ACTIVITY 4B:

Teacher Directions for
"Determination of Bone Density with
Bone Specimens" Lab

1. Students should be divided into groups of 4. Assign a number to each group.
2. Each student should receive the student handouts which include:
    a) the lab directions,
    b) a table for the group's data collection,
    c) a table for the class's data collection,
    d) a graph for the class data and group data, and
    e) analysis questions.
See the student handouts and answer key.
3. Have students wear dissecting gloves while handling the specimens. Each group will be given their own bone specimen that has been cut into 10 transverse sections.
4. Students will determine the mass, volume (displacement method), and density (mass/volume) of their specimen cuts. Then, each student will record the group's data.
5. The class data collection sheet will require the students to calculate the average density, minimum and maximum density, range, and median density. Review how to determine these calculations with the students (refer to Unit 11, Activity 4 for examples). Have one member from each group record their group's results on the front board or on the teacher transparency provided for class results. Have each student record the class data on their classcollection sheet on bone density.
6. Students will answer the analysis questions.
7. Next, the students will complete the graphing activity. Students will graph the average density values for the 10 specimen cuts for all the class's bones. Then, they will graph their group's bone density values for all 10 specimen cuts from their bone. A teacher transparency of the graph is available as part of the post-lab discussion of the class's results. See the teacher transparency on graphing bone density. One lab group could volunteer to graph their results on the transparency to compare with the class density averages.

Procedure for Preparation of Specimens for
"Determination of Bone Density with Bone Specimens" Lab

Preparation of the materials for this lab must occur in advance to allow sufficient time to secure the bone specimens. The source of the long bone specimens may be obtained by contacting a local butcher or meat processing plant. A long bone from a deer, cow, or lamb would be appropriate. Obtain one long bone for each lab group of four students. Each group should work with the same type of bone.

With a bandsaw, cut the long bone into 10 transverse cuts, or ask the butcher or woodshop teacher to assist. *(The specimen slices should be cut to fit inside the size of gradu-ated cylinder you have available to measu   re their volume by the displacement method, or the*

*slices can be cut to fit into a la rger beake r, then measu red using the positive displacement method.)*Make sure you number the sections, which might be easier to do if the specimens are allow to dry and the soft marrow removed. (The slices could also be boiled to clean them and to remove the marrow.) The numbering can be done with a permanent ink marker, such as a Sharpee™ , then coated with clear nail polish. Number the bone sections in sequence as they were cut from the long bone.

See the figure below.
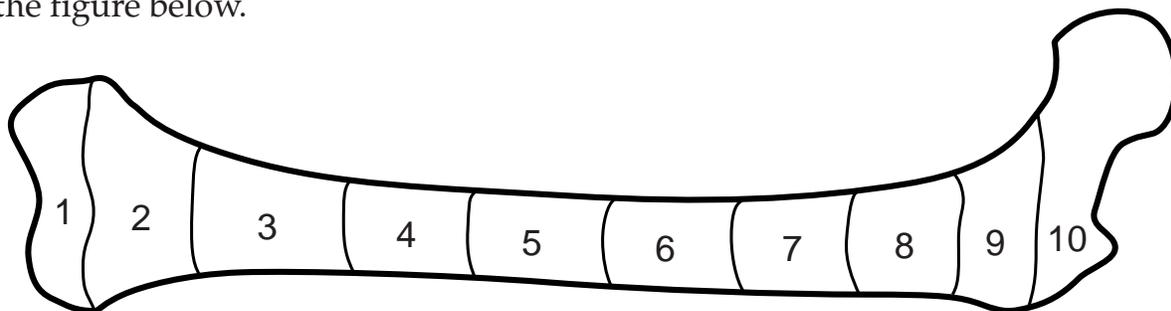
Briefly discuss the concept of density as mass per unit volume of an object. The teacher should demonstrate how to determine mass and volume of an object. Students will need to be familiar with determining the mass of an object using a triple beam balance and the volume of an object by the displacement method. Review the units of measurement for mass is grams and for volume is 1 cubic centimeter or 1 milliliter. Refer back to activity 4A on how to use the density formula.