PAWS
Science
Grade 8

Released Items
With Data

2010

Solar System Objects

Shanna wanted to compare the movement of different objects in the solar system. She went to the library and found information about ten different objects in the solar system. She put all of the information she found into a data table. The table is shown below.

Data for Some Objects in The Solar System

Object Name	Distance From Sun (10^6 km)	Time to Complete One Orbit (around the Sun)	Year of Discovery
Mercury	57.9	88 days	before recorded history
Venus	108.1	225 days	before recorded history
Earth	149.6	365 days	before recorded history
Mars	227.8	687 days	before recorded history
Jupiter	778.1	12 years	before recorded history
Saturn	1427.0	29 years	before recorded history
Uranus	2870.3	84 years	1781
Neptune	4499.9	165 years	1846
Pluto	5913.0	248 years	1930
Eris	14511.0	557 years	2005

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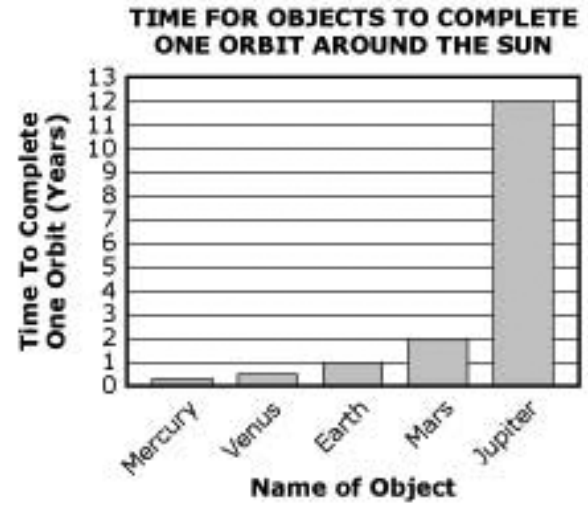
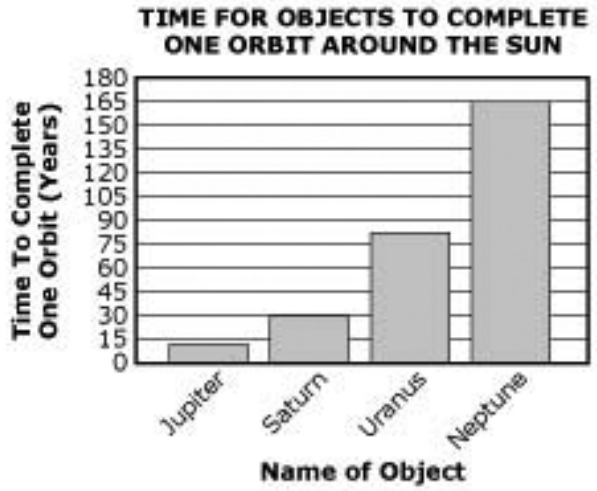
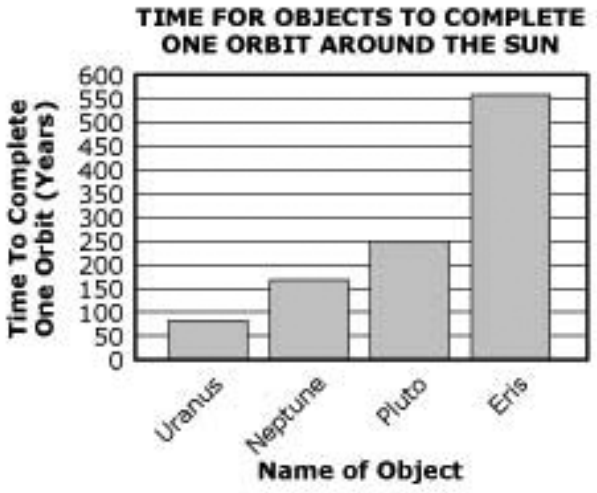
Shanna decided to make a bar graph of her data for "Time for Objects to Complete One Orbit Around the Sun." She tried several times to graph the data. Finally, she drew the graphs shown.







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Why did Shanna <u>most likely</u> draw three graphs instead of one?

A. She wanted to make it look like she had more data.

B. She had to use different scales to make all of her data readable.

C. She wanted to show that Mars, Saturn, and Uranus are the same size.

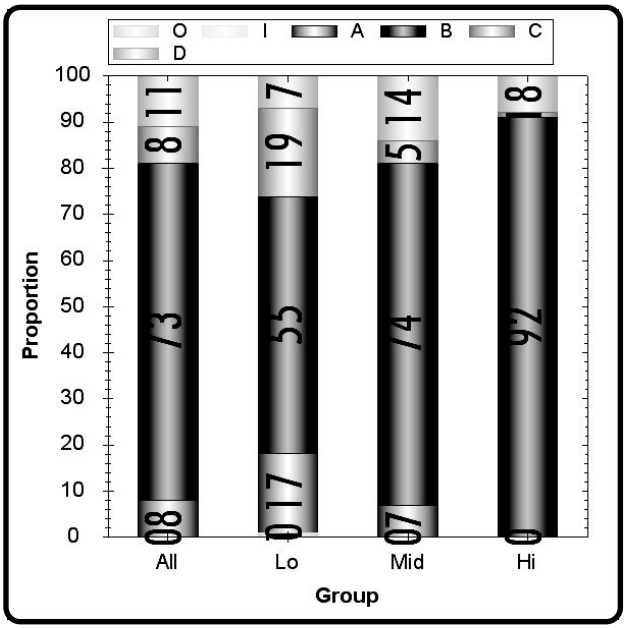
D. She had to use several sheets of paper to keep her bars from running together.

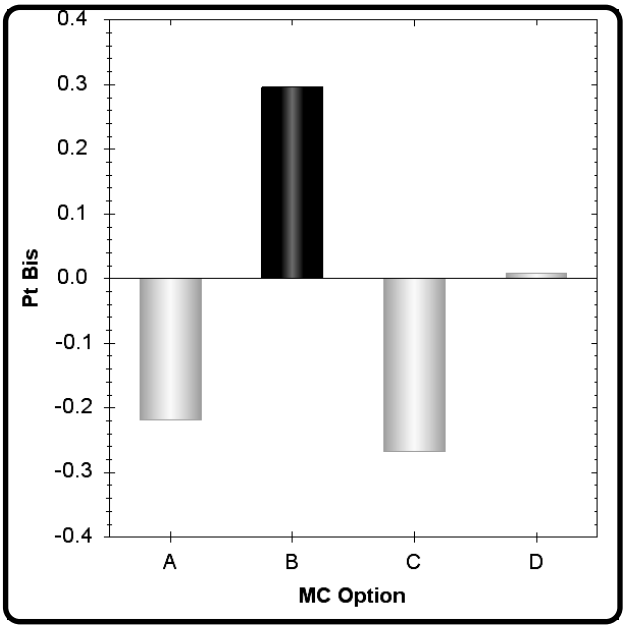
Grade 8	Science	CID 100000034866
Item # 22		S.08.4.h
Psg : Solar System Objects		FT08

Type	Max Points	Correct Answer	N Count	Item Mean	Discrimination
Multiple Choice	1	B	716	0.726	0.296

	A	B	C	D	Omit	Invalid
All	8	73	8	11	0	0
Low Scorers	17	55	19	7	1	0
Middle Scorers	7	74	5	14	0	0
High Scorers	0	92	1	8	0	0

MC Item Option Discriminations			
A	B	C	D
-0.219	0.296	-0.267	0.008





Notes:

Female students may perform better on this item as compared to Male students. (C)

Non SPED students may perform better on this item as compared to SPED students. (B)

Option D has positive discrimination. Check option for ambiguity/correctness.

Shanna wants to use her data table to make other predictions about the objects in the solar system. Which kind of graph would be most helpful in making such predictions?

A. A bar graph showing distance from Sun for each object named

B. A scatter plot comparing year of discovery to distance from Sun

C. A line graph plotting distance from Sun against time to complete one orbit

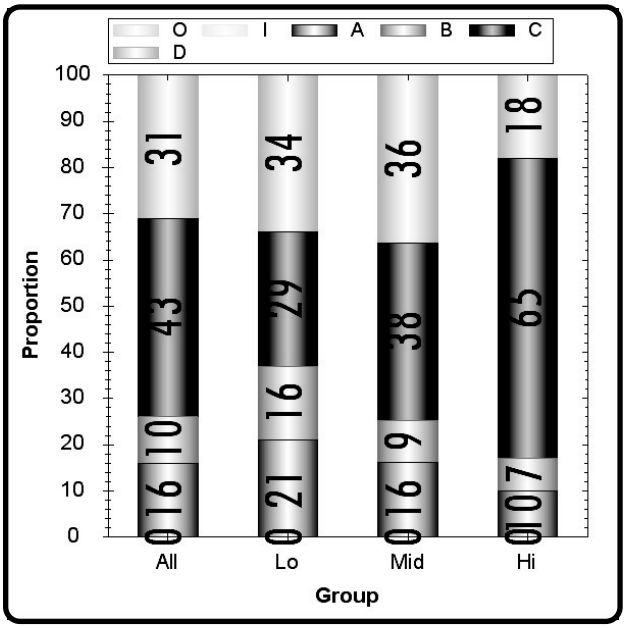
D. A double-bar graph giving year of discovery and distance from Sun for each object named

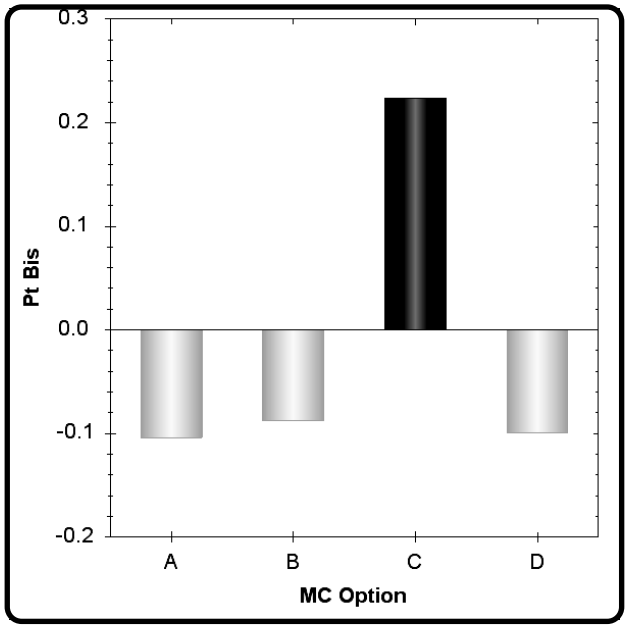
Grade 8	Science	CID 100000034867
Item # 7		S.08.4.h
Psg : Solar System Objects		OP10

Type	Max Points	Correct Answer	N Count	Item Mean	Discrimination
Multiple Choice	1	C	6377	0.430	0.224

	A	B	C	D	Omit	Invalid
All	16	10	43	31	0	0
Low Scorers	21	16	29	34	0	0
Middle Scorers	16	9	38	36	0	0
High Scorers	10	7	65	18	0	0

MC Item Option Discriminations			
A	B	C	D
-0.104	-0.088	0.224	-0.099





Notes:

Based on the data table, when was the telescope most likely invented?

