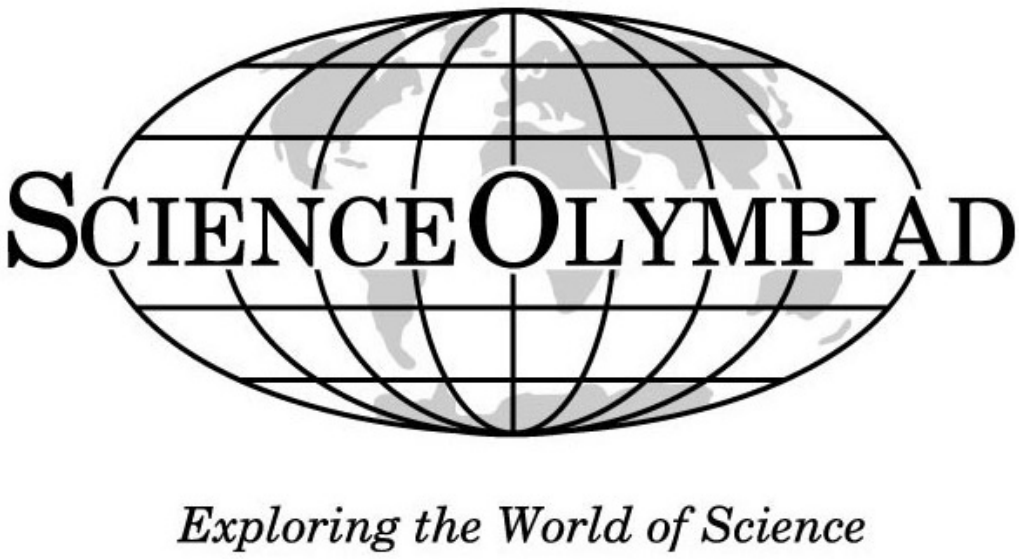
Solar System B

UT Invitational, Fall 2017



Competitors: _____

School Name: _____

Team Number: _____

This test contains 4 parts: matching (30 pts), picture identification (20 pts), short answer (30 pts), and the Interpretive Task™ (20 pts). As always, you'll have 50 minutes to complete the test. You may separate the pages; be sure to put your team number at the top of every page. You may use two letter-sized notes sheets. Good Luck, Have Fun! And always remember: The Eyes of Texas Are Upon You!

Page:	1	2	3	4	Total
Points:	30	20	30	20	100
Score:					

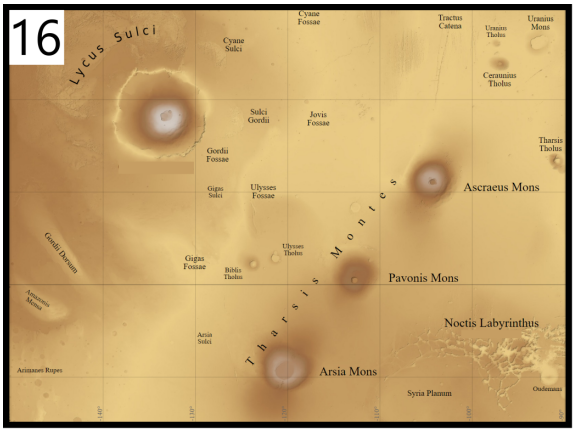
PART I: Matching. 2 points each. Each choice might be used 0, 1, or more times. (sorry! not really)

A	Olympus Mons	**B**	Maat Mons	**C**	Mars
D	Kuiper Belt	**E**	Oort Cloud	**F**	Ice
G	Batholith	**H**	Stratovolcano	**I**	Pancake dome
J	Oxygen	**K**	Pyroclastic flow	**L**	Caloris Basin
M	Carbon Dioxide	**N**	Io	**O**	Deimos
P	Phobos	**Q**	Sulfur Dioxide	**R**	Mercury
S	Areoid	**T**	Earth's moon	**U**	Antipode
V	Pluto	**W**	Tharsis	**X**	Valles Marineris
Y	Asteroid Belt	**Z**	None of the above		

