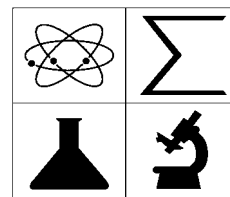


MESA DAY CONTEST RULES 2003-2004



Soil Science

LEVEL:	Middle/Junior High School
TYPE OF CONTEST:	Individual/Team
COMPOSITION OF TEAMS:	1 – 2 students per team
NUMBER OF TEAMS:	3 teams per Center
SPONSOR:	Bret Harrison, Director, MESA Agricultural Initiative, Cal Poly, San Luis Obispo

OVERVIEW: Students will measure and calculate the soil pore space, determine soil pH by chemical test, and use field textural analysis techniques to identify the properties of two unknown soil samples and classify them by name using the Texture Triangle. Students will complete three laboratory experiments and related soils science math calculations within one hour.

MATERIALS: The following materials will be provided by the Host Center:

- Lab tables
- Running water or water in pitchers
- 2 cups of pre-measured soil samples, approximately 500 ml of each sample
- 2 clear plastic cups or graduated beakers per team
- 1 (one) 100 ml graduated cylinder per team
- pH indicator solution with dropper, cavity dishes, and pH color chart per team
- 1 squeeze bottle or water sprayer per team
- 1 copy of the Official Entry Form, Texture Triangle Problems, and Textural Triangle Grid per team
- Pencils
- Plastic Bags for used wet soil
- Broom & Dustpan

RULES:

- 1) Students must complete the pore space and soil texture experiments, complete pH analysis on both samples, and complete the texture triangle problems within 1 hour of starting the contest.
- 2) Students are allowed to communicate only with their team member/partner, but discussion with other team members is strictly prohibited.
- 3) Students must not utilize any outside reference materials, including notes or books.

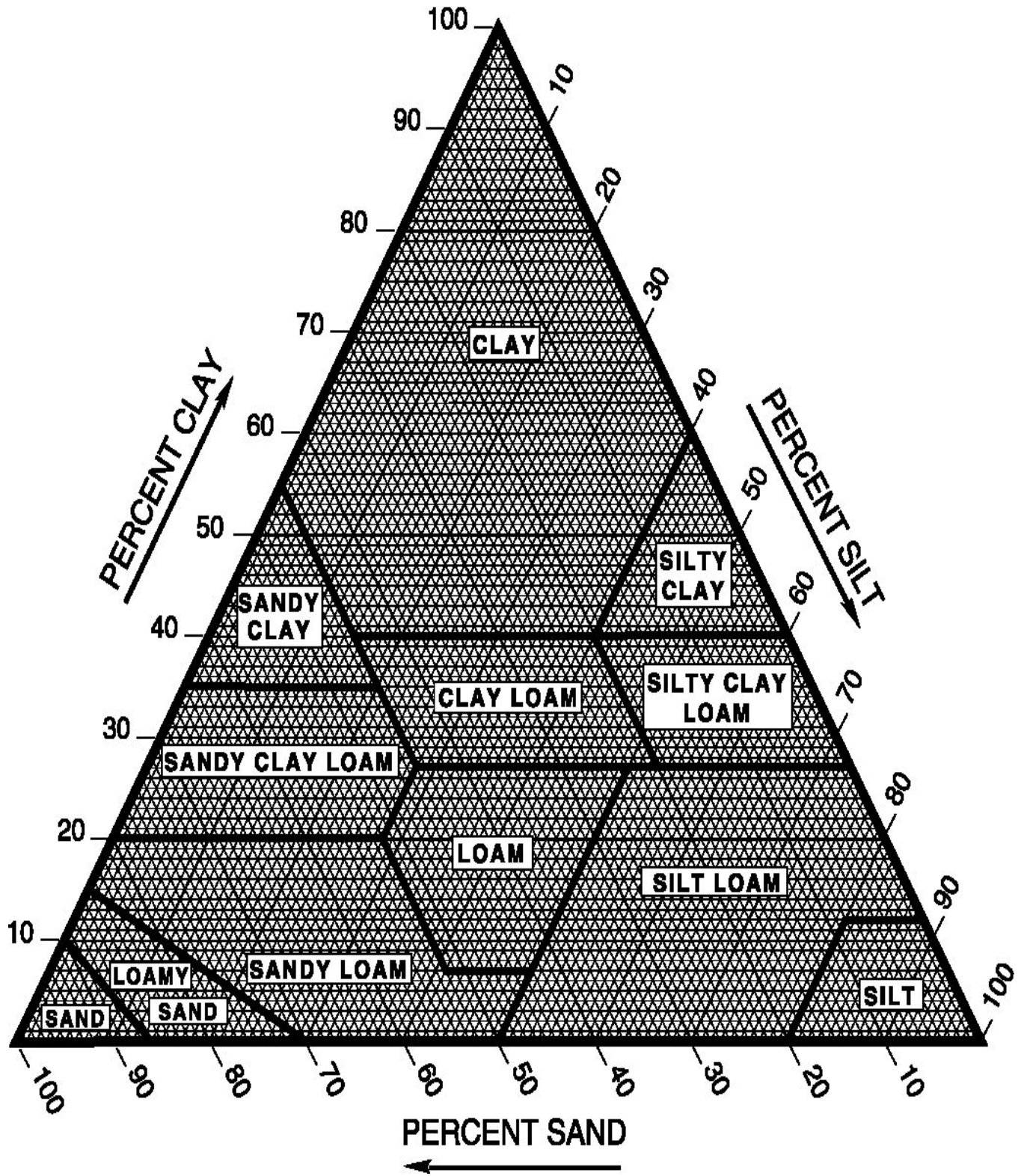
- 4) Each student team will turn in only one answer packet to the judges. Students must write very legibly. Judges will not score illegible answers.
- 5) Upon finishing, students must assist in cleaning their samples and may leave the room quietly.

