

Model Science – The Heart

LEVEL:	Grades 9-10
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 model of a bisected human heart 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 student:

- “Items that are not perishable” with which to build their model

RULES:

1. 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 4.2 point penalty will be deducted from the grand total score.***
2. 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 use. **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.
3. The display and model should meet minimum and maximum size requirements.
(See JUDGING #1)
4. The display should be freestanding.
5. A labeled hand-drawn diagram of the bisected heart should be attached to the front of the display.
6. A materials table should be attached to the display.

7. The model of the bisected heart should be clearly labeled.
8. The competitors will attempt to answer five randomly drawn questions, plus unpublished tiebreaker questions.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 Heart” from the MESA Day Host Center.

Component I: Display and Model of the GI Tract

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 heart 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 elements), hand-drawn diagram of the heart 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 Heart – Materials Table

Element	Material
1. Aorta	Rubber Tubing
2. Left Ventricle	Sponge
3.	
4.	

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

Element	Present (0.5 points)	Labeled (0.5 points)
Aorta		
Left Ventricle		
Right Ventricle		
Left Atrium		
Right Atrium		
Mitral Valve		
Tricuspid Valve		
Superior Vena Cava		
Inferior Vena Cava		
Right Coronary Artery		
Left Coronary Artery		
Aortic Valve		
Pulmonary Valve		
Ventricular Septum		

3. Bonus points may be awarded for up to 4 additional elements other than the required elements listed in Judging #2. These extra elements must be a part of the heart and must be correctly placed, labeled, and listed on the materials table. (1 point per additional element, **4 points maximum**)
4. Points will be awarded for accuracy. Is the overall model a realistic and true representation of the human heart? Are the various elements accurate in anatomical location and size? (**6 points maximum**)
5. Points will be awarded for creativity. Do the model and various elements display characteristics of originality and creativity in terms of overall composition? Is the use of materials used to depict the different elements creative? (**4 points maximum**)

Component II: Understanding the Physiology of the Human Heart

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 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 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 Heart
Specification Checklist for Students

- 2008 – 2009 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 ft. x 3 ft. x 2 ft.
- The **model** of the bisected heart is no larger than 2 ft. x 2 ft. x 2 ft.
- The **model** of the bisected heart is no smaller than 1 ft. x 1 ft. x 1 inch.
- The **model** of the bisected heart is clearly labeled.
- A hand drawn diagram of the GI tract is attached to the display.
- A hand drawn diagram is labeled.
- A materials table is attached to the display.

ATTACHMENTS:

Questions for Model Science – The Heart
Score Sheet for Model Science – The Heart

Questions for Model Science – The Heart

2008-2009

Grades 9-10

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

1. What is the size of the human heart?
2. Describe the fetal heart's developmental stages.
3. Describe the pericardium and its function.
4. What is the function of the aorta and what are the sections of the aorta?
5. Describe the pulmonary arteries and its function.
6. Name 4 risk factors for heart disease.
7. Describe the left ventricle and its function.
8. Describe the right ventricle and its function.
9. Where is the tricuspid valve located? What is its function?
10. What is the function of the superior and inferior vena cava?
11. Describe the right atrium and its function.
12. What is the purpose of the cardiovascular system?
13. What is arteriosclerosis?
14. Describe what happens in a myocardial infarction.
15. What three types of exercise are needed for a healthy heart? Describe each.
16. Name 4 difference between an angina and heart attack.
17. Describe a heart-healthy diet.
18. What three major waves of electrical signals appear on the ECG/EKG? Describe each wave.
19. What regulates the rhythm of the heartbeat?
20. Describe ventricular systole.

Score Sheet for Model Science – The Heart

Grades 9-10

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 Elements (14 points, plus 0 – 4 bonus points = 18 points total)

Element	Present = 0.5 points	Correctly Labeled = 0.5 points
Aorta		
Left Ventricle		
Right Ventricle		
Left Atrium		
Right Atrium		
Mitral Valve		
Tricuspid Valve		
Superior Vena Cava		
Inferior Vena Cava		
Right Coronary Artery		
Left Coronary Artery		
Aortic Valve		
Pulmonary Valve		
Ventricular Septum		
TOTAL		

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

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

Subtotal for Part II _____

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

Up to 2 points for each of the below:

- 1. Accuracy of the overall model (realistic) _____
- 2. Accuracy of the individual elements (*anatomically accurate in size*) _____
- 3. Accuracy of the individual elements (*anatomically accurate in 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 elements _____

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 42
DEDUCT 4.2 POINTS FROM GRAND TOTAL 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 _____

TOTAL INCLUDING TIE-BREAKER QUESTIONS _____