**WC 1.2 Identifying minerals**

1. Color – not the best method, impurities can change the color –pyrite is called fool’s gold because it is golden unless it is exposed to air – then it turns black
2. Streak – scratch the mineral on a rough surface to reveal its true color
3. Luster – metallic or submetallic are reflective and either shiny or dull – non-metallic can be glassy, creamy or earthy (rough and dull)
4. Cleavage – how it breaks – cleavage is a flat break – fracture is irregular – slate is cleavage
5. Hardness – measured on Mohs scale 1-10 - try to scratch your sample on a reference rock – diamonds are a 10 because they are the hardest substance known to man
6. Density - water is 1g/cm3 – gold is 19g/cm3 – so it has 19 times the mass
7. Special properties include – glow under UV lights, magnetic, taste and chemical reaction

**WC 1.3 Formation and mining of minerals**

1. Evaporation – if an ocean or lake evaporates it leaves minerals behind – salt, gypsum
2. Limestone – dissolved minerals end up in a lake or ocean
3. Metamorphic – pressure, temp. or chemicals change a mineral into another garnet, graphite
4. Hot water solutions hot groundwater allows minerals to crystalize (hot springs)
5. Pegmatites form in small pockets underground leaving medium sized minerals like topaz
6. Plutons form very slowly deep underground – minerals are pure and smooth – quarts

**Mining** – can destroy habitat / waste can seep into groundwater – reclamation tries to clean it up

1. Ore – deposits that are large enough to mine for profit
2. Surface mining (dig a big hole) – open pit for gold/copper quarries, strip mining for coal
3. Subsurface mining digging deep in shafts

Chapter 2 Rocks

**WC 2.1 Rock Cycle – the geologic process**

1. Weathering and eroding break up surface rocks into pieces that blow or move by water
2. Sedimentary rocks – when those broken pieces either get pushed together or cemented
3. Metamorphic – when any type of rock is heated, crushed or melted to become another rock
4. Magma – molten liquid rock – not actually a rock type but part of the cycle
5. Igneous rock – rock that forms when magma cools and is uplifted to the surface to start again
6. Rocks are classified by their composition and their texture (grain)

**WC 2.2 Igneous Rocks**

1. Igneous Rock
	1. from magma
	2. solidifies at 700 - 1250°C
	3. light colored rock is less dense and called felsic
	4. dark colored rock is called malfic
	5. if magma cools slowly the minerals in the rock have time to form large chunks called crystals – this is how granite is formed
	6. intrusive igneous rock – slow cooling – has a coarse grain from minerals
	7. extrusive igneous rock – quick cooling smooth grain small or no crystals

**WC 2.3Sedimentary Rocks**

1. Sediment is the pieces of rock that are broken off by erosion (wind, water, ice and snow)
	1. These pieces eventually pile up and become compacted.
	2. Water runs over them the water can remove minerals from the rock
	3. Those minerals can act a cement
	4. The layers that were in the sediment are still in sedimentary rock and are called strata
2. **Types of sedimentary rock**
	1. Clastic –cementation – classified as fine, medium or coarse grained
	2. Chemical – evaporating water leaves minerals behind – good example halite (salt)
	3. Organic – from living things – limestone is coral, coal is ancient plants
	4. Stratification –the layers of sedimentary rock
		1. Ripple marks show where flowing water ran over the rock
		2. Mud cracks – look like cracked mud and form when sediments made at the bottom of water are exposed to air

**WC 2.4 Metamorphic Rocks –** when rock is changed by heat or pressure or chemicals

1. Rock is changed in color, mineral size and sometimes even folded
2. Heated by nearby magma to 50°C-1000°C and above
3. Some by heavy pressure at 2Km-6Km beneath the surface of earth
	1. Earth’s crust movements cause pressure and can cause mineral grains to line up
	2. Regional metamorphism – under most continents – pressure very deep in the crust deform and chemically change the rock
4. Composition
	1. Index minerals – minerals that form only in metamorphism biotite, mica, chlorite
	2. Foliated texture – mineral grains are aligned in planes or bands or stripes
	3. Non-foliated texture – no lines – minerals get re-crystalized

**WC 3.1 Fossils**

1. Fossil in rocks – bones may get trapped in rock as it forms
2. Fossils in Amber – amber is tree sap – insects (and frogs) get trapped before it hardens
3. Petrification – minerals fill the cells of dead organisms, taking their shape and even color all the dinosaur bones you have seen are petrified so they are now rock – not bone
4. Fossils in asphalt – asphalt is a tar. The La Brea tar-pits in Los Angeles are at least 38,000 years old. Woolly mammoths and saber tooth tigers have fallen into the pits and been preserved.
5. Frozen fossils – in 1999 scientists pulled a 20,000-year-old woolly mammoth out of the glaciers that had melted in Siberia. (global warming uncovers something cool!)
6. Trace fossils – footprints in mud that then form rock can tell us how big an animal was and how fast it moved. Fossilized poop (called coprolite) can tell us what an animal ate.
7. Molds and casts – when an object’s shape is imprinted into a rock it’s a mold – when another rock fills the mold – it’s a cast and looks just like the original

Information from the fossil record – a very small percent of living things are ever fossilized

1. Fossilization happens in some places and not in others – can’t give a complete picture
2. Marine fossils tell us where oceans once were – plants tell us about climate – old animals like the Trilobite Phacops can tell us that the rock is at least 400 million years-old
3. An index fossil is an animal that lived for only a short period of time so we can very accurately date rock that contains them. Ammonites are an index fossil Tropites lived in the ocean between 230 million and 208 million years ago

Other info they might like, or need:

How old is earth? 4.543 billion years according to the geologic record

The dinosaur National Monument in Utah – 1,500 fossilized bones – 150 million years old

The Grand Canyon has been cutting rock for 6 million years – the rock cut represents 2 billion years

Billions of species of plants and animals have arrived and gone extinct

 North America used to have a huge sea in its middle – many fossils in the Midwest are marine fossils

In Mantua Township New Jersey a Drexel team has uncovered some amazing fossils over the past 12 years, including a predator the size of a bus, and a 7-foot-long thoracosaurus crocodile that once lived along the coast here.

the Hadrosaurus, pulled out of a marl pit in Haddonfield in 1858 (reconstruction shown below) – its about 80 million years old 