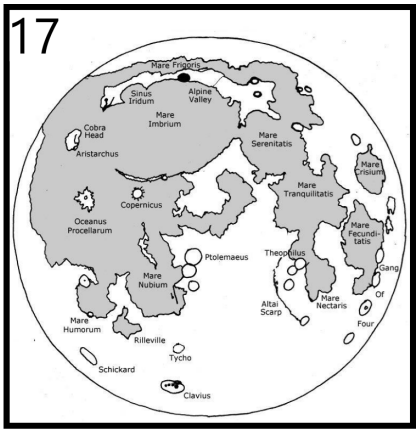
1. **R** An example of an *inferior planet* (relative to Earth).
2. **M** The main chemical component of the Venusian atmosphere.
3. **E** The region of the solar system where most comets originate.
4. **B** The tallest volcano on Earth's sister planet.
5. **N** The most volcanically active body in the solar system.
6. **I** A type of Venusian volcanic structure that is not present on Earth.
7. **Q** The main chemical component of the Ionian atmosphere.
8. **F** High radar reflection at Mercury's poles suggests the presence of:
9. **Z** A planet colored red due to the presence of copper oxide.
10. **R** A planet whose year is half as long as its day.
11. **R** A planet whose craters are named after famous artists.
12. **S** The zero-elevation reference level on Mars.
13. **X** The landform that suggested that Mars might have two tectonic plates.
14. **D** The region of the solar system that hosts Pluto.
15. **O** The smaller of Mars's moons.

PART II: Identification. 4 points each. Identify which planet or moon each of these images represents.

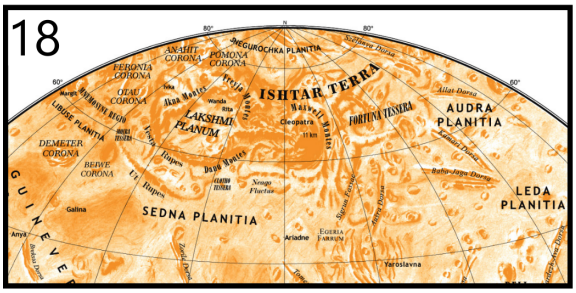
16.



17.



18.



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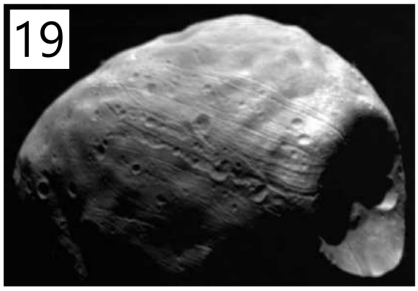
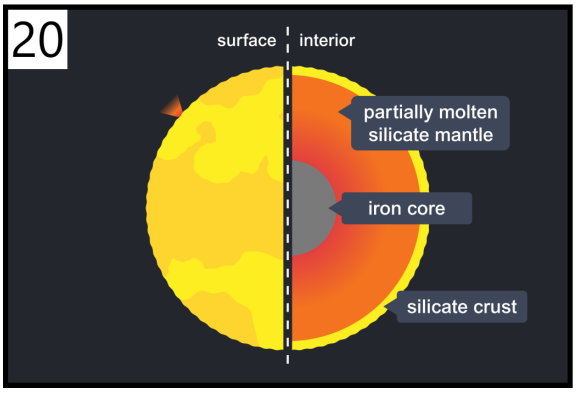


20.



16. **Mars**

17. **Moon**

18. **Venus**

19. **Phobos**

20. **Io**

PART III: Short Answer.

21. (15 points) Explain the Giant-Impact Hypothesis for the formation of the moon. What do we think happened? When do we think it happened? What are some pieces of supporting evidence?

