



# MESA DAY CONTEST RULES

## 2024-2025

(FINAL)

### Investigative Science

LEVEL:	Middle School (MS)
DIVISION(S):	Grade 6 and Grades 7/8
COMPOSITION OF TEAM:	2-3 students per team
NUMBER OF TEAMS:	Preliminary – Determined by your local MESA center Regional – # of teams per division at the discretion of each region (Northern/Central, LA/Central Coast, and Southern)
SPONSORS:	University of California San Francisco MESA College Prep University of Southern California MESA College Prep

**OVERVIEW:** Changes, if any, from “DRAFT” rules are highlighted in “yellow.” Are you interested in science and solving mysteries? Are you able to showcase your knowledge of life science? This is your opportunity! Your team is invited to collaborate using your knowledge of science to solve this new mystery working your way through an investigation using your knowledge of punnett squares and plant cells including sketching a microscope and designing and constructing a Plant Cell model that test your science skills! **Participation logistics, limits, and competition facilities may vary by host site. Advisors and students are responsible for verifying this information with their local MESA center.**

**SCIENCE JOURNAL:** A science journal is a required component of this competition. The purpose of the Science Journal is not only to help guide students through some of the information surrounding the competition but also aligns with the process that scientists follow while completing research. MESA projects are not designed to be completed in a single class period or day, but to be the result of thoughtful research, planning, analysis and evaluation. Keeping a science journal throughout the process will help to keep a designer on track, using a logical progression of planning, in order to develop their project efficiently.

For the Science Journal, **electronic submissions will be required.** Teams should use an electronic portal/application such as Google Docs to keep and maintain a science journal. Access and permission to the science journal is then given to MESA Day staff and judges OR science journal is submitted electronically (e.g., PDF file) for review. **Please check with your local MESA center for the deadline and submission platform to submit your team’s science journal for local events.**

**MATERIALS:****For the Plant Cell Model:**

- All materials are legal with the exception of food, hazardous materials, or unsafe energy. The use of recycled and repurposed materials is highly encouraged.
- No kits allowed.

**The Host Center will provide the following:**

- Answer Sheet
- A series of questions will be given to each team
- Pencils
- Any materials/tools required by the challenge
- Stop watch
- Microscope
- Table

**GENERAL RULES:**

- 1) The students' full name, grade level, school name, and MESA center must be clearly labeled on the Plant Cell model. A 10% penalty in the score will be assessed for failing to properly label.
- 2) Each team members' full name, school name, and MESA center must be completely filled out on the answer sheet.
- 3) Teams must consist of 2 to 3 students. Teams consisting of 1 student will not be allowed to compete.
- 4) Teams will be required to submit a science journal with the following requirements:
  - a) The students' full name, grade level, school name and MESA center must be clearly labeled/identified in the Science Journal. A 10% penalty in the score will be assessed for failing to properly label.
  - b) Using one to two sentences, answer the following questions:
    - i) How many genes do humans have?
    - ii) What is a chromosome?
    - iii) Are children identical to their parents? Why or why not?
  - c) Sketch of DNA with labeled parts (sketches can be hand drawn or computer generated):
    - i) Adenine
    - ii) Thymine
    - iii) Guanine
    - iv) Cytosine
    - v) Sugar phosphate backbone
  - d) Define the scientific terms and provide **ONE (1) example** for each of the following:
    - i) Phenotype
    - ii) Genotype
    - iii) Punnett squares - Please use parents Xx and Yy for your example (this counts as your example, no need to create another)
  - e) Using two to three sentences, what are the differences between animal and plant cells?
    - i) Please include a sketch of an animal and plant cells and label all parts and highlight the differences between them (sketches can be hand drawn or computer generated).
  - f) Sketch of Microscope with labeled parts (sketches can be hand drawn or computer generated):

