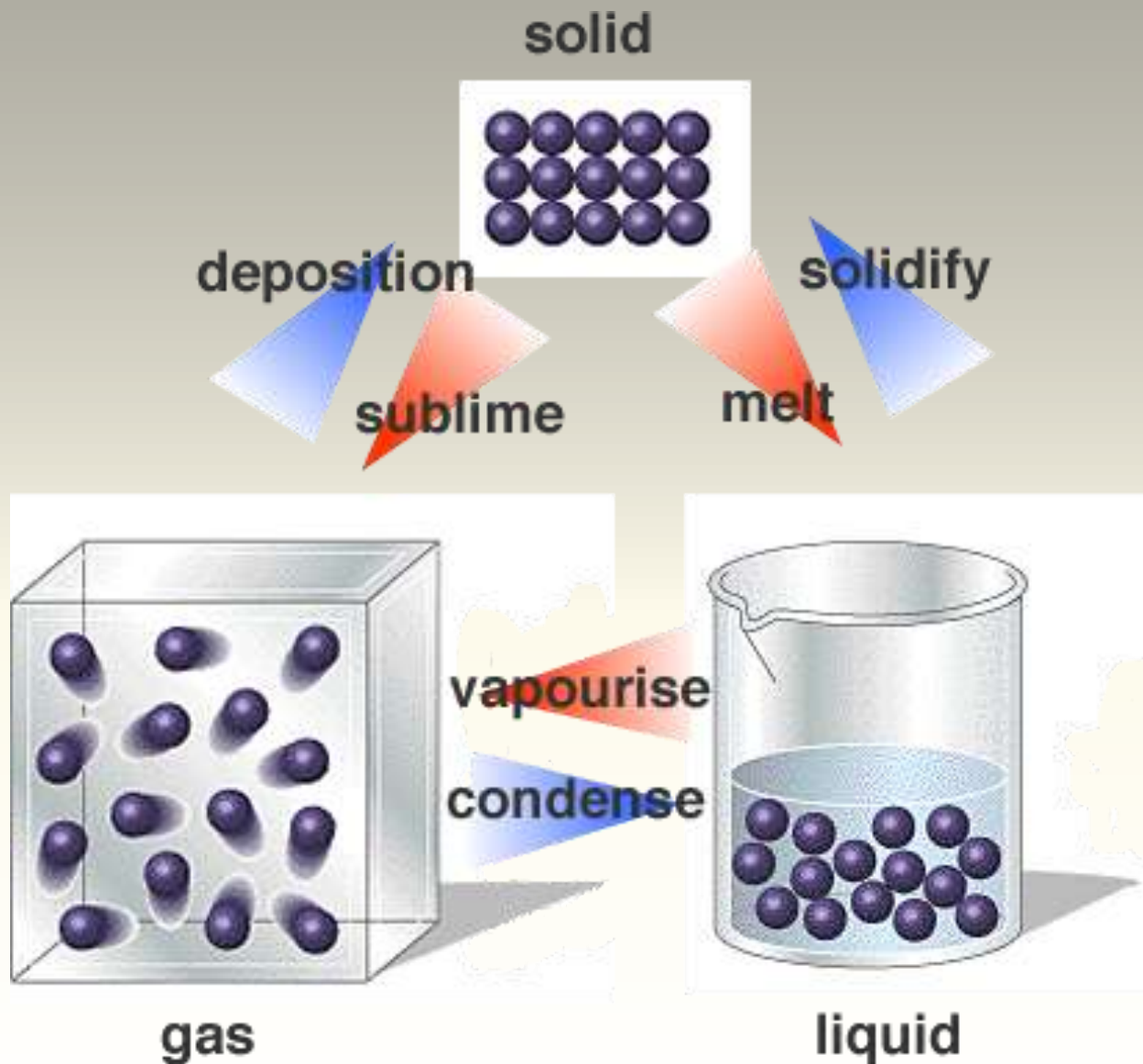


2. You will better appreciate Earth's
unique geology to support life

In your groups, everyone get out a clear sheet of paper and draw:

1. A large Triangle.
2. Label the three corners with the three phases of matter.
3. Draw arrows going clock wise around labeling the transitions between phases.
4. Draw arrows going around COUNTER clockwise, labeling the transitions between the phases

Your diagram should look like this:



PRS: Which of the following is not a form of light (electromagnetic radiation)?

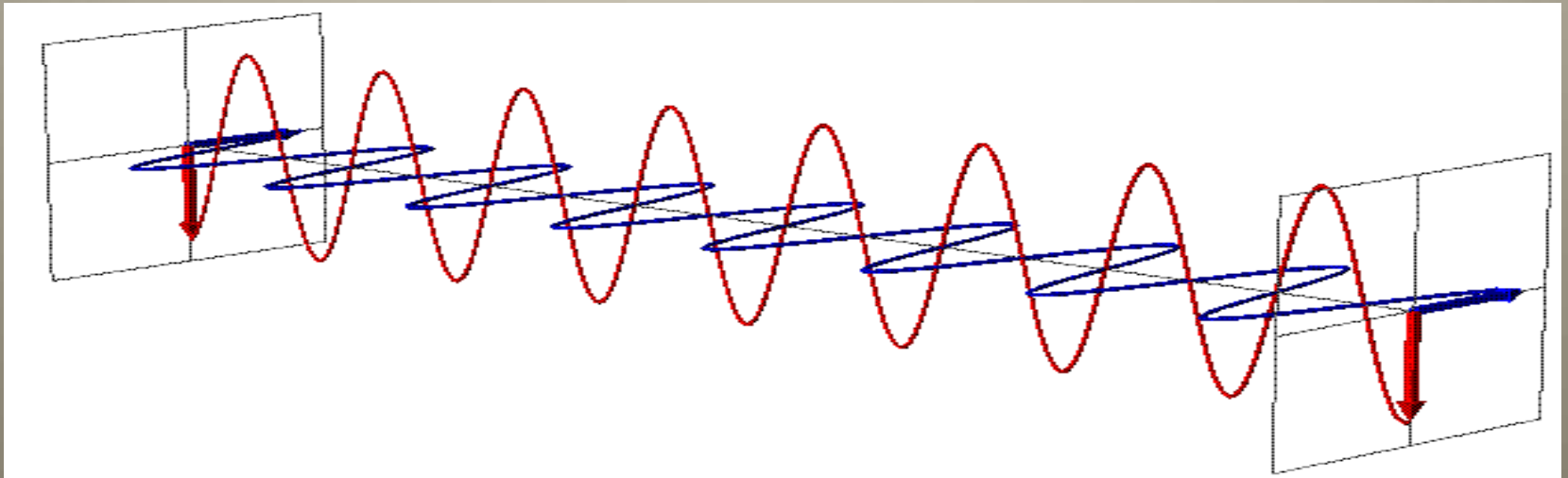
1. Gamma Rays
2. Cosmic Rays
3. X Rays
4. Microwaves
5. Radio waves

Make sure your channel
is set right: Go 80 Go

What is light?

Scientifically, we call it electromagnetic radiation

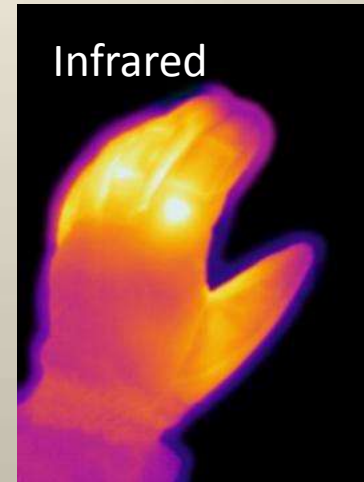
- An oscillating electrical and magnetic pulse.
- Travels with or without (vacuum) a 'medium'
- Travels with a specific speed (depends on medium)
- Has an associated wavelength, frequency and energy
- Comes in many 'colors'



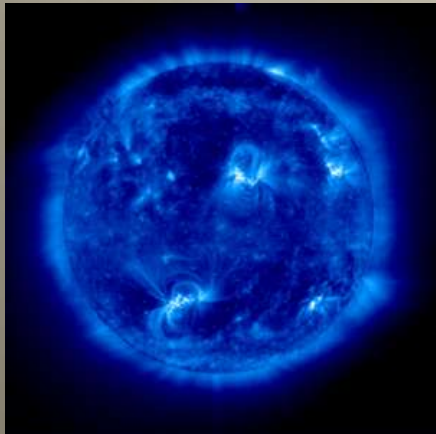
Put the 7 types of light in order from highest energy & shortest wavelength, to lowest energy



