NAME _____ DATE _____

INSTRUCTOR _____ PERIOD _____ PARTNER _____

UNIT 1: Earth's Dimensions

LAB 1-2: EARTH'S SHAPE

INTRODUCTION: Pictures of Earth taken from space show that Earth *appears* to be perfectly round and smooth. However, to us, Earth appears to have a highly irregular surface. In addition, accurate measurements of Earth's shape show that the equatorial diameter is slightly different than the polar diameter.

OBJECTIVE: After you complete this lab you will better understand the true roundness and smoothness of Earth.

VOCABULARY:

relief:

model:

oblate spheroid:

sphere:

PROCEDURE:

A. ROUNDNESS

The ratio of the polar diameter to the equatorial diameter of a sphere is a measure of its roundness. Dividing the polar diameter by the equatorial diameter would give a value of one since both diameters of a perfect sphere are equal. The farther from 1 the actual computed ratio is, the less spherical a globe is.

1. Use the values given for equatorial and polar diameters of Earth in the Data Chart on the Report Sheet to calculate Earth's roundness-ratio. Record this value on the Report Sheet.

2. Measure the equatorial and polar diameters of the globe represented by the diagram. Record these measurements on the Report Sheet.

3. Calculate the roundness-ratio for the globe using the data from Procedure 2. Record this value on the Report Sheet.

B. SMOOTHNESS:

A relief globe shows the relative height of its surface features, such as mountains. It is a scale model of Earth. The following procedures will show you whether or not these features are constructed to scale on such a globe. To do this you must use the proportion shown below.

$$\frac{\text{Actual height or depth of Surface Features (km)}}{\text{Earth Diameter (km)}} = \frac{\text{Relief Global height or depth of Surface Feature (cm)}}{\text{Relief Globe Diameter (cm)}}$$

When you place your data into the equation shown above, you have one unknown value. You then apply the mathematical rules for cross-multiplying ratios, and solve for the unknown value.

NOTE: The following chart information is to be recorded on the Data Chart under "Smoothness" on your Report Sheet.

