

Model Science – Gastrointestinal (GI) Physiology

LEVEL: Middle School - Grades 6th – 8th

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

OVERVIEW: Students will construct an original model of the human gastrointestinal tract that will *simulate the passage of food* and will answer questions drawn from an assigned list using reading material provided in the MESA Day curriculum. Participation logistics, limits, and competition facilities may vary by host site. Advisors and students are responsible for verifying this information with their center director.

MATERIALS: The following materials will be provided by the students:

- Nonperishable materials with which to build the original model
- Nonperishable materials to represent the “food” item for testing

RULES:

1. The model must be the original work of the student(s). Judges may ask questions to verify authenticity of the display/model.
2. Only materials that are not perishable may be used in the model’s construction. Nonperishable items are those that will not rot, spoil, or decay without refrigeration. 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 allowable materials in the model.
3. The model should be clearly labeled with student name(s), school and MESA center. If the model is not clearly labeled with student name(s), school and MESA center, a **2** point penalty will be deducted from the total score.
4. The model should be no larger than 3 feet high by 3 feet wide by 2 feet deep.
5. The model should realistically depict all required structures and demonstrate the passage of food through the GI Tract.

6. The model should account for the time it takes for the food to pass through the GI tract. (*See JUDGING # 5*)
7. The representation of the food item is at the student's discretion, but it must be a nonperishable item.
8. Students must provide all materials needed to demonstrate their model. Host center will not provide electrical power, liquids, or any material to use in the demonstration of the model.
9. A materials table should be provided with the model. The materials table may be attached to the model or provided separately. If provided separately, it must be clearly labeled with student name(s), school and MESA center.
10. The competitors will attempt to answer three randomly selected questions from the attached list, plus unpublished tiebreaker questions if needed.

JUDGING:

1. Four points will be awarded for the following: **(maximum 4 points)**
 - a. The model, including the stand and all of its components is no larger than 3 feet high by 3 feet wide by 2 feet deep.
2. Three points will be awarded for a COMPLETE display table listing all materials utilized for all structures on the model. **(maximum 3 points)**

Sample Materials Table

Structure	Material
1. Esophagus	Pink tubing
2. Duodenum	Red Balloon

3. Points will be awarded for each of the 12 required structures presented on the model as listed below. **(maximum 48 points)**
 - a. Required structure present: 0 – ½ point awarded
 - b. Required structure correctly labeled: 0 – ½ point awarded
 - c. Required structure creatively demonstrates the passage of food: 0 - 1 points awarded
 - d. Realistic depiction of required structure: 0 - 2 points awarded

Structure	Present (0 - .5 point)	Correctly Labeled (0 - .5 point)	Passage of Food (0 – 1 point)	Realistic Depiction (0 - 2 points)
Mouth				
Esophagus				
Stomach				
Duodenum				
Jejunum				
Ileum				
Cecum				
Ascending Colon				
Transverse Colon				
Descending Colon				
Sigmoid Colon				
Rectum				

4. Points may be awarded for the presence of up to 3 additional structures other than the required structures. **(maximum 9 points)** Additional structures will be judged as follows:
 - a. Additional structure present: 0 – ½ point awarded
 - b. Additional structure correctly labeled: 0 – ½ point awarded
 - c. Realistic depiction of additional structure: 0 - 2 points awarded
5. Points will be awarded based on the amount of time it takes for the food item to pass from the mouth to the rectum. **(maximum 9 points)**
 - a. Less than 30 seconds: 1 point
 - b. 30 seconds – 1 minute: 4 points
 - c. 1 minute – 2 minutes: 9 points

Maximum time for food passage is 2 minutes. Models not able to complete the task in 2 minutes will receive 0 points for this portion of the competition.

6. Points will be awarded for creativity. Do the 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? **(maximum 8 points)**
7. Judges will determine team order by random drawing and will post the team order prior to the start of the competition.
8. Once a team is called they will be given a maximum of 3 minutes to demonstrate the functionality of their GI Tract.
Students will then answer three questions from an assigned list based on information provided in the MESA Day curriculum. **(maximum 9 points)** Question/answer portion judged as follows:
 - a. Students will randomly select 3 questions.
 - b. Students will have a maximum of 30 seconds to answer each question.
 - c. Each correct answer will be awarded up to 3 points. Partial points may be awarded for partial answers.
 - d. 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 3 points each.