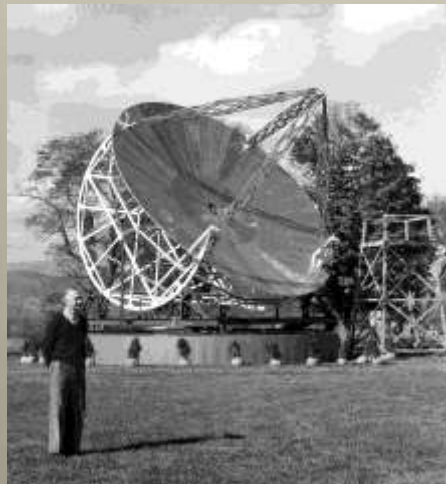
Visible or optical



X-rays



Ultraviolet



Radio

Microwave



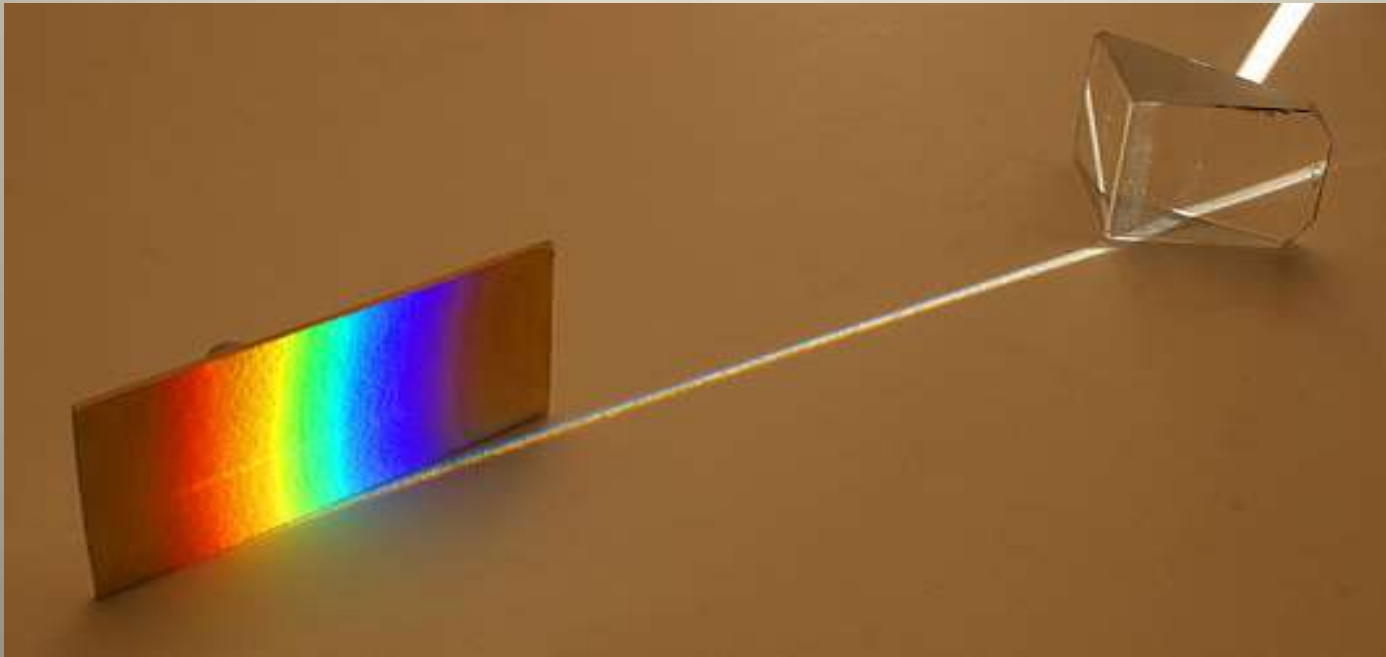
Radio waves... Are these the same?

1. Radio waves are picked up by your `radio'.
What kind of waves are these?

2. We may say, 'I am listening to the radio'.
What kind of waves are these?

The utility of spectroscopy

You know white light can be spread out into its component colors using a prism. All light can be spread out like this.



The same can be done with light from astronomical objects
Spectroscopy can be used to learn about distant objects

PRS: If we removed the yellow light from sunlight, what color would we see through a prism where the yellow used to be?

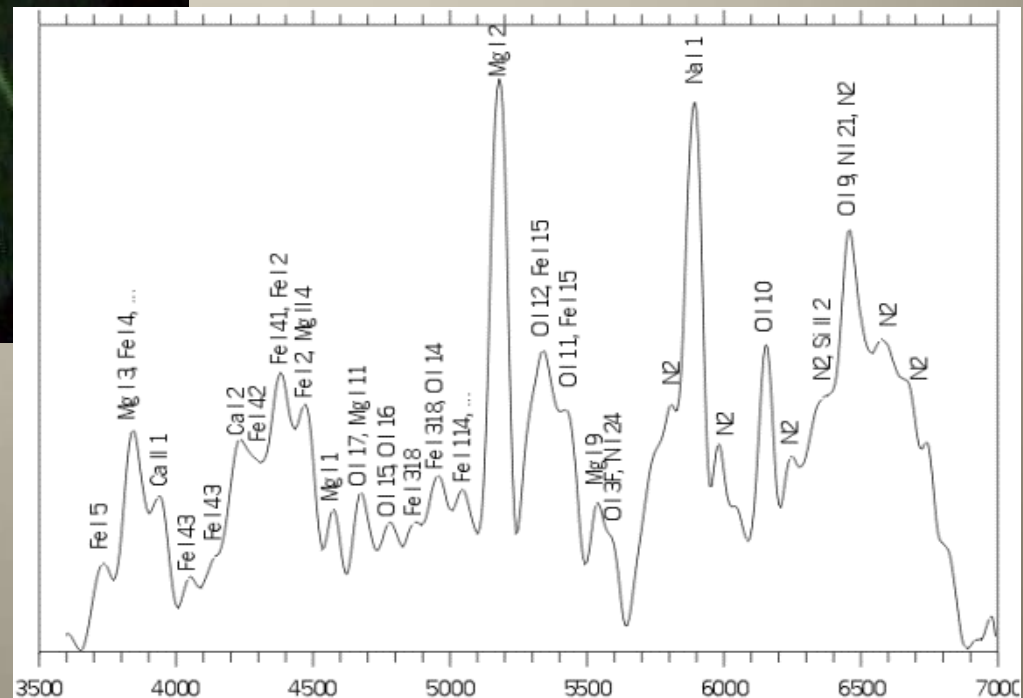
1. White
2. Red
3. Orange
4. Green
5. Black

Spectra from a Meteor Shower



This is just an amateur astronomer's data, but clear elements are identified. Shifts in the line positions indicate relative velocity.

Spectra of such 'space debris' has told us the composition of our original solar nebula.



PRS: Why did life form here and not on other Terrestrial planets?

1. Because we have active volcanoes
2. Because we have plate tectonics
3. Because we have a magnetic field
4. All of the above

Why did life form here and not on the other Terrestrial planets?

There are three (almost) geologically unique characteristics of Earth not shared by the other terrestrial planets:

Volcanism: released gases to form our atmosphere and oceans, and was a source of heat for early life.

Plate Tectonics: the renewal of surface material and recycling in the ocean floor leads to a stabilization of surface temperature.

Earth's Magnetic Field: a true 'energy field' which protects surface life and retains the atmosphere.

Bottom line: GEOLOGY is really important to life!

Let's review the three rock types and cycle

Which rock type goes with these definition?