A. Before 1781

B. Between 1782 and 1846

C. Between 1847 and 1930

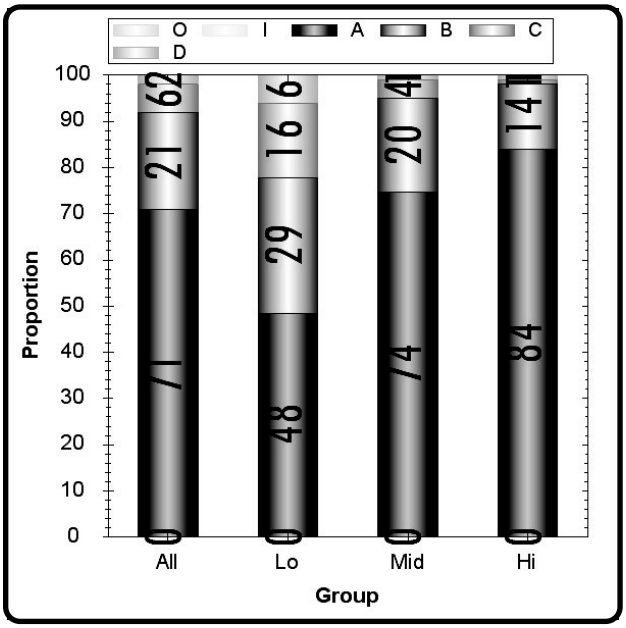
D. After 1930

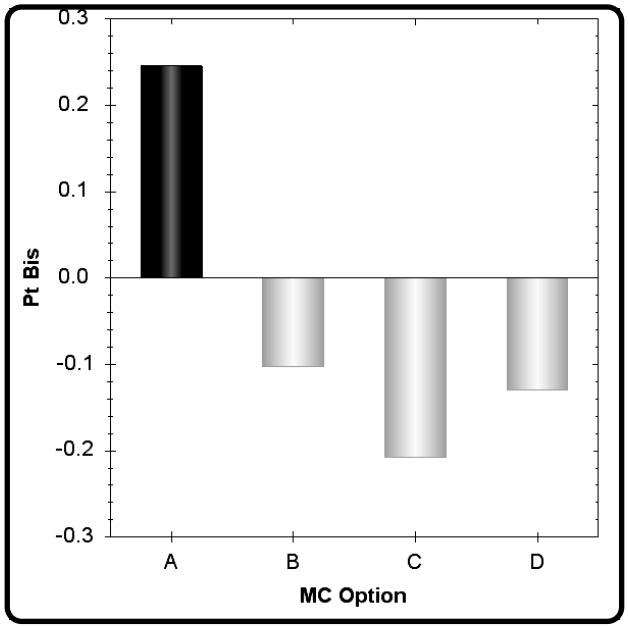
Grade 8	Science	CID 100000034870
Item # 8	S.08.5.h	
Psg : Solar System Objects		OP10

Type	Max Points	Correct Answer	N Count	Item Mean	Discrimination
Multiple Choice	1	A	6377	0.710	0.246

	A	B	C	D	Omit	Invalid
All	71	21	6	2	0	0
Low Scorers	48	29	16	6	0	0
Middle Scorers	74	20	4	1	0	0
High Scorers	84	14	1	1	0	0

MC Item Option Discriminations			
A	B	C	D
0.246	-0.103	-0.208	-0.130





Notes:

Which is the most likely scientific explanation for the pattern seen in Shanna's data table?

A. The oldest objects have lost most of their mass, so they move faster in their orbits around the Sun.

B. The objects closest to the Sun are most affected by the Sun's gravity, so they must move faster to stay in orbit.

C. The objects discovered before recorded history move slower than newly discovered objects.

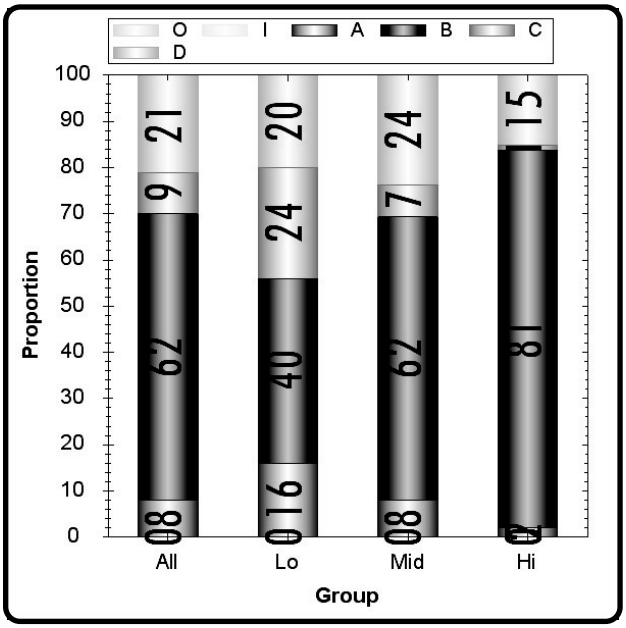
D. The objects whose orbits take days are spinning faster on their axes than those whose orbits take years.