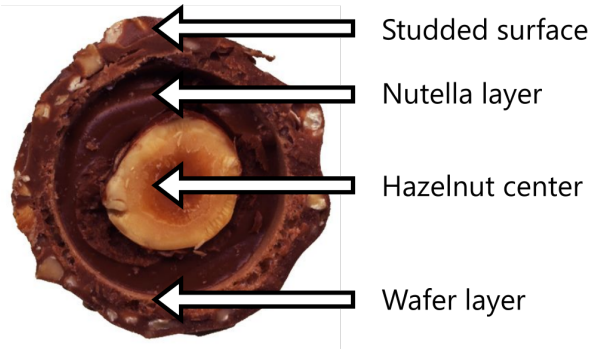
Solution: (Shamelessly copied from Wikipedia) (Maximum 15 pts) The Moon formed from the coalesced debris left over from a collision between Earth and another protoplanetary body **(+4)** about the size of Mars **(+1)** named Theia **(+1)**. This collision would have significantly increased the mass and angular momentum of the earth **(+2)**. The collision probably happened about 4.4 bya **(+3)**, which is during the Hadean eon **(+1)**. Supporting evidence includes: similar orientation between Earth's spin and Moon's orbit **(+2)**; Moon samples indicate a once-molten surface **(+2)**; Moon has a relatively small iron core **(+1)**; Moon has lower density than Earth **(+1)**; identical isotope ratios in lunar and terrestrial rock **(+2)**.

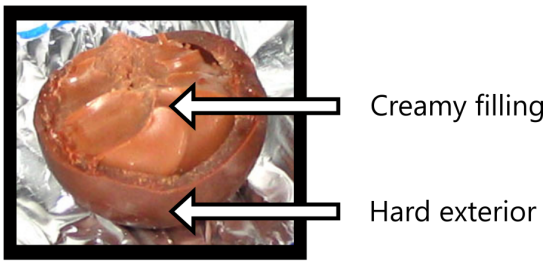
22. (15 points) Explain, with some detail, the favored hypothesis for the formation of Mercury's "Weird Terrain."

Solution: (Shamelessly copied from Wikipedia) (Maximum 15 pts) At the antipode of the Caloris Basin is a large region of unusual, hilly terrain known as the "Weird Terrain" **(+5)**. One hypothesis for its origin is that shock waves generated during the Caloris impact traveled around Mercury, converging at the basin's antipode **(+5)**. The resulting high stresses fractured the surface **(+5)**. Alternatively, it has been suggested that this terrain formed as a result of the convergence of ejecta at this basin's antipode **(+5)**.

PART IV: Interpretive Task™.

23. (20 points) Ferrero Rocher and Lindor Truffles are two types of spherical chocolates. The main structure of the Ferrero Rocher is a spherical wafer which is filled with Nutella and a whole hazelnut in the center. The wafer is surrounded by a layer of chocolate studded with crushed hazelnuts. On the other hand, Lindor truffles have two components: a hard, smooth chocolate exterior, and a creamy, liquid chocolate interior. The diagrams for both are shown below. Under each picture, compare contrast the internal and external structure of that chocolate with the structure of Io. You can make a bullet list of the similarities and differences for brevity. HINT: Discuss the composition, consistency, and relative sizes of the layers in Io and the chocolates.





Solution: (Maximum 20 points) Sample solutions (others can be accepted).

Ferrero Rocher:

- The surface of a Ferrero Rocher is "mountainous"; similarly, the surface of Io has many large mountains and active volcanoes. **(3)** However, unlike the continuous roughness of FR, the surface of Io is mostly smooth apart from the sparse mountain ranges. **(3)**
- Both have a large core; Io's core is up to 1/3 the radius of the moon, and the hazelnut core is similarly large compared to the chocolate. **(3)** However, while the hazelnut is solid, Io's core is thought to be liquid/molten iron (or iron sulfide). **(3)**
- Both have a thick "mantle" layer that stretches from the core to the outer solid layer (ultramafic mantle vs. Nutella) **(3)**
- Both have a relatively thin intermediary layer between the surface and the mantle (wafer layer vs. aesthenosphere) **(3)** However, while the wafer is solid, the aesthenosphere is molten. **(3)**

Lindor Truffle:

- The Lindor only has a outer layer and an inner region, while Io has multiple layers. **(3)**
- The smooth surface of the Lindor is similar to the generally smooth surface of Io, due to volcanic activity. **(3)**