Q1: When do you see the waxing crescent moon at its highest point in the sky?

Q2: When do you see the new moon at its highest point in the sky?

Q3: Is the (tidally locked) moon's terminator (relatively) fixed?

Q4: If Venus has an orbital eccentricity of e=0.00677 and a semi-major axis of 0.723 AU, what is its perihelion?

Q5: What is Venus' aphelion?

Q6: Imagine you are observing the Earth from Venus. What would you observe the Earth's synodic period to be?

Q7: A satellite is in a geosynchronous orbit about Earth – its orbital period is exactly 24 hr. Using Kepler's Laws, what is the distance from Earth's surface?

Q8: If the satellite appears stationary to an Earth-bound observer, what is the orientation of the satellite's orbital plane?

Q9: Suppose that a tenth planet was discovered in our Solar System with a perihelion distance of 80 AU and an aphelion distance of 100 AU. Find the eccentricity and semi-major axis.

Q10: What is the sidereal period of its orbit in years?

Q11: Suppose tonight is new Moon and you are a Space X employee working on the side of the Moon facing the Earth. What Earth phase do you see?

a. You can't see the Earth because it is eclipsed by the Sun.
b. new Earth
c. first quarter Earth
d. full Earth
e. third quarter Earth

Q12: As seen from the Moon, how often does the Sun rise?

a. never
b. every ~24 hours
c. ~once per week
d. ~once per month
e. ~once per year

Gravity Calculation & Simulation challenge

Derive the speed necessary for a circular orbit.

Start the PhET simulation "My Solar System". Select "Show Traces" and "Show Grid".

Set to the following initial conditions:
m1=500, x1=0, y1=0, vx1=0, vy2=0
m2=0.001, x2=100, y2=0, vx2=0
Experiment to find the value of vy2 that yields a circular orbit.

Theoretically compute vy2 if x2=200. Check your prediction using the simulator.

Orbital dynamics clip from The Martian