

Model Science – Gastrointestinal (GI) Physiology

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

OVERVIEW: Students will construct an original display and model of the human gastrointestinal tract 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 and model must be the original work of the student(s). Judges may ask questions to verify authenticity of the display/model.
2. The display and model should be clearly labeled with student name(s), school and center. ***If the display and/or model is not clearly labeled with student name(s), school and center, a 3.8 point penalty will be deducted from the total score.***
3. Designated materials that are not perishable must 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 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 GI tract should be attached to the front of the display.
7. A materials table should be attached to the display.
8. The structures depicted on the model of the GI tract 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 The competitors will attempt to answer five randomly drawn questions, plus unpublished tiebreaker questions.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 – GI Physiology” 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 model and 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 GI tract 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; however, attaching the model is not required.***
 - b. The model and display are freestanding at the time of judging.
 - c. The display has a clearly labeled (w/12 required structures), hand-drawn or student’s original computer-generated diagram of the GI tract on the front.
 - d. The display has a table of all materials utilized. A sample follows:

Model Science – GI Physiology – Materials Table

Structure	Material
1. Esophagus	Spaghetti
2. Duodenum	Pink Balloon
3.	
4.	

2. One point will be awarded for each of the 12 required structures presented on the model (0.5 points if the structure is present and an additional 0.5 points if the structure is labeled, **12 points maximum**). Required structures listed below.

Structure	Present (0.5 points)	Labeled (0.5 points)
Mouth		
Esophagus		
Stomach		
Duodenum		
Jejunum		
Ileum		
Cecum		
Ascending Colon		
Transverse Colon		
Descending Colon		
Sigmoid Colon		
Rectum		

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 model and 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 GI tract? 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 GI Physiology

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 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 – Gastrointestinal Physiology
Specification Checklist for Students**

- 2014 – 2015** MESA Day Rules were used.
- Only items that are not perishable have been used.
- The **display and model** is clearly labeled with student name(s), school and center.
- The **model and display** fits into a space that is 3 feet x 3 feet x 2 feet.
- The **model** of the GI tract is no larger than 2 feet x 2 feet x 2 feet.
- The **model** of the GI tract is no smaller than 1 foot x 1 foot x 1 inch.
- The **model and display** are clearly labeled w/ required structures.
- A labeled (w/required structures), hand drawn diagram or student's original computer-generated diagram of the GI tract is attached to the display.
- A materials table is attached to the display.

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

QUESTIONS FOR MODEL SCIENCE – GASTROINTESTINAL PHYSIOLOGY

2014 – 2015

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

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 (12 points, plus 0 – 4 bonus points = 16 points total)

Structure	Present = 0.5 points	Correctly Labeled = 0.5 points
Mouth		
Esophagus		
Stomach		
Duodenum		
Jejunum		
Ileum		
Cecum		
Ascending Colon		
Transverse Colon		
Descending Colon		
Sigmoid Colon		
Rectum		
TOTAL		

Bonus Points: One point per additional structure present, clearly labeled and included in the diagram and 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 _____

Labeling Penalty - _____

Deduct 3.8 points if display and/or model is not clearly labeled with student name(s), school and center.

GRAND TOTAL _____

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

Maximum score is 38

Tie Breaker Questions

Up to 2 points for each answer:

Question 1 _____

Question 2 _____

Question 3 _____

Question 4 _____

Question 5 _____

TOTAL INCLUDING TIE-BREAKER QUESTIONS _____