

Digging Deep: Fossil Hunt (K – 2nd grades) Pre-Visit Activities

Vocabulary List and Student Definitions (early elementary level)

- **Fossil:** the parts of living things that have become rocks
- **Plant:** something that is alive and makes its own food
- **Animal:** something that is alive and moves around for its food
- **Bone:** hardest part of most animals' bodies; they form our skeleton
- **Leaf:** part of a plant that makes food; found above the ground.
- **Matrix:** the rock surrounding a fossil
- **Paleontology:** study of fossils
- **Tool:** something that makes a job or task easier
- **Shell:** hard, outer covering of some animals
- **Skeleton:** the frame that makes up an animals shape
- **Extinct:** all of this kind of plant or animal has died

Key Point

1. Very few plants and animals become fossils. Circumstances have to be just right for a fossil to form. Most living organisms simply rot away after they die.

Teacher Background and Supporting Information

1. What is a Fossil?
 - a. **Fossil** (teacher definition): Any remains, trace, or imprint of a plant or animal that has been preserved in the earth's crust since some past geologic or prehistoric time.
 - b. **Fossil** (student definition): the preserved remains of living things
 - c. Fossils have been found on every continent and help us understand Earth's past. Generally, only hard parts of **plants** and **animals** become fossilized. **Bones** and **teeth** are common fossils. **Leaves** are also relatively common fossils.
 - d. Fossilization Process:
 - i. Most fossils are found in **sedimentary rocks**. Generally, the plant or animal died and was quickly buried, such as in mud pits or in sand storms.
 - ii. Over time, more and more sediment settles onto the location. Soft body parts rot. In the right circumstances, the minerals in bones and other hard parts are slowly replaced by minerals found in the environment. (Example: calcium from bones may be replaced by calcite and/or iron.)
 - iii. A fossil exists only when all of the original living (organic) material has been replaced by never-living (inorganic) material. The minerals that make fossils are more dense than bone or other organic parts, so the fossil weighs more than the original, living material.
2. Types of Fossils:
 - a. **Mold Fossils:** a fossilized impression made in the substrate; a negative image of the organism.
 - b. **Cast Fossils:** this type of fossil is formed when a mold is filled in.

- c. **Trace Fossils:** fossilized nests, burrows, coprolites (feces!) footprints, etc that are not part of an animal, but show traces of its existence.
 - d. **True Form Fossils:** fossils of the actual animal or animal part.
 - e. Note: Your students will see all four types of fossils when they visit the Children's Science Explorium.
3. Types of Fossilizations:
- a. **Unaltered Preservation:** examples include insects or plant parts trapped in amber (a hardened form of tree sap).
 - b. **Permineralization/ Petrification:** rock-like minerals seep in slowly and replace the original organic tissues. Silica, calcite, and pyrite are common minerals that form a rock-like fossil. This process may preserve hard and soft parts. Most bone and wood fossils are petrified, e.g. petrified wood.
 - c. **Replacement:** an organism's hard parts dissolve and are then replaced by other minerals, like calcite, silica, pyrite, and/or iron. The minerals will vary based on what is found in Earth's crust at different locations.
 - d. **Carbonization/Coalification:** only the carbon remains in the specimen; other elements, like hydrogen, oxygen, and nitrogen are removed.
 - e. **Recrystallization:** hard parts either revert to more stable minerals or small crystals turn into larger crystals.
 - f. **Authigenic Preservation:** these are molds and casts of organisms that have been destroyed or dissolved.
4. No matter how fossils are formed, they must lay undisturbed for thousands or millions of years before they truly form a fossil.
5. What is Paleontology?
- a. **Paleontology** (teacher definition): The study of forms of life existing in prehistoric or geologic times, especially as represented by fossils
 - b. **Paleontology** (student definition): The study of fossils.
 - c. Paleontologists:
 - i. look for fossils in sedimentary (layered) rock.
 - ii. study all kinds of fossils, not just dinosaurs.
 - d. How old are fossils?
 - i. One way paleontologists determine the age of fossils is through which layer the fossil was found in. Since sedimentary rock is formed by horizontal layers, the older layers should be deeper into the Earth's crust (unless plate tectonic activity has taken place).
 - ii. To get a more specific timeframe, paleontologists may do radio-isotope dating.
 - 1. Carbon dating is a form of this, but for most fossils, scientists use uranium, lead, and/or potassium because carbon degrades too quickly. Carbon is only used to date objects about 50,000 years or younger.
 - 2. The radio-isotopes are not necessarily found in the fossils. Instead, scientists measure the isotopes from the rocks around the fossil to determine an approximate timeframe.
 - iii. Using index fossils. Index fossils are commonly found fossils that we already know the timeframe of their existence. If another, unknown fossil is found near an index fossil, we know that the two lived at approximately the same time.
 - e. Fossils Have Been Found. Now What?