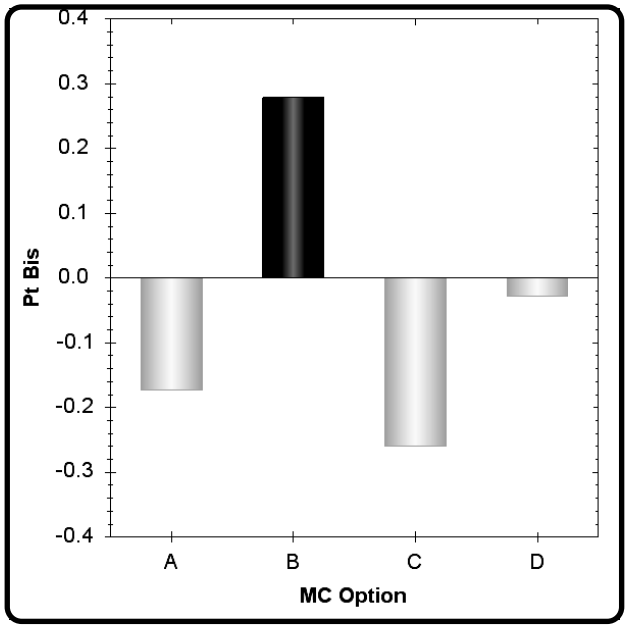
Grade 8	Science	CID 100000034871
Item # 9	S.08.5.h	
Psg : Solar System Objects		OP10

Type	Max Points	Correct Answer	N Count	Item Mean	Discrimination
Multiple Choice	1	B	6377	0.620	0.279

	A	B	C	D	Omit	Invalid
All	8	62	9	21	0	0
Low Scorers	16	40	24	20	0	0
Middle Scorers	8	62	7	24	0	0
High Scorers	2	81	1	15	0	0

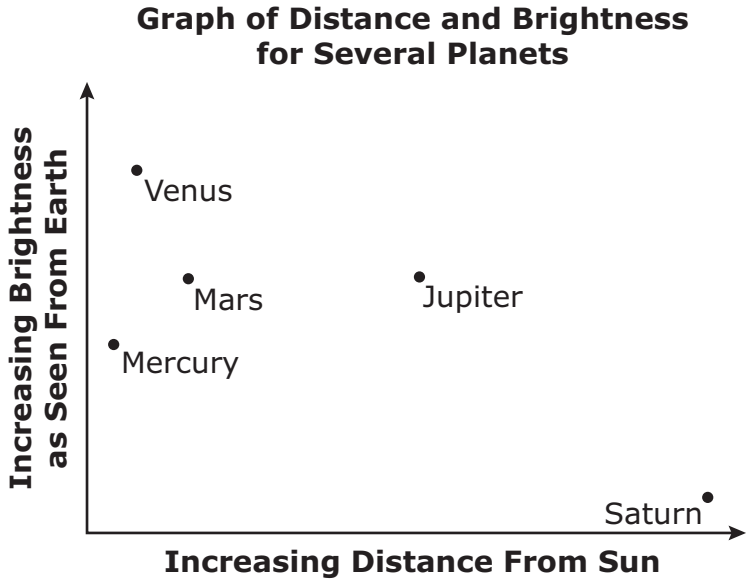
MC Item Option Discriminations			
A	B	C	D
-0.173	0.279	-0.260	-0.028





Notes:

Shanna did some more research. She found the maximum brightness for several of the objects in her data table. Using the new information, she made the following graph.



Shanna's teacher said that there is a relationship between a planet's distance from the Sun and its brightness. Shanna did not think that her graph showed a clear relationship between distance and brightness.

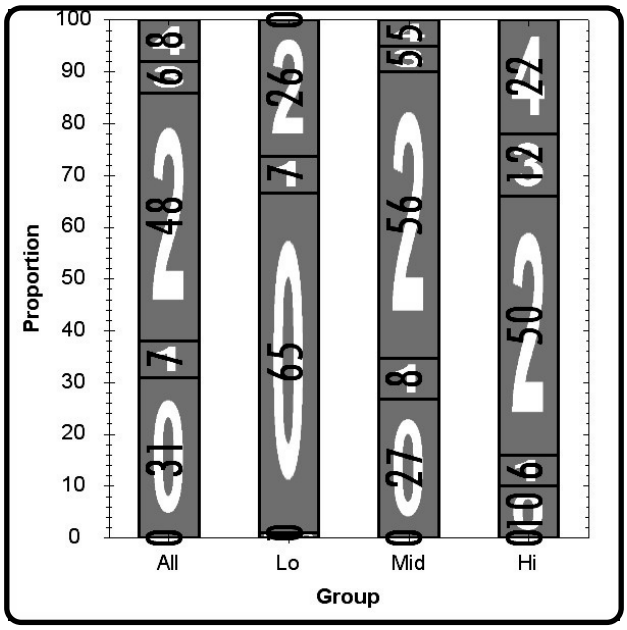
Part A. **Explain how brightness and distance from the Sun affect the relationship as shown in the graph.**