AWARDS:

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

**MODEL SCIENCE – Gastrointestinal Physiology
Specification Checklist for Students
NOT FOR USE BY COMPETITION JUDGES**

- Only nonperishable items used in the construction of the model.
- The model is clearly labeled with student name(s), school and MESA center.
- The model of the GI tract is no larger than 3 feet x 3 feet x 2 feet deep.
- The model is clearly labeled w/ required structures.
- The model depicts the passage of food through the gastrointestinal tract.
- A materials table is included with the model.

ATTACHMENTS: Questions for Model Science – Gastrointestinal Physiology
 Score Sheet for Model Science – Gastrointestinal Physiology

QUESTIONS FOR MODEL SCIENCE – GASTROINTESTINAL PHYSIOLOGY

2015 – 2016

Middle School – Grades 6, 7 and 8

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

1. How do nutrients from digested food reach the bloodstream?
2. Name two body organs that lie outside the GI tract and directly aid in the digestion of food.
3. What is mastication?
4. What are at least 3 things that saliva does?
5. Besides eating food, what 3 things can cause saliva secretion in humans?
6. Define peristalsis.
7. Name 3 parts of the stomach.
8. Name 3 functions of the stomach.
9. What is the pH and composition of chyme?
10. Name the 3 parts of the small intestines.
11. What is the primary function of the colon?
12. Name the four main sections of the colon.
13. What is bile?
14. Bile is secreted into the bile duct by what organ? And when not in use excess bile is stored where?
15. Name three important functions of the liver.
16. What is gut flora/intestinal bacteria and how does it aid in digestion?
17. What is the most important function of intestinal villi?
18. What is responsible for the brown color of feces?
19. What is defecation?
20. Define mechanical and chemical digestion.
21. What causes gastroesophageal reflux disease?
22. Digestion and absorption occur in what major portion of the GI tract?
23. What is a peptic ulcer and what are the possible causes?

SCORE SHEET FOR MODEL SCIENCE – GASTROINTESTINAL PHYSIOLOGY

Middle School – Grades 6, 7 and 8

2015 - 2016

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

Student Name(s): _____

Center & School: _____

Judges: _____

Part I: Model Criteria/Materials Table (7 points max)

Size (4 points) _____

Materials Table (0-3 points) _____

Subtotal for Part I _____

Part II: Model Structures (57 points max)

Required Structures:

Structure	Present (0 - .5 point)	Correctly Labeled (0 - .5 point)	Passage of Food (0 – 1 point)	Realistic Depiction (0 - 2 points)	Sub Total
Mouth					
Esophagus					
Stomach					
Duodenum					
Jejunum					
Ileum					
Cecum					
Ascending Colon					
Transverse Colon					
Descending Colon					
Sigmoid Colon					
Rectum					
				Total	

Additional Structures:

Structure	Present (0 - .5 point)	Correctly Labeled (0 - .5 point)	Realistic Depiction (0 – 2 points)	Subtotal
			Total	

Subtotal for Part II _____

Part III: Food Passage (9 points max)

Time to complete passage of food: _____

Scoring:

- Less than 30 seconds: 1 point
- 30 seconds – 1 minute: 4 points
- 1 minute – 2 minutes: 9 points

Subtotal for Part III _____

Part IV: Overall Creativity of Model (8 points max)

0 - 2 point for each of the following:

- 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 (9 points max)

Up to 3 points for each answer:

Question 1 _____

Question 2 _____

Question 3 _____

Subtotal for Part V _____

Labeling Penalty - _____

Deduct 9 points if model is not clearly labeled with student name(s), school and MESA center.

GRAND TOTAL _____

(Add subtotals for Part I – Part V; deduct penalty if applicable)

Maximum score is 90

Tie Breaker Questions

Up to 3 points for each answer:

Question 1 _____

Question 2 _____

Question 3 _____

Question 4 _____

Question 5 _____

TOTAL INCLUDING TIE-BREAKER QUESTIONS _____