1. Made from gradual
compression of sediments

Sedimentary

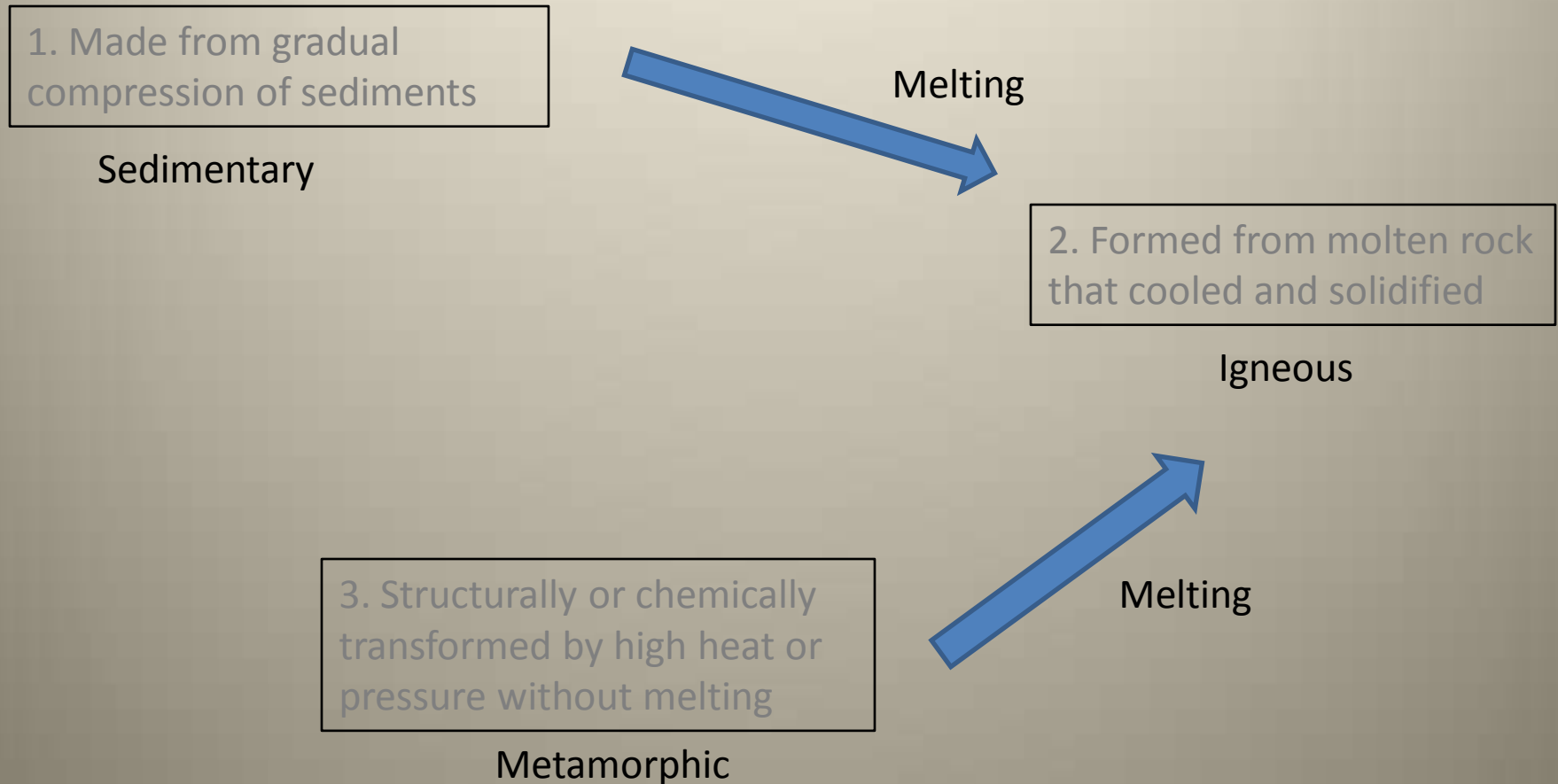
2. Formed from molten rock
that cooled and solidified