Part B. **In the space provided, identify and describe a factor that might cause the relationship between distance and brightness to be unclear in the graph.**

Grade 8	Science	CID 100000034865
Item # 43		S.08.5.h
Psg : Solar System Objects		OP09

Type	Max Points	N Count	Item Mean	Discrimination
ER	4	6203	1.514	0.410

	0	1	2	3	4	Omit	Invalid
All	31	7	48	6	8	0	0
Low Scorers	65	7	26	0	0	1	0
Middle Scorers	27	8	56	5	5	0	0
High Scorers	10	6	50	12	22	0	0



Notes:

White students may perform better on this item as compared to Am. Indian students. (B)

Non SPED students may perform better on this item as compared to SPED students. (B)

Part A. **Explain how brightness and distance from the Sun affect the relationship as shown in the graph.**

For the most part, the farther from the Sun a planet is, the less bright it is. These planetary objects appear smaller because they are so far away. This makes them seem less bright and smaller.

Part B. **In the space provided, identify and describe a factor that might cause the relationship between distance and brightness to be unclear in the graph.**

Two factors that make this relationship unclear is the distance from Earth and size of the planets. Venus is closest to Earth, so it appears large and bright. Though far away, Jupiter seems bright because it is the largest planet. These throw the relationship in the graph out of perspective.

Score 4
Part A. The explanation of how brightness and distance from the Sun affect the relationship as shown on the graph is complete and correct (the farther from the Sun a planet is, the less bright.).
Part B. The response contains two appropriate factors that might cause the relationship between distance and brightness to be unclear: distance from the Earth and size. Both factors have appropriate descriptions for full credit for either. Since only one factor is required, this response exceeds the standard.

Part A. **Explain how brightness and distance from the Sun affect the relationship as shown in the graph.**

The distance from the sun is bigger, the brightness as seen from earth is smaller, because it can't get sunshine from the sun.

Part B. **In the space provided, identify and describe a factor that might cause the relationship between distance and brightness to be unclear in the graph.**

Because some of the them is close to the earth, you can see better. Some of them is not close to the earth, you can't see clearly. Some of them is bigger, some of them is smaller.

Score 3
Part A The (distance from the Sun is bigger the brightness as seen from Earth is smaller) is a correct response. However, the statement (it can't get sunshine from the Sun) is a flaw which detracts from a correct answer.
Part B The student correctly identifies, distance from the Earth as a factor and describes why it is a factor by comparing them to the closeness to Earth.

Part A. **Explain how brightness and distance from the Sun affect the relationship as shown in the graph.**

The further away you get from the sun the darker it gets

Part B. **In the space provided, identify and describe a factor that might cause the relationship between distance and brightness to be unclear in the graph.**

Certian planets are brighter even though they are further away

Score 2
Part A The response receives partial credit because it refers to amount of sunlight a planet receives but not the brightness of the planet as seen form the Earth.
Part B The response receives partial credit for identifying a factor that makes the relationship unclear but fails to provide a specific example

Part A. **Explain how brightness and distance from the Sun affect the relationship as shown in the graph.**

The with of distance between a sun and planet reflects on how much amount of sun they get.

Part B. **In the space provided, identify and describe a factor that might cause the relationship between distance and brightness to be unclear in the graph.**

A factor could be how hot it is.

Score 1
Part A The response gets partial credit for alluding to the relationship between distance from the Sun and brightness but fails to specify a rule.
Part B Although the response could be a true statement, it is not relevant to the task.

Part A. **Explain how brightness and distance from the Sun affect the relationship as shown in the graph.**

The closer the planet is to the sun the shorter amount of days it takes to rotate around the sun.

Part B. **In the space provided, identify and describe a factor that might cause the relationship between distance and brightness to be unclear in the graph.**

The farther away from the sun, the darker it is. The darker it is the colder it gets.

Score 0
Part A The student does not identify a relationship between a planet's distance from the sun and its brightness as seen from the Earth.
Part B this response would be acceptable for partial credit in Step A, but it is irrelevant to the task in Step B and receives no credit.

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