

Phases of Venus - Exercise

Student Name: _____

Step 1.

- A. Start Stellarium. It should be in the default configuration you setup in the Using Stellarium exercise. You should be viewing to your South and set the program to full screen.
- B. Use the Date/Time Window to set the date to 2010/1/10 and the time to 17:00:00 Local Time and leave the Date/Time Window in the upper right hand corner of the screen. Set the FOV to between 30° and 35° .
- C. Move the horizon until the West compass mark is in the lower right corner of the screen. Keep the horizon low on the screen. You are now facing Southwest just prior to sunset during a Superior Conjunction of Venus and therefore Venus is in a Full Phase (Venus appears very close to the Sun).
- D. Now use the Search Window to locate Venus and center it.
- E. Now turn off the atmosphere and the landscape.

Step 2.

- F. Zoom into to a FOV of about 0.03° . You can see that, viewed from Earth, Venus is fully illuminated.
- G. Use the Date/Time Window to advance the date by four months. Leave the Window up in the upper right corner.

- **Question 1:** What is the general phase of Venus at this point?

- **Question 2:** If you noticed any other change(s) in Venus' appearance, describe it/them.

- H. Advance the time by five months. You should be at 2010/10/10.

- **Question 3:** What is the general phase of Venus at this point?

- **Question 4:** You should now notice a significant change in Venus' appearance, can you describe it?

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- **Question 5:** Can you explain why this change in appearance has taken place?
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I. Continue to advance the time in one month intervals until Venus is in Full Phase.

- **Question 6:** How many months have you advanced since you started the exercise? _____

- **Question 7:** What is this time in years (divide the number of months by 12 to get decimal years)?

- **Question 8:** What is this time in days (multiply the number of decimal years by 365.25 to get decimal days)?

- **Question 9:** Is this the Orbital Period, or the Synodic Period?

Step 3.

- J. Use the Date/Time Window to reset the date to 2010/1/10 and the time to 17:00:00.
- K. Using the Location Window, set the value for "Planet:" to "Solar System Observer". You are now looking down on the plane of the Ecliptic. From here we can observe the orbits of the inner planets.
- L. Use the Sky and Viewing Window to check "Show Planet Orbits."
- M. Use the Search Window to select and center the Sun. Zoom out to about 3° FOV.
- N. Note the current position of Venus relative to the Sun.

- **Question 10:** What is the term for the currently set relationship between the Earth, Sun and Venus?

- O. Now use the Date/Time Window to advance the date by one month.
 P. Notice that as you advance the time, that all the planets move, not just Venus.
 Q. Now continue to advance the date in one month increments until the Sun, Earth and Venus are once again close to alignment.

- **Question 11:** What is the term for the currently set relationship between the Earth, Sun and Venus?

- **Question 12:** About how many months did you advance to get to this configuration?

R. Use the Date/Time Window to reset the date to 2010/1/10 and the time to 17:00:00.

S. Again, note the position of Venus.

T. Advance the date in one month increments until Venus returns to a point close to the same location (relative to the Sun), but just past.

U. Now backup one month.

- **Question 13:** About how many months did you advance to get to this configuration? (it will be between two months, so just use the half month in between, e.g. between 1 and 2 would be 1.5 months, etc.)

- **Question 14:** How many years (in decimal) did it take for this period (divide the number of months you got by 12)?

Step 4.

V. Using the actual values for Venus:

- Orbital = 0.62 years
- Synodic = 583.92 days

and using Equation 1. to calculate % error.

- **Question 15:** What is your percent error for the Orbital period?

- **Question 16:** What is your percent error for the Synodic period?

$$\%Error = ((Measured\ value - Actual\ value)/Actual\ value) \times 100\%$$

Equation 1.