Igneous

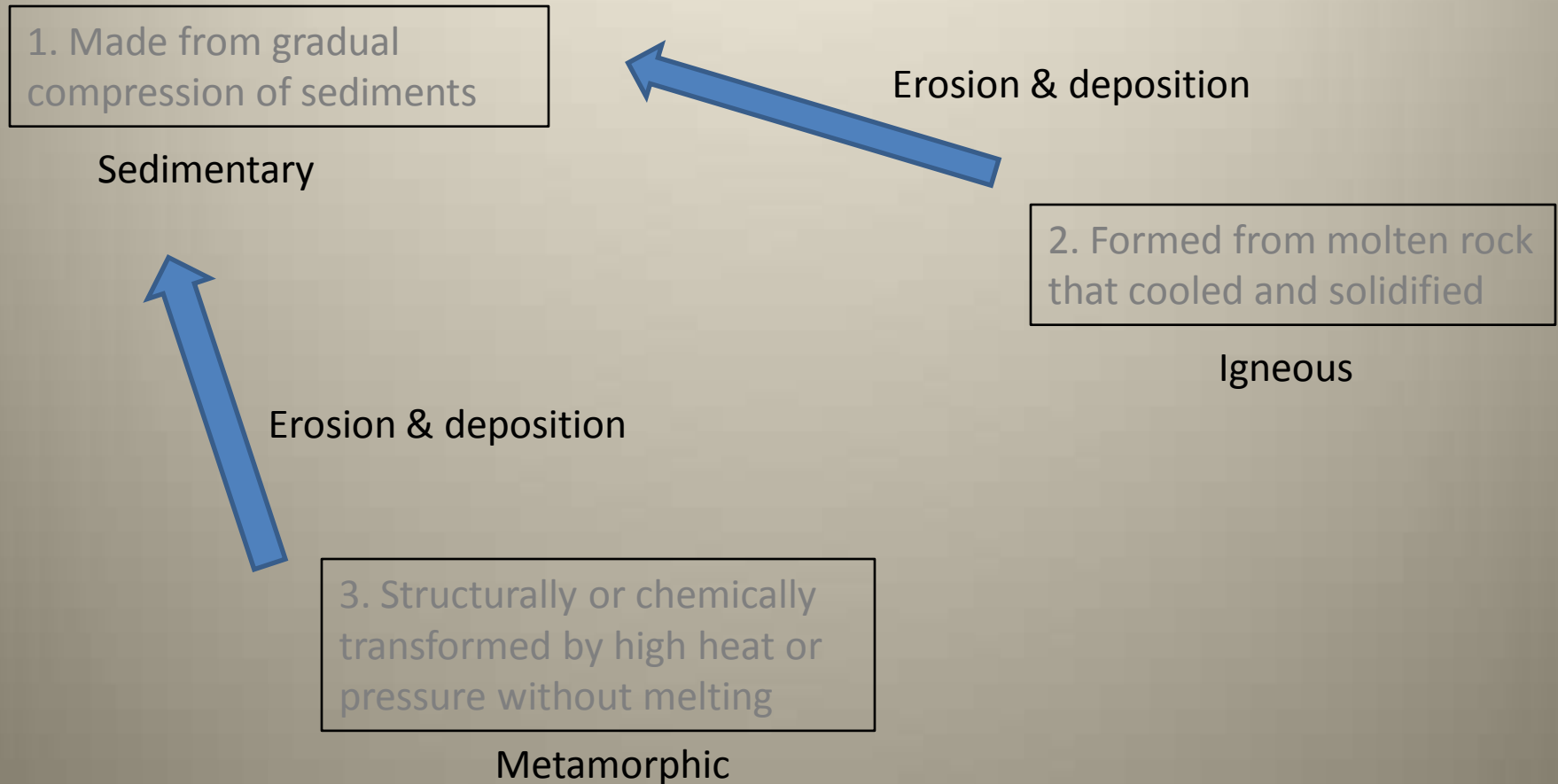
3. Structurally or chemically
transformed by high heat or
pressure without melting

Metamorphic

How do you convert Sedimentary and Metamorphic rock to Igneous?



How do you convert Igneous and Metamorphic rock to Sedimentary?



How do you convert Igneous and Sedimentary rock to Metamorphic?

1. Made from gradual compression of sediments

Sedimentary



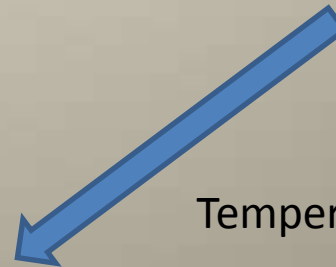
Temperature & pressure

3. Structurally or chemically transformed by high heat or pressure without melting

Metamorphic

2. Formed from molten rock that cooled and solidified

Igneous



Temperature & pressure

The rock type (ex. igneous, metamorphic) tells us..

1. The age
2. Its composition
3. About the color
4. How it was made
5. How dense it is

True



or

False



?

1. Fossils can be found in metamorphic rock. TRUE
2. Isotopes have the same number of neutrons. FALSE
3. The nucleus after decay is the parent nucleus. FALSE
4. Decay rates are constant with time. TRUE
5. An element is fully decayed after two half lives. FALSE
6. After 1 half-life, $1/2$ of the parent is decayed away. TRUE
7. A stable nucleus is one that does not decay. TRUE

Put all your materials on the floor and place your PRS clicker in front of you.

Use just one clicker for yourself.

Take care that others can not view your selection

1. What is the name for the transition from Solid to Gas?

1. Melting
2. Drying
3. Freezing
4. Deposition
5. Sublimation

2. Of the kinds of light given below, which has the longest wavelength?

1. Infrared
2. Gamma Rays
3. Ultraviolet
4. Optical
5. Microwave

3. When listening to the radio,
you are hearing _____

1. Radio waves
2. Light waves
3. Sound waves
4. Infrared waves

4. How do you convert Sedimentary rock in to Metamorphic rock?

1. High temperature & pressure
2. Erosion & deposition
3. Vaporizing
4. Melting

5. You measure equal amounts of Parent and Daughter nuclei. How many half-lives have passed?

1. one
2. two
3. three
4. four

To do list for next class

- Refer to the class syllabus
- Read assigned pages in textbook and review study questions on objectives list
- Register and bring PRS transmitter to class
- Bring textbook to class (not mandatory)