

Solar System B

2015 Katy Regional Tournament



Names: _____

School: _____

Team Number: _____

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Section 1: Matching

A. Write the letter of the body on which each feature is located. Some bodies (labeled A-G) will be used more than once.

1. Ruach and Tuolena Planitia
2. Malun Crater
3. Alexandria Sulcus
4. Delphi Flexus
5. Labtayt Sulcus
6. Cantaloupe Terrain
7. Kraken Mare
8. Equatorial Glaciers
9. Conamara Chaos
10. Piazzzi Bright Spot
11. Roncevaux Terra
12. Hellas Planitia
13. Jingpo Lacus
14. Thera and Thrace Macula
15. Plumes (put down all applicable answers, hint: should be 3)

- A. Mars
- B. Europa
- C. Enceladus
- D. Iapetus
- E. Triton
- F. Ceres
- G. Titan

B. Write the letter of the mission each description describes. It can include unique discoveries, instruments, mission objectives, etc. Missions/people will be used more than once and there may be extras. You do not need to provide anything more specific, such as discovery date or instrument used to discover it.

16. Discovered plumes on Enceladus
17. Discovered plumes on Europa using ultraviolet spectra
18. Evidence of water flow in Gale Crater
19. Landed on Titan, was a part of a larger mission
20. First man-made object to land on a comet
Hint: this happened very recently
21. Planned asteroid sample and return mission
(from asteroid 101955 Bennu) planned for 2016
22. Discovered permafrost near the north pole of Mars
23. Current ESA mission in orbit around Mars
24. (Going to be) the first spacecraft to ever fly by Pluto.
25. Has VIR and GRaND instruments used to study properties of asteroids
26. Has two instruments named Ralph and Alice
27. First successful mission to Mars by an Asian country
28. Discovered Titan

- A. Cassini
- B. Curiosity Rover
- C. Phoenix Lander
- D. Huygens Probe
- E. Dawn
- F. Mars Express
- G. HST
- H. Philae
- I. OSIRIS-REx
- J. New Horizons
- K. MOM
- L. MAVEN
- M. William Herschel
- N. Voyager 2
- O. Christiaan Huygens

Section 2: Short Answer

You do not need complete sentences/perfect grammar, but make sure that your idea/answer is clear to me.

For some of these questions, especially in Section B, a phase diagram may be helpful. If you do not have a phase diagram on your notes or in your head, you can ask me for one, but it will come at a penalty of 2 points. You can only use this loaned phase diagram right in front of me.

All questions are 2 pts. Partial credit will be given for #40 (a through d will each be 0.5 pts) but it is all-or-nothing for #30

A. SSBs

- 29. What is the difference between a Near Earth Object (NEO) and a Main Belt Comet (MBC)?
- 30. According to the IAU, what must an object be in order to be a planet?
- 31. Expanding on #30, why is Pluto not a planet?
- 32. What is thought to be the origin of long-period comets?
- 33. What is VP 113?
- 34. Name all 5 dwarf planets recognized by the IAU

B. Phase Diagrams of Water and Carbon Dioxide

- 35. It is very difficult for water to exist on Mars. Why?
- 36. Is the majority of the water in the solar system in liquid, gas, or solid form?
- 37. In Denver, Colorado, the station pressure there is ~0.85 atm. In comparison to water at 1 atm, would the boiling point of water increase or decrease, and what would the new boiling point be?
- 38. What state of matter would carbon dioxide be in when water is at its triple point?
- 39. What is the difference between amorphous and crystalline ice?
- 40.
 - a) What instrument on Galileo mapped ice on Castillo, Ganymede, and Europa?
 - b) Does Castillo have mainly crystalline or amorphous ice?
 - c) Does Ganymede have mainly crystalline or amorphous ice?
 - d) Does Europa have mainly crystalline or amorphous ice?

C. True/False

- 41. Mars had water at one point in its history
- 42. Titan is the largest moon in the solar system
- 43. Enceladus is a moon of Jupiter
- 44. MAVEN was launched in 2003 to study the outer solar system
- 45. Generally, bodies of liquid hydrocarbons on Titan are concentrated around Titan's North Pole.

Section 3: Long (Short Paragraph) Answer

#46 and #47 are 5 pts, and #48 and #49 are 20 pts.