JUDGING:

- 1) Do not mix the two sample soils together. Each sample has different properties.
- 2) Clearly label each of the two soils used in the contest as either "A" or "B".
- 3) Judges will be provided with official soil samples prior to the start of the contest. The properties of these samples will be determined by the MESA Agricultural Initiative Office prior to competition day.
- 4) Keep soil samples dry before giving them to the students. Do not mix/shake/disturb the soil more than you have to in transporting soil from place to place. Do not compact the soil.
- 5) Judges may answer procedural questions, but are not permitted to give guidance or instruct students on matters of laboratory or math techniques.
- 6) Four different performance criteria are scored:
 - a) Student or team ability to correctly determine pore space percentage (0% to 100%) in two unknown soil samples by using the water absorption pore space analysis test. (50 points possible; 25 points for each sample)
 - b) Student or team ability to correctly classify (by name) the same two unknown soil samples using whatever classification method the student/team chooses. (50 points possible; 25 points for each sample)
 - c) Student or team ability to correctly determine the pH level of the same two unknown samples (50 points possible; 25 points for each sample)
 - d) Performance on three texture triangle questions that require the students to perform calculations related to soil analysis and the Textural Triangle. (25 points possible)
- 7) In the event of a tie, duplicate prizes will be awarded to winning teams.

AWARDS: Awards will be given for 1st, 2nd and 3rd place teams.

ATTACHMENTS: Official Entry Form
Texture Triangle Problems
Texture Triangle Grid
Web Information
Judging Guidelines



TEXTURE TRIANGLE PROBLEMS FOR SOIL SCIENCE CONTEST

(25 points possible)

Problem 1:

A sample of soil was screened and the size separates (smaller than 2mm) were determined, with the following results:

Sand content (2-0.04mm diameter) = 140 grams

Silt content (0.05-0.002mm diameter) = 38 grams

Clay content (<0.002mm diameter) = 22 grams

Total dry soil weight = 200 grams

Determine what percentage of the total weight each soil separate is and then using the Texture Triangle determine the textural class. **(2 points each, 8 points maximum)**

% sand: _____ % silt: _____ % clay: _____ Textural Class: _____

Problem 2:

Using the Texture Triangle, determine the lowest clay percentage allowed for a texture to be classified as: **(2 points each, 12 points maximum)**

a) clay _____ b) silt loam _____ c) loam _____

d) clay loam _____ e) sandy clay _____ f) silty clay loam _____

Problem 3:

Determine the textural class for each using the Texture Triangle. **(1 point each, 5 points maximum)**

a) 90% sand, 5% silt, 5% clay _____

b) 40% sand, 45% silt, 15% clay _____

c) 15% sand, 10% silt, 75% clay _____

d) 10% sand, 46% silt, 44% clay _____

e) 55% sand, 10% silt, 45% clay _____

JUDGING GUIDELINES FOR THE SOIL SCIENCE CONTEST

Middle/Junior High School

Scoring Procedures, Individual Criteria:

- 1) **Pore Space Percentage:** Subtract 1 point for each percentage point team is away from actual pore space percentage. A perfect score (exact match) is worth 25 points. The total for both samples are combined for a maximum possible score of 50 points.
- 2) **Soil Sample Classification:** Students examine soil samples and use any field analysis technique they wish, and classify soil samples by name. Subtract 10 points for each incorrect classification away from the correct classification on the Texture Triangle. Twenty-five (25) points are awarded if students determine the correct textural classification, 15 points are awarded if they are one classification away from the correct answer, 5 points are awarded if they are two or more classifications away from correct, and 0 points if a greater discrepancy exists or if they incorrectly respond to the answer, for example they write a number or numbers instead of the name of the soil. The total for both samples are combined for a maximum possible score of 50 points.
- 3) **pH Classification:** Students use pH test equipment provided to determine the correct soil pH level for each sample. Twenty-five (25) points are possible for each sample, a perfect measurement is worth 25 points, and 5 points are subtracted for each pH category (graduated in 0.5 pH increments) away from the proper classification of the sample. The total for both samples are combined for a maximum possible score of 50 points.
- 4) **Texture Triangle Problems:** Problem 1 is worth 8 points (two points each for the % answers and 2 points if student names the correct texture class), Problem 2 is worth 12 points (2 points each if student provides the correct % in each of the six questions) and Problem 3 is worth 5 points (1 point awarded if student correctly identifies the textural classification of the five problems where only particle percentages are given). A perfect score on the all Texture Triangle Problems would be 25 points.

A perfect score for this contest is 175 points.