- i) Arm
  - ii) Head
  - iii) Ocular Lens/Eyepiece
  - iv) Objective Lens
  - v) Slide Holder Clips
  - vi) Focus adjustment knob
  - vii) On/Off Switch
  - viii) Illuminator/Light Source
  - ix) Base
  - x) Stage
- 5) **All parts on the Plant Cell model must be CLEARLY labeled and displayed on the model. (Students MUST create a Plant Cell model in order to compete).** Required and labeled parts to be included:
- a) Amyloplast
  - b) Cell Membrane
  - c) Cell Wall
  - d) Chloroplast
  - e) Cytoplasm
  - f) Endoplasmic Reticulum
  - g) Golgi Apparatus
  - h) Mitochondria
  - i) Nucleolus
  - j) Nucleus
  - k) Peroxisome
  - l) Ribosome
  - m) Vacuole
- 6) The Plant Cell model must have a **MINIMUM** width/length of 25cm by 25cm and **MAXIMUM** width/length of 35cm by 35cm with a **HEIGHT** minimum of 25cm and maximum height of 35cm.
- a) All materials are legal with the exception of food, hazardous materials, or unsafe energy.
  - b) No kits allowed.
- 7) The model and science journal must be the original work of the students.
- 8) Teams will be allotted **30** minutes to solve an investigation.
- 9) Answer sheets will be placed on a table in front of judges; teams must return to the answer sheet after every question and write answers in front of judges.
- a) Students may **NOT** change answers once submitted.
- 10) Each clue must be answered before moving on to the next question and receiving the next clue in the case.
- 11) Only answers submitted in the designated format or location will be scored.
- 12) The clues will be based on the ones provided by the host and vary from punnett squares, genotypes, phenotypes, and types of plant or animal cells.
- 13) Scratch paper is not allowed as each clue is printed on a separate sheet of paper. Teams may use both sides of the clue sheet to solve the problem if needed. Any additional work done on the blank part of the answer sheet or clue sheet will **NOT** be used for scoring purposes.
- a) Only answers written on the final answer sheet are evaluated for scoring purposes.
- 14) Books, notes, or other resource materials may not be used on the day of the competition.
- 15) Cell phones, laptops, ipads, smart watches, or any other electronic devices are strictly prohibited.
- 16) Digital media (e.g., photos, video recordings, etc.) will not be accepted for judging purposes. **All judging decisions are final.**

## JUDGING:

- 1) Lead contest judge will assemble all teams and review the event guidelines and judging criteria.
- 2) Teams will be assigned a random number to determine the order teams will compete in.
- 3) Teams will be asked to wait outside of the room. One team will enter the room for competition (hosts may choose to have more than one team to compete at a time).
- 4) A table will be placed in front of the room where an answer sheet will be placed for each individual team.
- 5) Microscope and materials needed for competition will be placed on another table for competing teams.
- 6) Each team will receive details about the investigation and Question #1 in a sealed envelope.
  - a) When the team has the answer, they must go to the table where the answer sheet is and enter their answer. Once they enter an answer, they will receive the next question envelope; **even if the previous answer is incorrect they will proceed to the next question.**
- 7) Once the lead judge has signaled the beginning of the competition, teams may open the envelope and begin solving the first question.
- 8) Teams will have 30 minutes to complete the investigation. Once the 30 minutes are over, teams will be asked to stop and to place materials down and will not be allowed to enter answers on the answer sheet.
- 9) Proctors will record the time for completion (i.e., the total time the team used to complete all of the clues); this recorded time will be used in the tie-breaker process.

## SCORING:

- 1) Plant Cell Model = up to 65 points
- 2) Science Journal = up to 55 points
- 3) Investigation Clues = up to 100 points
- 4) Tiebreaker: recorded time where the team who completed the questions faster (in the least amount of time with more time left) will place ahead of the other.