1. Measure the Relief Globe Height of Mt. Everest in cm using the diagram in place of the relief globe.

2. Actual height of Mt. Everest = 8.8 km

3. The average diameter of Earth (Refer to the Earth Science Reference Tables.)

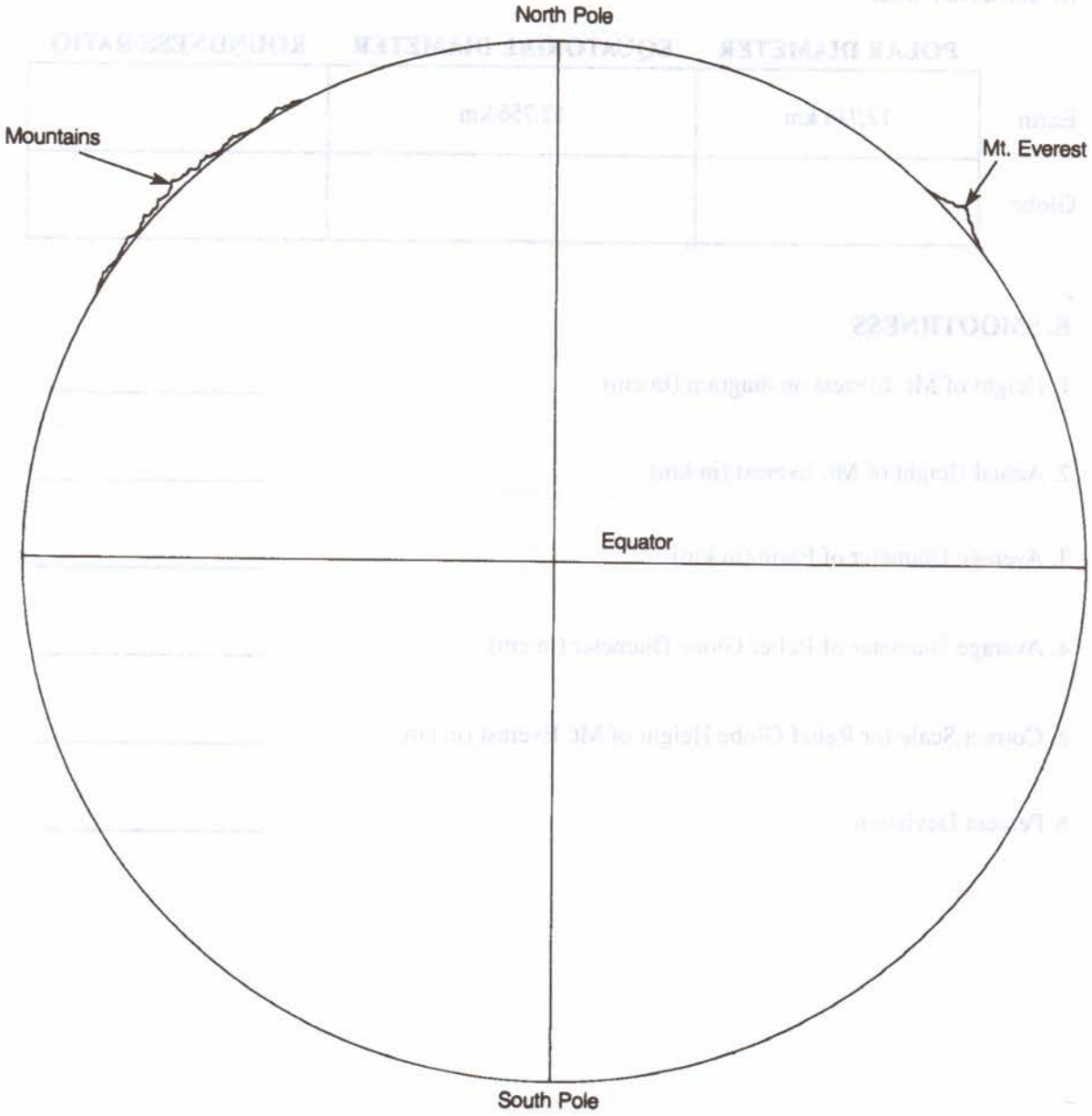
4. Relief Globe Diameter (measure the equatorial diameter.)

5. Using the values obtained in Procedures 2 through 4, and the equation shown above, solve for the relief globe height of the surface feature (Mt. Everest) to correct scale for this globe.

6. Using the equation shown below, calculate the percentage deviation between the measured height of Mt. Everest on the diagram and the height it should have been if drawn to the correct scale. For the accepted value, use the correct scale for the relief globe height that you calculated in procedure 5.

$$\text{Percent Deviation from the Accepted Value} = \frac{\text{Difference from accepted value}}{\text{Accepted Value}} \times 100$$

The diagram below represents an average classroom globe.



REPORT SHEET

A. ROUNDNESS

	POLAR DIAMETER	EQUATORIAL DIAMETER	ROUNDNESS-RATIO
Earth	12,714 km	12,756 km	
Globe			

B. SMOOTHNESS

1. Height of Mt. Everest on diagram (in cm) _____

2. Actual Height of Mt. Everest (in km) _____

3. Average Diameter of Earth (in km) _____

4. Average Diameter of Relief Globe Diameter (in cm) _____

5. Correct Scale for Relief Globe Height of Mt. Everest (in cm) _____

6. Percent Deviation _____

DISCUSSION QUESTIONS: *(Answer in Complete Sentences)*

1. Using the roundness ratio you calculated, which is more nearly a perfect sphere, Earth or the average classroom globe?

2. How does Earth's polar diameter compare with its equatorial diameter?

3. Is Earth a perfect sphere? How do your data confirm your answer?

4. Using your calculations under Procedure B, explain why you think Earth is, or is not, smoother than the average classroom relief globe.

5. A 0.1 cm deep scratch was made in the surface of a globe with a diameter of 40 cm. Calculate the actual depth of the surface feature (represented by the scratch) on the real Earth. (SHOW ALL WORK.)

6. In terms of roundness and smoothness, name an object which would be a good model of Earth. EXPLAIN YOUR CHOICE.

CONCLUSION: From the information obtained from this lab, describe the roundness and smoothness of Earth.