Mission 1
Project Profile

Welcome to the SET1 team! In ***Life: Here? There? Elsewhere? The Search for Life on Venus and Mars*** you will be learning how to conduct a search for life on Venus and Mars. To accomplish your missions, you will undertake 14 missions to learn about life on Earth and about the planets Venus and Mars. It may be useful for you to jot down your initial impressions and responses to the following questions before starting the missions. Do you think your ideas will change?

Mission 1: Comparative Planetology

Can you find evidence of life on Earth, Mars, and Venus? What are these planets like?

Mission 2: There's Power in Numbers! (Phase I)

What is the effect of scale? Can you tell if a planet has life on it by looking at the entire planet? Can you tell if a planet has life on it by looking at microscopic samples of its soil?

Mission 3: Venus Plates and Mars Jars! (Phase I)

Can life as we know it survive in the conditions found on Mars and Venus today?

Mission 4: There's Power in Numbers! (Phase 11)

What would Mars and Venus look like at different scales? Would you recognize life at different scales?

Mission 5: Initial Spacecraft and Lander Design

What are the major components of a spacecraft and lander designed to search for life on another planet? How are the landing site characteristics incorporated into the design?

Mission 6: Venus Plates and Mars Jars! (Phase 11)

Did our terrestrial life survive through hostile environmental conditions similar to those on Venus and Mars?

Mission 7: Water!

How can you tell if a liquid on another planet is water? Why would you want to know?

Mission 8: What Is Life?

What are the main characteristics of life? How can you tell when something is not alive?

Mission 9: Mission to Planet Earth-Life in Soil!

Is it possible to detect life in a soil sample from Earth or from another planet? How?

Mission 10: Chemical Tests for Life

How can you test for the chemicals that indicate life?

Mission 11: Mission to Planet Earth-Life Trap!

Is it possible to detect life in a planet's atmosphere? How?

Mission 12: Can You "Gas" What's Happening?

Can you test for the presence of life by analyzing a soil sample's release of gases?

Mission 13: The Viking Search for Life on Mars

What was found by the Viking spacecraft during its search for life on Mars? Are any of the tests that were conducted by this spacecraft similar to the tests that you have conducted in your missions?

Mission 14: Final Spacecraft and Lander Design

How would you design a spacecraft and lander to detect life on another planet?

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Looking for Life—Worksheet

Name: _____ Date: _____

Please answer the following questions:

Earth

1. n the images of Earth, did you see any environmental features that could support life as we know it? Describe these environmental features.

2. In the images of Earth, did you see any features that could only have been created by life? What else could account for these features?

Mars

3. In the images of Mars, did you see any environmental features that could support life as we know it? Describe these environmental features.

4. In the images of Mars, did you see any features that could have been created by life? What else could account for these features?

Venus

5. In the images of Venus, did you see any environmental features that could support life as we know it? Describe these environmental features.

6. In the images of Venus, did you see any features that could have been created by life? What else could account for these features?

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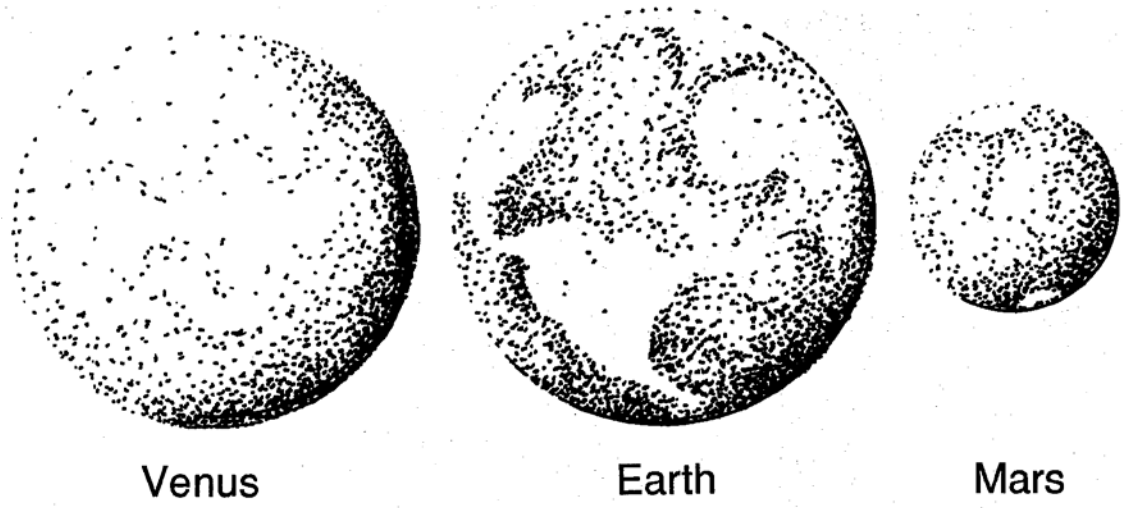
Comparing the Planets--Transparency

Figure 1.2-Mars, Venus, and Earth.