## AWARDS:

- Teams who do not submit a Science Journal will NOT be eligible for any awards.
- Awards will be given per division: Grade 6 and Grades 7/8.
- Medals will be awarded for 1st, 2nd, and 3rd place based on the highest Final Team Score.
- Ribbons will be awarded for Innovative Model Design.
- Only teams that place in the Team Score category will advance to Regional MESA Day; please check with your MESA center to determine the # of teams that advance to Regional MESA Day.

## ATTACHMENTS/APPENDIX:

- Next Generation Science Standard
- Science Concept Resources
- Suggested Microscope and Slides
- Score Sheet for Investigative Science

## Next Generation Science Standards

The specific Next Generation Science Standard link this competition covers is below:

- [MS-LS3-2 Heredity: Inheritance and Variation of Traits](#)
  - **Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.** [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]
- [MS-LS1-2 From Molecules to Organisms: Structures and Processes:](#)
  - **Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]
- [MS-LS1-7 From Molecules to Organisms: Structures and Processes](#)
  - **Develop a model to describe how food is rearranged through chemical reactions to support growth and/or release energy as this matter moves through an organism.** [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

## Science Concept Resources

The following science concepts can be used in any variation in the challenges:

- Microscope: identification of parts and how to use it.
- Types of cells including animal and plant.
- Pattern identification.
- Phenotype
- Genotype
- Punnett squares
- Parts of the cell: both animal and plant.

Vocabulary:

- Hereditary
- Genes
- Recessive
- Genotype
- Phenotype
- Punnett square
- Homozygous
- Heterozygous

### **Suggested Microscope and Slides**

Recommendations: Please coordinate with your school's Life Sciences/Biology department to arrange for loaner microscopes. If this is not feasible, you can find microscope purchase recommendations at the following link:

- [Microscope](#)
- [Slides](#)

**SCORE SHEET FOR INVESTIGATIVE SCIENCE**

Middle School - Grade 6 and Grades 7/8

*Copies of this score sheet will be provided by the MESA Day Host Center.*

Student Names: \_\_\_\_\_, Grade: **6** or **7/8** (circle one)

SCHOOL: \_\_\_\_\_ MS CENTER: \_\_\_\_\_

PLANT CELL MODEL RUBRIC						TOTAL
MODEL LABELING	Amyloplast ___/5	Cell Membrane ___/5	Cell Wall ___/5	Chloroplast ___/5	Cytoplasm ___/5	___/65
	Endoplasmic Reticulum ___/5	Golgi Apparatus ___/5	Mitochondria ___/5	Nucleolus ___/5	Nucleus ___/5	
	Peroxisome ___/5	Ribosome ___/5	Vacuole ___/5			

SCIENCE JOURNAL						TOTAL
Genes, Chromosome, Parents and Children: ___/5	Sketch of DNA with correctly labeled parts: ___/10	Phenotype Definition & Example: ___/4	Genotype Definition & Example: ___/4	Punnett Square Definition & Example: ___/8	Plant v.s. animal cell written differences: ___/4	___/55
Plant cell sketch with correct labels: ___/5	Animal cell sketch with correct labels: ___/5	Sketch of microscope with correctly labeled parts: ___/10				

QUESTION SET RUBRIC		
Intro:	/ 5 pts	
Clue # 1:	/ 15 pts	
Clue # 2:	/ 15 pts	
Clue # 3:	/ 15 pts	
Clue # 4:	/ 15 pts	
Clue # 5:	/ 15 pts	
Final Suspect and Organelle:	/ 20 pts	
		Recorded Time:
TOTAL Question Set (max of 100 pts)		

OVERALL SCORE
SCIENCE JOURNAL TOTAL(X/55):___/55
SCIENCE JOURNAL LABELING DEDUCTION(-10%): YES/NO:
Science Journal SUBTOTAL: _____.
PLANT CELL MODEL SCORE (X/65):___/65
MODEL LABELING DEDUCTION(-10%): YES/NO:
Model SUBTOTAL: _____.
QUESTION SET TOTAL(X/100 POINTS): _____/100
OVERALL SCORE = science journal + model + question set (X/220 POINTS): _____/220