46. Juno is a spacecraft en route to Jupiter, planned to reach there in 2016. However, the information it collects won't be that useful to scientists studying icy moons in orbit around Jupiter, such as Europa and Ganymede. Why is this the case?

47. Is the atmospheric pressure on Mars consistent throughout the year? If not, why does it change?

48. What are some of the factors that decrease and increase the likelihood of life on planets orbiting red dwarf stars? I.e., what are some characteristics about habitable planets orbiting red dwarf stars that would hinder or help the development of life?

49. Referencing #40, what causes some Galilean moons to have a higher percentage (you did not have to provide percentages in #40) of amorphous ice in comparison to other Galilean moons? I.e. what process/phenomenon, involving Jupiter, resulted in the amounts of amorphous ice being different? Hint: has to do with how close the moons are to Jupiter.

Section 4: Identification and Analysis

All questions in Part A are 1 pt. All questions in Part B are 3 pts, with the sole exception of #104.

A. To be used in conjunction with Image Set A

Refer to Image A for questions 54-58

50. What moon is it?

51. What planet does this moon orbit?

52. What does the blue-green color signify?

53. What instrument on which spacecraft took this picture?

54. Are the plumes on this object more active when it is farther from the planet (apocenter) it orbits or when it is closer (pericenter)?

Refer to Image B for questions 59-64

55. What moon is this?

56. What planet does this moon orbit?

57. In this picture, would the dark or light material be hotter?

58. Give one theory as to why this dark material is on this moon

59. What is the largest crater on this moon?

60. What image shows this crater?

Refer to Image C for questions 65-73

61. What feature is shown?

62. What body is it on? Hint: it has a subsurface ocean

63. How is this feature formed?

64. What does this suggest about the interaction between the surface of this object and its subsurface ocean?

65. Name one other surface feature on this body that is in the rules

66. True or false: This is a false color image.

67. What do the reddish-brown areas represent?

68. What do the bright white areas represent?

69. What do the bluish areas represent?

70. What spacecraft obtained this image?

71. What image(s) show(s) a crater on the surface of this body?

72. Why are craters rare on this body?

Refer to Image H for questions 73-75

73. What event is shown in this picture?

74. What year this did happen?

75. What did this tell scientists about Jupiter's atmosphere?

Refer to Image I for questions 76-78

- 76. What feature is this?
- 77. What planet is this on?
- 78. What instrument(s) on which spacecraft help(s) estimate the volume of these?

Refer to Image J for questions

- 79. What object is this (name)?
- 80. Where in the solar system is it located (e.g. Oort Cloud, Kuiper Belt, Asteroid Belt, Inner Solar System, Outer Solar System, etc.)
- 81. What spacecraft recently visited this object?
- 82. What is this spacecraft's next destination, which it will reach later this year?

Refer to Image K for questions 76-80

- 83. What moon is this?
- 84. What planet does it orbit?
- 85. What is special about the orbit of this object?
- 86. What surface feature (not terrain) is shown here?
- 87. What terrain is shown here?

Refer to Image L for questions

- 88. What type of object is this?
- 89. What is the name of this object?
- 90. What spacecraft took this picture?

Refer to Image M for questions 81-84

- 91. What body is this on?
- 92. What other image shows an image of this body?
- 93. What phenomenon/thing does this other image show?
- 94. What probe landed on this object in 2005?

B. To be used in conjunction with Image Set B

Refer to Image AA for questions 95-97.

- 95. What body is this on and where on the body is it located?
- 96. What do the different colors mean? (hint: it is showing a deposit of something)
- 97. What instrument on which spacecraft took this picture?

Refer to Image BB for questions 98-101. It is a picture of Enceladus's plumes

- 98. This picture was taken in visible light with the Cassini narrow angle camera. Why does it look the way it does?
- 99. What is the band shown in the background?
- 100. What does this picture tell scientists about the relationship between the band pictured and Enceladus?
- 101. Why does this happen with Enceladus but not another moon with plumes like Europa?

Refer to Image CC for questions 102-104

- 102. What is this picture showing?
- 103. What did this help discover?
- 104. How was this discovered (what process, instruments, etc)? This question is worth 10 points as opposed to 3.