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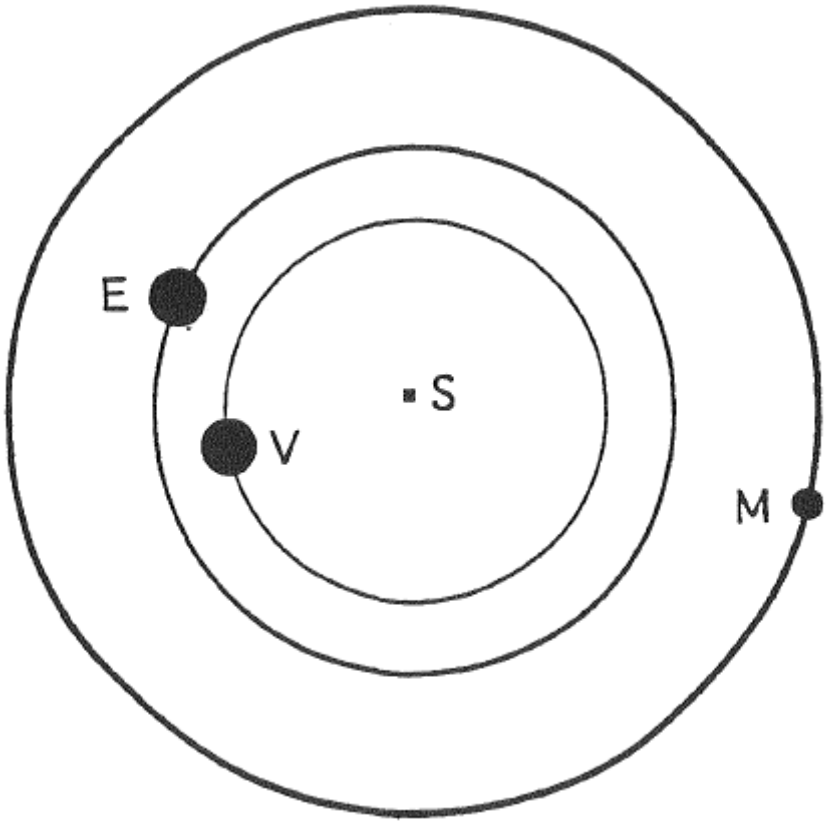
Orbital Model—Transparency

Figure 1.3—Orbital Model



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Creating an Orbital Model—Directions

Making the Planets

1. Split your clay into two equal balls. Choose one of these balls to be your first planet and set it aside.

2. Divide the other ball into seven smaller balls of equal size. Select one of these smaller balls to be your second planet and set it aside.

3. Combine the remaining six small balls to form your third planet.

4. Determine which planet is Earth, which is Venus, and which is Mars. Check with your teacher to make sure you are correct. Mark the surface of each planet with the letter V, E, or M.

Making and Using an Orbital Model

1. Cut (or make sure you have) strings of the following lengths: .72 meters, to represent a scale average distance from Venus to the Sun; 1 meter, to represent a scale average distance from Earth to the Sun, and 1.52 meters, to represent a scale average distance from Mars to the Sun. These lengths represent the average distance between the Sun and the planet in the orbits of Venus, Earth, and Mars, respectively.

