

## Model Science – The Human Brain

- LEVEL:** Grades 9 and 10
- TYPE OF CONTEST:** Individual / Team
- COMPOSITION OF TEAMS:** 1 – 2 students per team
- NUMBER OF TEAMS:** 3 teams per Center
- SPONSOR:** Ben Louie, Associate Director, USC MSP Center
- OVERVIEW:** Students will construct an original display and model of a bisected human head 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:
- “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 4.4 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 or student’s original computer generated diagram of the bisected human head 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 head 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 The competitors will attempt to answer five randomly drawn questions, plus unpublished tiebreaker questions.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 Human Brain” from the MESA Day Host Center.*

### **Component I: Display and Model of the Bisected Human Brain**

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 human head 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 head 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 Brain – Materials Table**

<b>Structure</b>	<b>Material</b>
1. Cranium	Styrofoam
2. Cerebral Cortex	Elbow macaroni
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**)

<b>Structure</b>	<b>Present (0.5 points)</b>	<b>Labeled (0.5 points)</b>
Cranium		
Cerebral Cortex		
Frontal Lobe		
Parietal Lobe		
Occipital Lobe		
Temporal Lobe		
Corpus Callosum		
Thalamus		
Hypothalamus		
Pituitary Gland		
Mid Brain		
Cerebellum		
Pons		
Medulla Oblongata		

3. Bonus points may be awarded for up to 6 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, **6 points maximum**)
4. Points will be awarded for accuracy. Is the overall model a realistic and true representation of the human brain? Is the model accurate in anatomical location and size of various structures? (**6 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, length, and dimensions? Is the use of materials used to depict the different structures creative? (**4 points maximum**)

#### Component II: Understanding the Anatomy and Physiology of the Human Brain

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 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> place.

## MODEL SCIENCE – The Human Brain Specification Checklist for Students

- 2011 – 2012 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 head is no larger than 2 feet x 2 feet x 2 feet.
- The **model** of the bisected human head is no smaller than 1 foot x 1 foot x 1 inch.
- The **model** of the bisected human head is clearly labeled.
- A hand drawn diagram or student's original computer-generated diagram of the bisected human head 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 Brain  
                          Score Sheet for Model Science – The Human Brain

## QUESTIONS FOR MODEL SCIENCE – THE HUMAN BRAIN

2011 – 2012

Grades 9 and 10

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

1. Which lobe of the brain is important for vision? Where is it located?
2. Which part of the brain is important for reasoning? Where is it located?
3. Describe three functions of the nervous system.
4. What is the approximate weight of an adult normal brain? What percentage of the total human body weight does the brain represent?
5. Describe the three membranes known as meninges.
6. Describe the two types of cells the brain is made of.
7. Describe the four primary structures of a neuron.
8. Describe the amygdala and its function.
9. Describe the hypothalamus and its function.
10. Describe an action potential.
11. What is the limbic system and what is its function?
12. Describe the thalamus and its function.
13. Describe the midbrain and its function.
14. Describe the cerebellum and its function.
15. Describe how neurons transmit electrochemical impulses.
16. Describe the medulla oblongata and its function.
17. Describe the four ventricles of the ventricular system.
18. Describe four functions of cerebrospinal fluid.
19. What characterizes white and gray matter in the brain?
20. Describe a cerebral aneurysm.
21. Describe epilepsy.
22. Describe a negative feedback loop and give two examples.
23. What is agoraphobia?
24. Describe Multiple Sclerosis.
25. Describe the two forms of stroke or “brain attack.”

# SCORE SHEET FOR MODEL SCIENCE – THE HUMAN BRAIN

## Grades 9 and 10

*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 – 6 bonus points = 20 points total)**

Structure	Present = 0.5 points	Correctly Labeled = 0.5 points
Cranium		
Cerebral Cortex		
Frontal Lobe		
Parietal Lobe		
Occipital Lobe		
Temporal Lobe		
Corpus Callosum		
Thalamus		
Hypothalamus		
Pituitary Gland		
Mid Brain		
Cerebellum		
Pons		
Medulla Oblongata		
<b>TOTAL</b>		

Bonus Points: One point per additional structure present, clearly labeled and included in the materials table. (0 – 6 bonus points total)

Bonus Structure	Present = 0.5 points	Correctly Labeled = 0.5 points
<b>TOTAL</b>		

**Subtotal for Part II** \_\_\_\_\_

**Part III: Overall Accuracy of Model (0 – 6 points total)**

*Up to 3 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 44*

**DEDUCT 4.4 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 2 \_\_\_\_\_
- Question 3 \_\_\_\_\_
- Question 4 \_\_\_\_\_

**TOTAL INCLUDING TIE-BREAKER QUESTIONS** \_\_\_\_\_