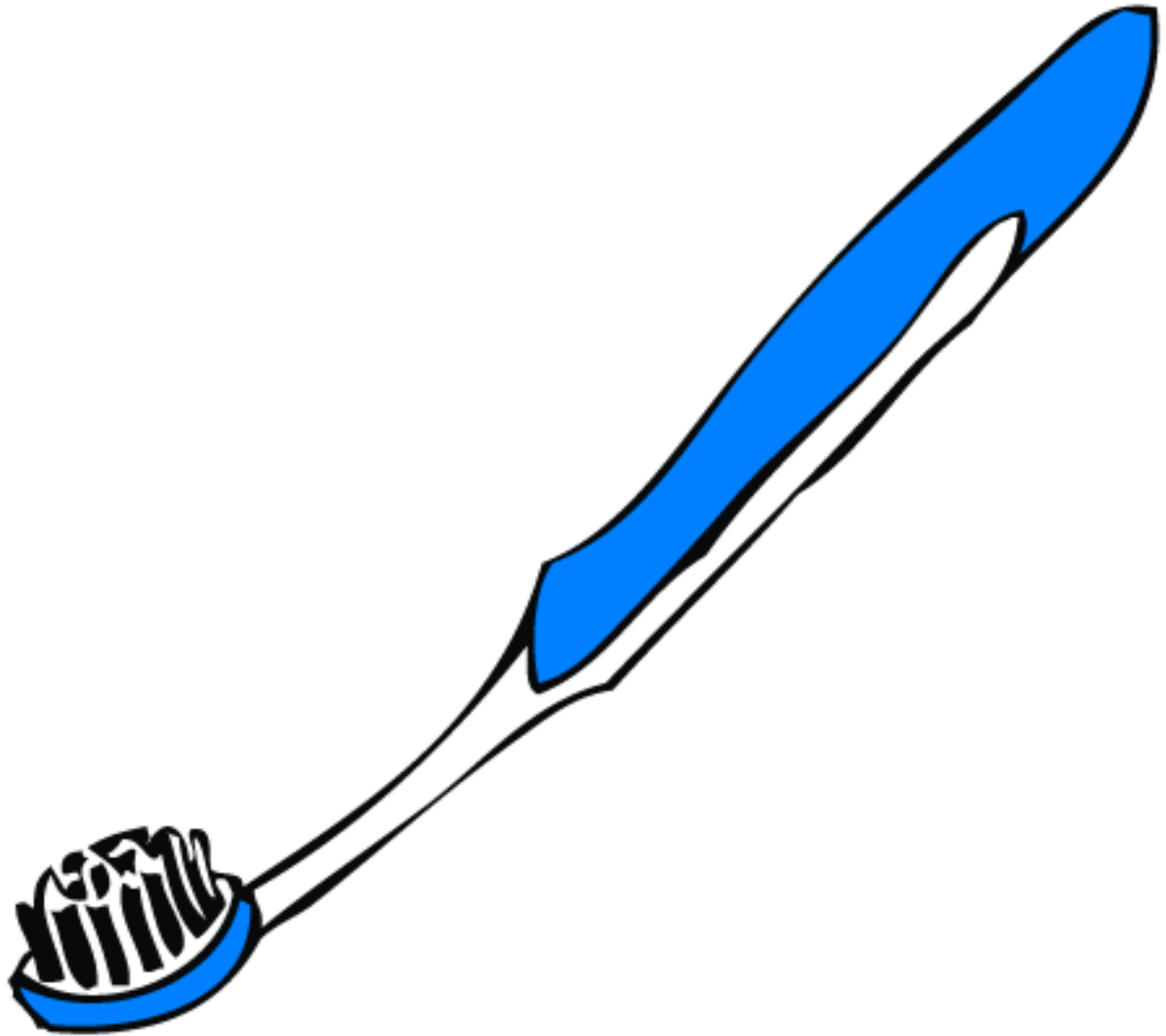
- i. Before a fossil moves to a laboratory or museum, much work must occur in the field.
- ii. First, photographs are taken of the fossil and the surrounding rock, called the **matrix**.
- iii. The **overburden**, or the rocky part above the fossil, is carefully removed.
- iv. More pictures are taken when the overburden has been removed, and some of the matrix remains.
- v. The matrix is carefully removed.
 1. “Carefully removed” for a small fossil, like a delicate **shell**, may mean dental picks and toothbrushes.
 2. “Carefully removed” for a large fossil, or entire **skeleton**, may mean a pick axe and jackhammers!
 3. If the matrix can’t be removed safely in the field, the scientists may take the fossil and matrix to a laboratory setting.
- vi. The fossil is prepared for travel.
 1. Small fossils may be wrapped in bags or boxes.
 2. Large fossils may be wrapped in paper or burlap.
 3. Fossils may also be wrapped in a layer of plaster, similar to how doctors set broken bones, to protect it on the journey.
- vii. Once fossils are back in the lab, the paleontologists begin working on a difficult puzzle. One or many bones may be missing. Bones from other animals may be present. Paleontologists must have a strong understanding of **anatomy** in order to solve the riddles and assemble fossils into skeletal representations.

Student Activities

1. Read [The Magic School Bus: In the Time of Dinosaurs](#) by Joanna Cole and Bruce Degen to gain a better understanding of fossils and where they can be found.
2. Generate a class list of ideas and/or questions about fossils that students may want to explore further.
3. Class discussion questions:
 - a. What can a fossil be?
 - b. How do fossils form?
 - c. How are fossils different from bones (claws, shells, etc)?
 - d. How are fossils different from rocks?
 - e. What can we learn from fossils?
 - f. How do we find fossils?
4. Explore what paleontology is and what a paleontologist does.
 - a. Create a life-sized paleontologist with all of his/her *tools*.. Have students trace their bodies on butcher paper. Draw/paint and cut and paste tools (templates on following pages).
 - b. Students should understand that paleontologists may study fossils from plants or animals that are still alive today, like cockroaches and ferns, or animals that are *extinct*, like dinosaurs.
 - c. Let the students know that they are going to be paleontologists for the next activity. You have “pictures” from a dig site and the students need to assemble the bones correctly.
 - i. Prior to class, using the *skeleton* and puzzle templates

- provided, make enough two-sided copies for your students.
- ii. Cut out the puzzle pieces, creating two skeleton puzzles (one human and one dinosaur).
 - iii. Distribute the pieces for a full skeleton, plus one or two pieces from the other puzzle, dependent upon your students' level, to each student or team. Have them assemble the puzzle correctly and identify how other bones may have been mixed in with the complete skeleton.
 1. For more advanced students you may leave out one or two pieces of the skeleton and discuss what may have happened to those bones.
 2. Have them glue their completed skeletons to an 8 ½ x 11 sheet of paper and color.
 3. Discuss that paleontology is a lot like solving puzzles. Paleontologists often find “extra” bones, or are missing bones, from the fossils they are working with. This is one reason why it is very important that paleontologists know a lot about the animals or plants they are studying and how body parts are normally laid out.