2. Tack the end of each string into its appropriate planet. Tie together the ends of the three strings.

3. Tack the knot where the strings are tied together to a piece of cardboard. This knot represents the Sun.

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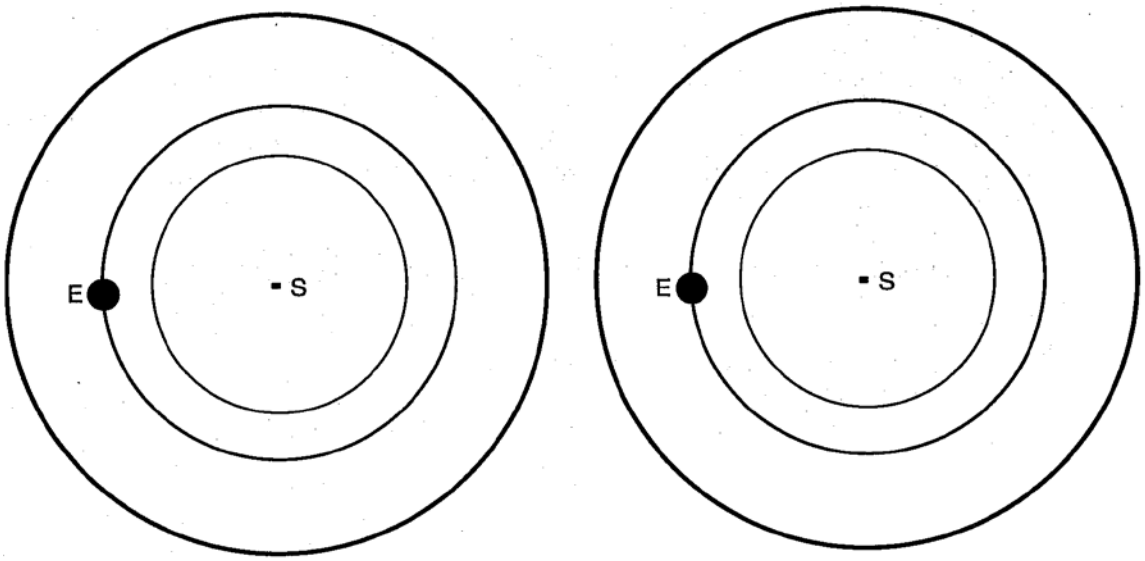
Creating an Orbital Model—Directions

Name: _____ Date: _____

Note: When using your orbital model to make calculations, move the planets counterclockwise in their orbits, keeping the strings tight. When measuring distances, measure from the center of each planet.

1. On one of the blank orbital pictures below, add Venus and Mars to their orbital paths as close as possible to Earth. Label Venus with the letter V and Mars with the letter ***M.*** On the remaining blank orbital picture below, add Venus and Mars to their orbital paths as far as possible from Earth. Label the planets again.

Figure 1.4—Orbital Model.



2. If 1 meter on your orbital model represents 150 million actual kilometers, what is the shortest distance that can occur between

Earth and Venus?

Earth and Mars?

3. What is the greatest distance that can occur between

Earth and Venus?

Earth and Mars?

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Planet Attribute Cards

Earth

Gravity (Earth = 1): 1
Average Distance from Sun (million km): 150
Average Distance from Sun (AU): 1
Year Length: 365.26 days
Day Length: 23 hr., 56 min., 43 sec.
Axis Tilt: 23^{o} 27'
Diameter at Equator (km): 12,756
Volume (Earth = 1): 1
Main Components of Atmosphere: Nitrogen, Oxygen
Atmospheric Pressure (Earth = 1): 1
Known Natural Satellites: 1

Mars

Gravity (Earth = 1): 0.38
Average Distance from Sun (million km): 228
Average Distance from Sun (AU): 1.524
Year Length: 6,787 days
Day Length: 24 hr., 37 min., 23 sec.
Axis Tilt: 23^{o} 59'
Diameter at Equator (km): 6,787
Volume (Earth = 1): 0.15
Main Components of Atmosphere: Carbon Dioxide
Atmospheric Pressure (Earth = 1): 0.006
Known Natural Satellites: 2

Venus

Gravity (Earth = 1): 0.9
Average Distance from Sun (million km): 108
Average Distance from Sun (AU): 0.723
Year Length: 224.7 days
Day Length: 243 days (retrograde).
Axis Tilt: 3^{o}
Diameter at Equator (km): 12,104
Volume (Earth = 1): .86
Main Components of Atmosphere: Carbon Dioxide
Atmospheric Pressure (Earth = 1): 90
Known Natural Satellites: 0

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Blank Planet Attribute Cards

Planet: ______________
Gravity (Earth = 1):
Average Distance from Sun (million km):
Average Distance from Sun (AU):
Year Length:
Day Length: .
Axis Tilt:
Diameter at Equator (km):
Volume (Earth = 1): .
Main Components of Atmosphere:
Atmospheric Pressure (Earth = 1):
Known Natural Satellites:

Planet: ______________
Gravity (Earth = 1):
Average Distance from Sun (million km):
Average Distance from Sun (AU):
Year Length:
Day Length: .
Axis Tilt:
Diameter at Equator (km):
Volume (Earth = 1): .
Main Components of Atmosphere:
Atmospheric Pressure (Earth = 1):
Known Natural Satellites:

Planet: ______________
Gravity (Earth = 1):
Average Distance from Sun (million km):
Average Distance from Sun (AU):
Year Length:
Day Length: .
Axis Tilt:
Diameter at Equator (km):
Volume (Earth = 1): .
Main Components of Atmosphere:
Atmospheric Pressure (Earth = 1):
Known Natural Satellites:

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Attributes of the Planets-Optional Worksheet

Name: _____ Date: _____

Describe each of the following planets as completely as you can. Use information from the video image show, from your orbital model, and from the "Planet Attribute Cards." Note anything that would make each planet either suitable or unsuitable for life as we know it.

Earth:

Mars:

Venus: