

Model Science – The Human Eye

LEVEL:	Middle School - Grades 6, 7 and 8
TYPE OF CONTEST:	Individual / Team
COMPOSITION OF TEAMS:	1 – 2 students per team
NUMBER OF TEAMS:	3 teams per Center
SPONSOR:	Nicole Patterson, UC Irvine MSP Center
OVERVIEW:	Students will construct an original display and model of a bisected human eye and will answer questions drawn from an assigned list using reading material provided in the MESA Day curriculum.
MATERIALS:	The following materials will be provided by the students: <ul style="list-style-type: none"> • “items that are not perishable” with which to build the original model

RULES:

1. The display/model must be the original work of student(s). Judges may ask questions to verify authenticity of the display/model.
2. The display/model should be clearly labeled with student name(s), school and center. ***If display/model is not clearly labeled with student name(s), school and center, a 4.0 point penalty will be deducted from the grand total score.***
3. Designated materials that are not perishable must be used in the model’s construction. Use of any other items will result in disqualification. Commercial models may NOT be used. **Violation of this rule and only this rule will result in disqualification.** Students are encouraged to fully incorporate a variety of designated materials in the model.
4. The display and model should meet minimum and maximum size requirements.
(See JUDGING # 1a)
5. The display should be freestanding.
6. A labeled hand-drawn diagram or student’s original computer-generated diagram of the bisected human eye should be attached to the front of the display.
7. A materials table should be attached to the display.
8. The model of the bisected human eye should be clearly labeled.
9. The competitors will attempt to answer five randomly drawn questions, plus unpublished tiebreaker questions. (See JUDGING # 6 – 10)

JUDGING:

The competition will be judged in two components. Judges will receive the “Score Sheet for Model Science – The Eye” from the MESA Day Host Center.

Component I: Display and Model of the Bisected Human Eye

1. One point will be awarded for each of the following: **(4 points maximum)**
 - a. The display including the stand and all of its components fits into a space that is 3 feet high by 3 feet wide by 2 feet deep. The model of the bisected human eye is no larger than 2 feet high by 2 feet wide by 2 feet deep and no smaller than 1 foot high by 1 foot wide by 1 inch deep. ***The model may be attached to the display board, but it also may need not.***
 - b. The display is freestanding at the time of judging.
 - c. The display has a clearly labeled (14 required structures), hand-drawn or student’s original computer-generated diagram of the bisected eye on the front.
 - d. The display has a table of all materials utilized. Points will be awarded to models that most fully incorporate a variety of designated materials. A sample follows:

Model Science – The Human Eye – Materials Table

Structure	Material
1. Optic Nerve	Elbow macaroni
2. Iris	Styrofoam
3.	
4.	

2. One point will be awarded for each of the 14 required structures listed below: (0.5 points if the structure is present and an additional 0.5 points if the structure is labeled, **14 points maximum**)

Structure	Present (0.5 points)	Labeled (0.5 points)
Conjunctiva		
Cornea		
Sclera		
Iris		
Ciliary Body		
Choroid		
Pupil		
Lens		
Retina		
Fovea Centralis		
Optic Nerve		
Central Retinal Artery		
Vitreous Chamber		
Anterior Chamber		

3. Bonus points may be awarded for up to 4 additional structures other than the required structures listed in *JUDGING # 2*. These extra structures must be correctly placed and labeled on the hand-drawn or student's original computer-generated diagram, and listed on the materials table. (1 point per additional structure, **4 points maximum**)
4. Points will be awarded for accuracy. Is the overall model a realistic and true representation of the human eye? Is the model accurate in anatomical location and size of various structures? (**4 points maximum**)
5. Points will be awarded for creativity. Do the model and various structures display characteristics of originality and creativity in terms of overall composition? Are the different structures variable with different colors, textures, and dimensions? Is the use of materials used to depict the different structures creative? (**4 points maximum**)

Component II: Understanding the Anatomy of the Human Eye

6. Students will answer five questions from an assigned list based on information provided in the MESA Day curriculum. (**10 points maximum**)
7. Judges will determine the order of teams by a random drawing.
8. Students will randomly select the 5 questions.
9. Each correct answer will be awarded up to 2 points. Partial points may be awarded for partial answers.
10. There will be a set of 5 previously unpublished tiebreaker questions available on the day of the competition. Each tiebreaker question will be worth up to 2 points each. (**10 points maximum**, depending on number of tiebreaker questions used)

AWARDS:

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

MODEL SCIENCE – The Human Eye Specification Checklist for Students

- ☐ **2013 – 2014** MESA Day Rules were used.
- ☐ Only items which are **not perishable** have been used.
- ☐ The display/model is clearly labeled with student name(s), school and center.
- ☐ The **display** fits into a space that is 3 feet x 3 feet x 2 feet.
- ☐ The **model** of the bisected human eye is no larger than 2 feet x 2 feet x 2 feet.
- ☐ The **model** of the bisected human eye is no smaller than 1 foot x 1 foot x 1 inch.
- ☐ The **model** of the bisected human eye is clearly labeled.
- ☐ A hand drawn diagram or student's original computer-generated diagram of the bisected human eye is attached to the display.
- ☐ The hand drawn diagram or student's original computer-generated diagram is labeled.
- ☐ A materials table is attached to the display.

ATTACHMENTS: Questions for Model Science – The Human Eye
 Score Sheet for Model Science – The Human Eye

QUESTIONS FOR MODEL SCIENCE – THE HUMAN EYE

2013 – 2014

Middle School – Grades 6, 7 and 8

Students MUST be prepared to answer each question with a complete sentence or sentences.

1. Describe the three layers that make up the wall of the eyeball.
2. Describe visible light. What is the range of wavelengths that a typical human eye can see?
3. Describe the lacrimal gland and its function.
4. Describe the conjunctiva and its function.
5. Describe aqueous humor and its function.
6. Describe the cornea and its function.
7. Describe the three chambers of the eyeball.
8. Describe the retina and its function.
9. Describe the iris and its function.
10. Describe the sclera and its function.
11. Describe the lens and its function.
12. Describe the optic nerve and its function.
13. Name the four kinds of light-sensitive receptors found in the retina.
14. Describe how the lens causes light to come to focus.
15. Describe the zonules, also known as the zonules of Zinn, and its function.
16. What is hyperopia?
17. What is a cataract and what is the cause?
18. What is astigmatism?
19. Describe the macula and the fovea centralis and their functions.
20. What causes color blindness?
21. Name four symptoms associated with dry eyes.
22. Define the blind spot.

SCORE SHEET FOR MODEL SCIENCE – THE HUMAN EYE

Middle School – Grades 6, 7 and 8

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

Student Name(s): _____

Center & School: _____

Judges: _____

Part I: General Display/Model Criteria (4 points total)

One point for each criterion met:

Size _____ Freestanding _____ Diagram _____ Materials Table _____

Subtotal for Part I _____

Part II: Specific Model Structures (14 points, plus 0 – 4 bonus points = 18 points total)

Structure	Present = 0.5 points	Correctly Labeled = 0.5 points
Conjunctiva		
Cornea		
Sclera		
Iris		
Ciliary Body		
Choroid		
Pupil		
Lens		
Retina		
Fovea Centralis		
Optic Nerve		
Central Retinal Artery		
Vitreous Chamber		
Anterior Chamber		
TOTAL		

Bonus Points: One point per additional structure present, clearly labeled and included in the materials table. (0 – 4 bonus points total)

Bonus Structure	Present = 0.5 points	Correctly Labeled = 0.5 points
TOTAL		

Subtotal for Part II _____

Part III: Overall Accuracy of Model (0 – 4 points total)

Up to 2 points for each of the below:

1. Accuracy of the overall model (realistic) _____
2. Accuracy of the individual structures (anatomically accurate in size and location) _____

Subtotal for Part III _____

Part IV: Overall Creativity of Model (0 – 4 points total)

Up to 1 point for each of the below:

1. Creativity in the use of materials to depict colors _____
2. Creativity in the use of materials to depict textures _____
3. Creativity in the use of materials to depict dimensions _____
4. Creativity in the use of materials to depict variability of the different structures _____

Subtotal for Part IV _____

Part V: Model Science Questions (10 points total)

Up to 2 points for each answer:

Question 1 _____

Question 2 _____

Question 3 _____

Question 4 _____

Question 5 _____

Subtotal for Part V _____

GRAND TOTAL _____

(Add subtotals for Part I – Part V)

*Maximum score is **40***

**DEDUCT 4.0 POINTS FROM GRAND TOTAL (ABOVE) IF DISPLAY/MODEL IS NOT
CLEARLY LABELED WITH STUDENT NAME(S), SCHOOL AND CENTER**

Tie Breaker Questions

Up to 2 points for each answer:

Question 1 _____

Question 3 _____

Question 2 _____

Question 4 _____

TOTAL INCLUDING TIE-BREAKER QUESTIONS _____