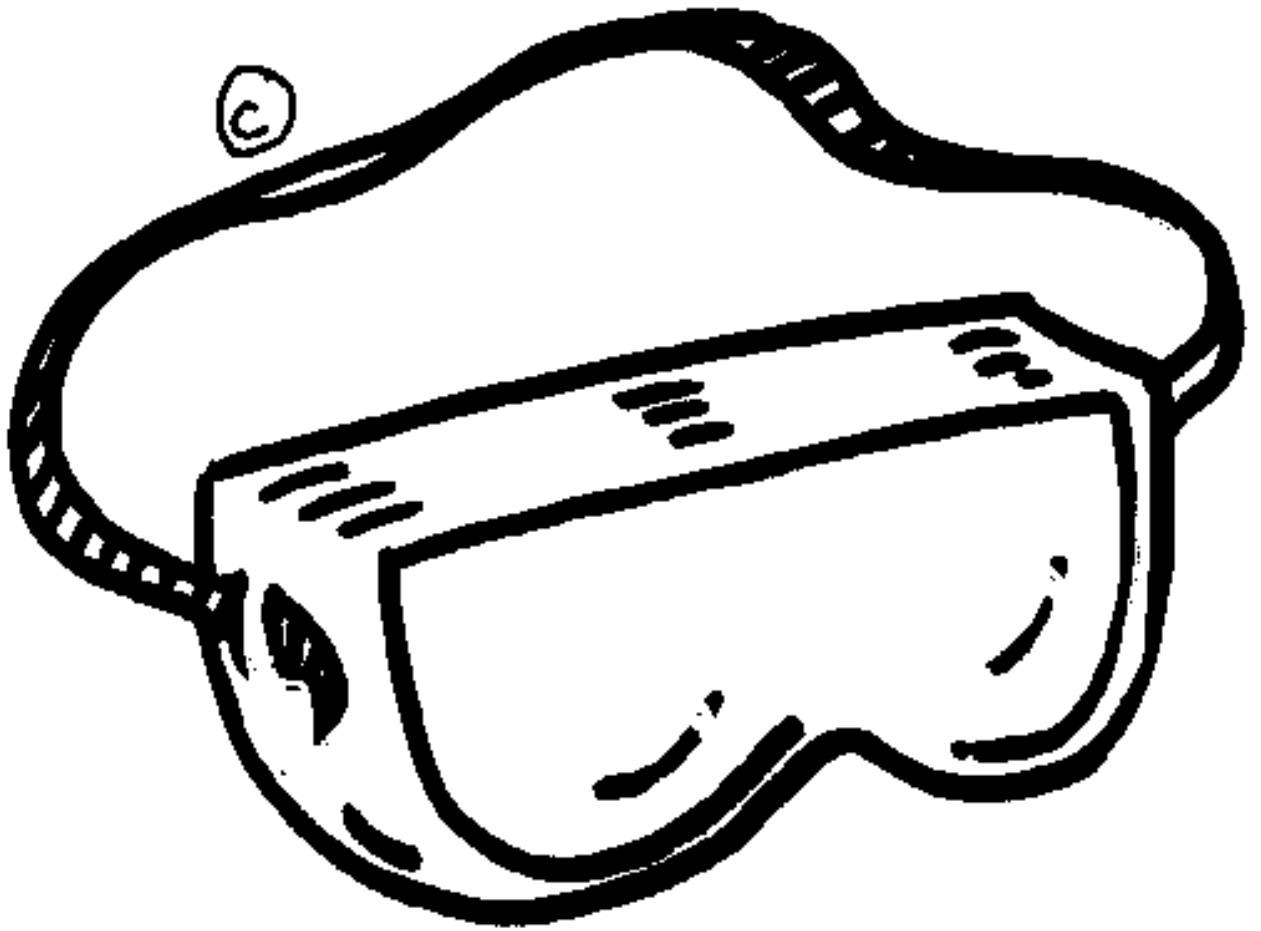
Toothbrush Template:



Hat template:



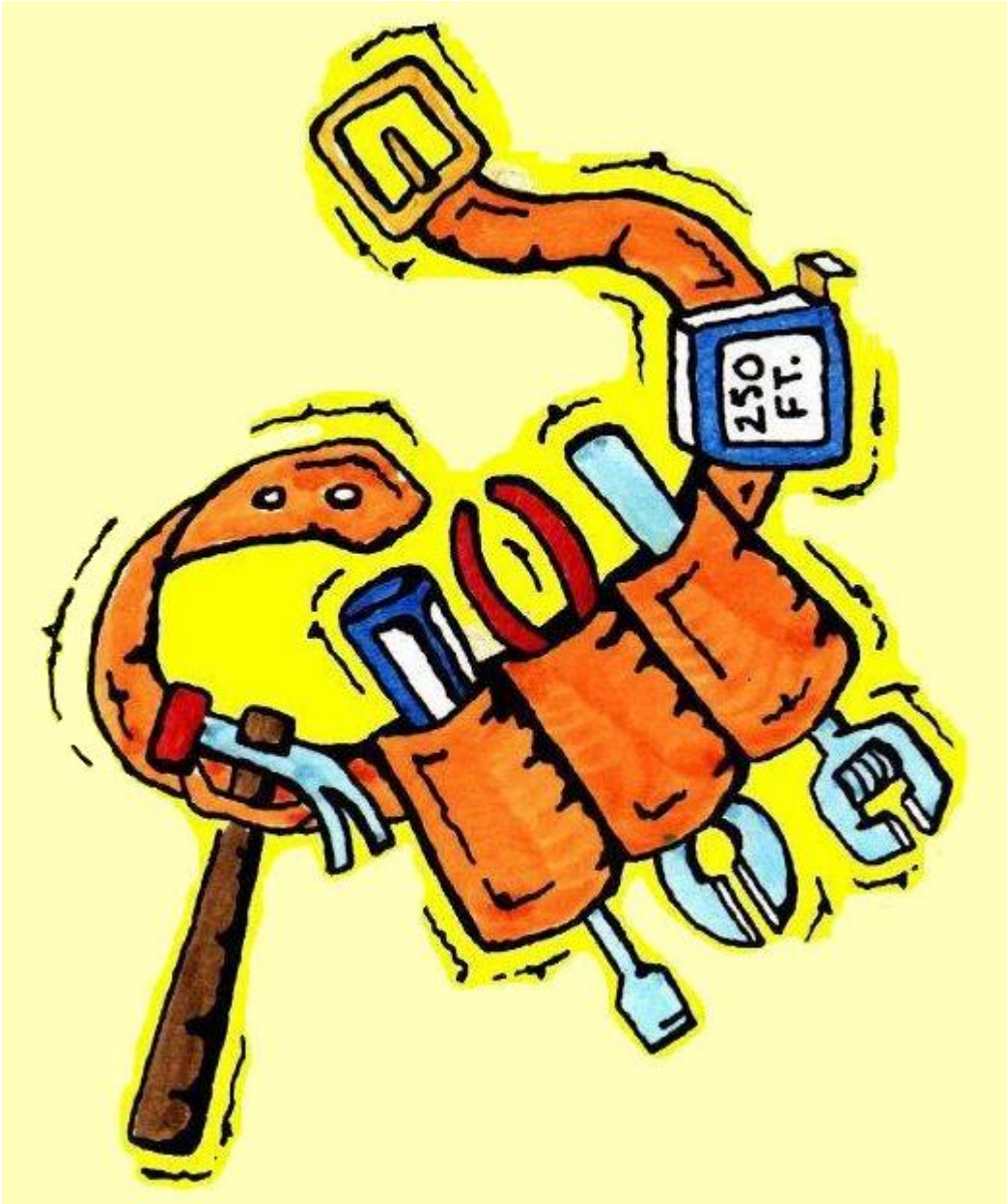
Goggles Template:



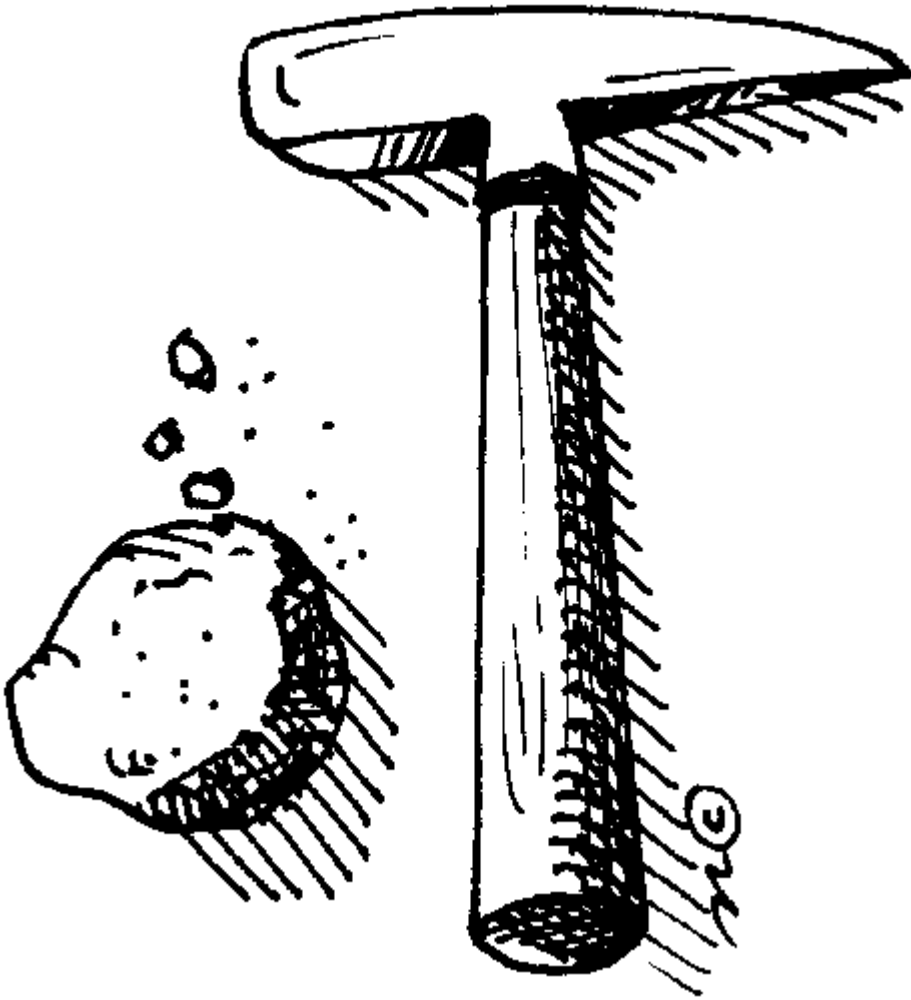
Gloves template:



Tool Belt Template:



Rock Hammer Template:



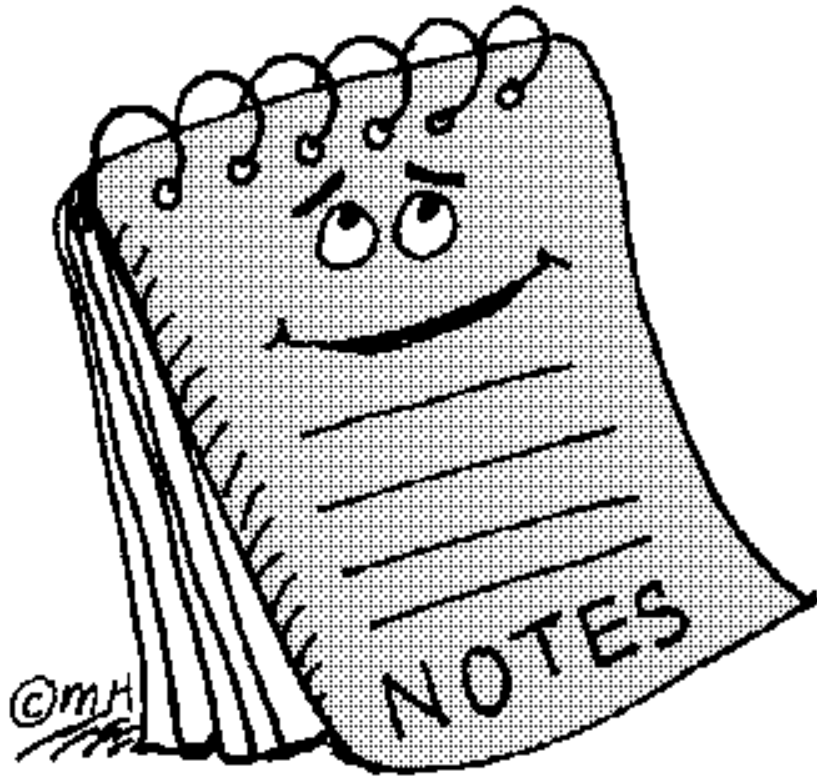
Chisel Template:



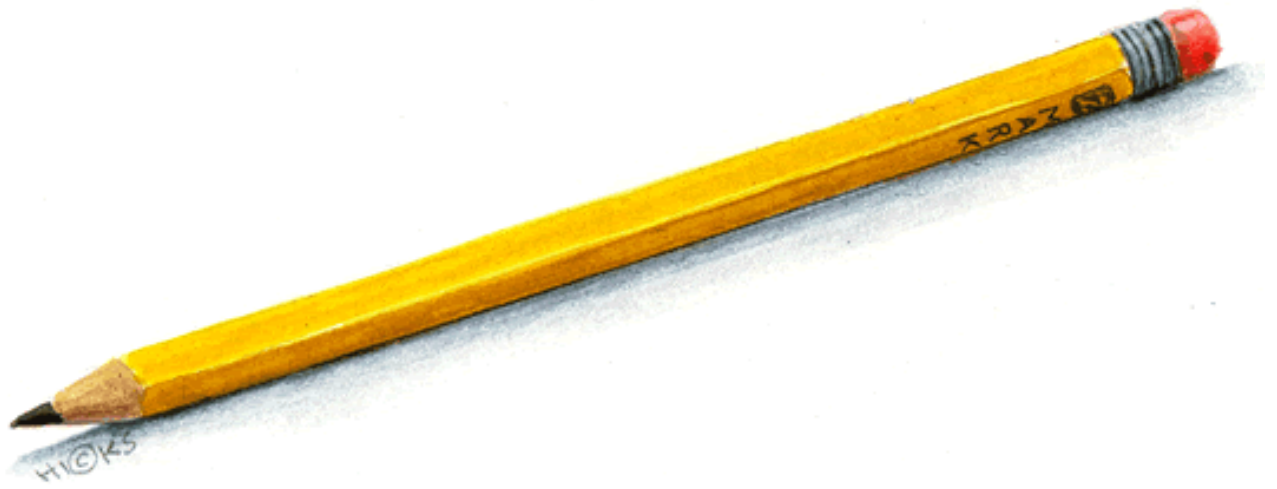
Paint Brush Template:



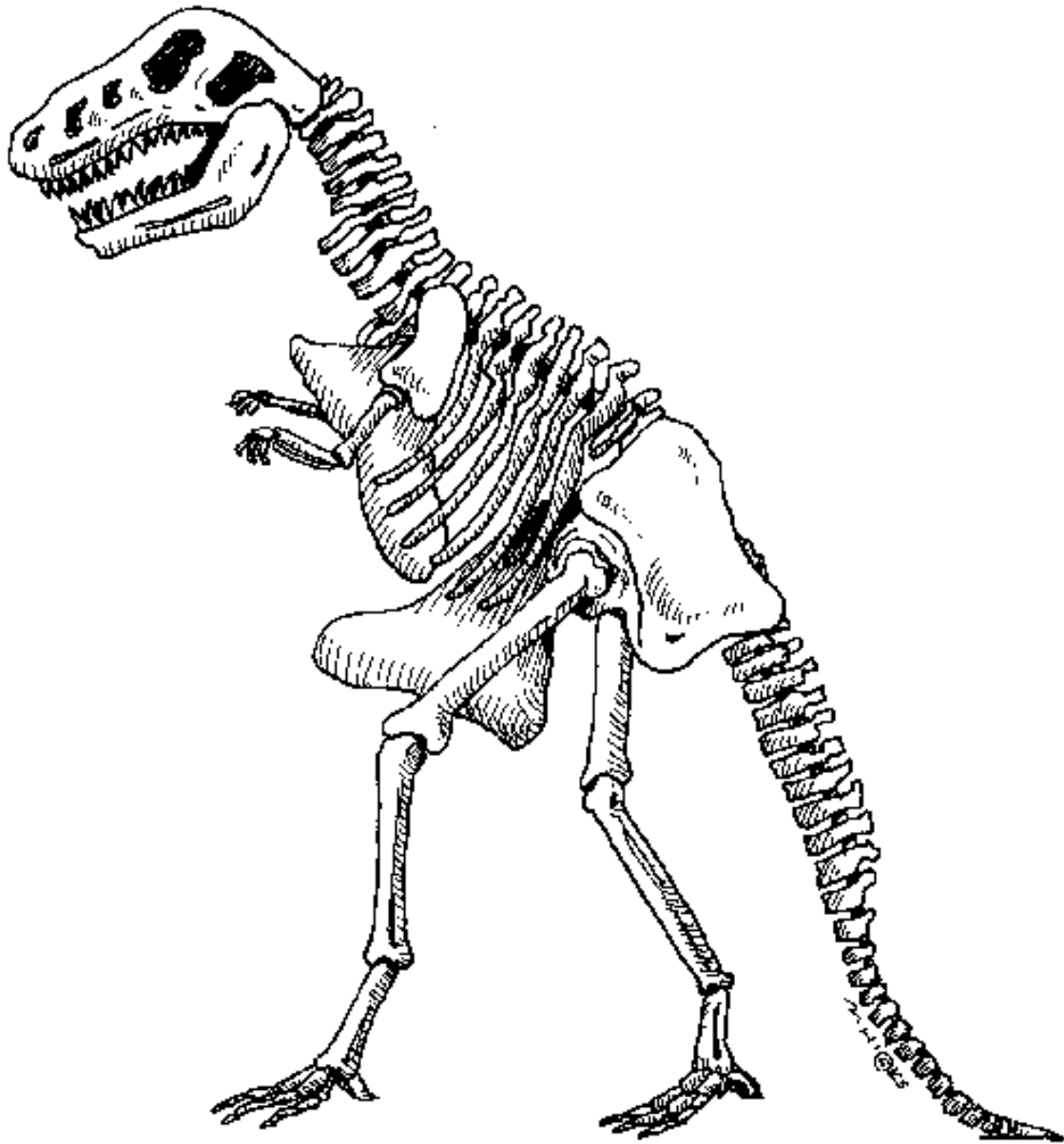
Notebook Template:



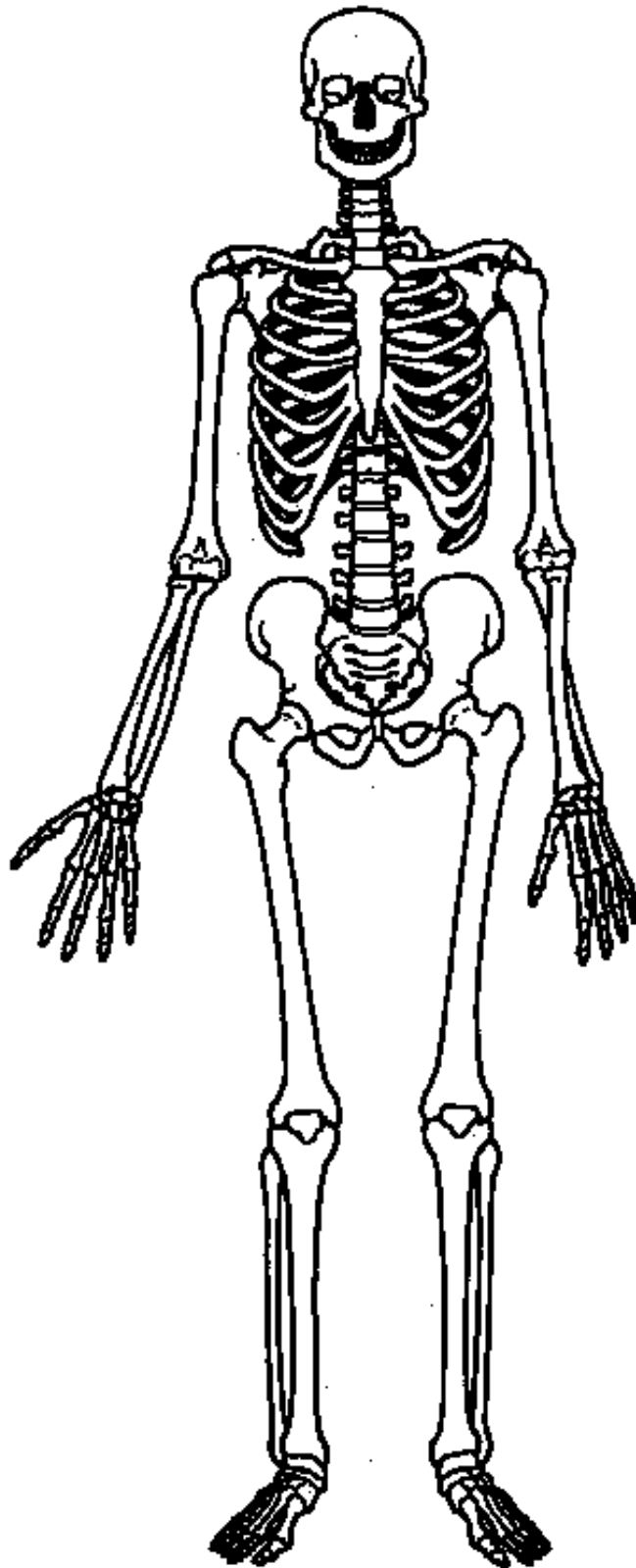
Pencil Template:



Dinosaur Skeleton – Bones may be cut out to meet your students' needs for the skeleton puzzle.



Human Skeleton for Skeleton Puzzle



Puzzle Template: Print out one copy of this template for each skeleton.

