Solar System Data

Celestial Object	Mean Distance from Sun (million km)	Period of Revolution (d=days) (y=years)	Period of Rotation at Equator	Eccentricity of Orbit	Equatorial Diameter (km)	Mass (Earth = 1)	Density (g/cm^3)
SUN	—	—	27 d	—	1,392,000	333,000.00	1.4
MERCURY	57.9	88 d	59 d	0.206	4,879	0.06	5.4
VENUS	108.2	224.7 d	243 d	0.007	12,104	0.82	5.2
EARTH	149.6	365.26 d	23 h 56 min 4 s	0.017	12,756	1.00	5.5
MARS	227.9	687 d	24 h 37 min 23 s	0.093	6,794	0.11	3.9
JUPITER	778.4	11.9 y	9 h 50 min 30 s	0.048	142,984	317.83	1.3
SATURN	1,426.7	29.5 y	10 h 14 min	0.054	120,536	95.16	0.7
URANUS	2,871.0	84.0 y	17 h 14 min	0.047	51,118	14.54	1.3
NEPTUNE	4,498.3	164.8 y	16 h	0.009	49,528	17.15	1.8
EARTH'S MOON	149.6 (0.386 from Earth)	27.3 d	27.3 d	0.055	3,476	0.01	3.3

Overview:

Our solar system is mostly empty space. However, in the center of this "seemingly empty space" is the most massive body in our solar system - Our Sun, containing over 99% of the total mass of our solar system. Due to its large mass, all objects in our solar system are controlled by the gravitational attraction of the Sun. These objects consist of planets, asteroids, comets, dust, and other numerous small objects all revolving around the Sun. But, "What about Pluto?" It has been kicked out of the planet family and demoted to the dwarf planet classification. I hope Pluto doesn't take this too seriously and give us the cold shoulder (around –230°C) and starts looking for another solar system to be accepted. At least teachers can no longer ask students, "What planet is sometimes the 9th planet and sometimes the 8th planet?"

The Chart:

The measurements, numbers, etc. are obvious, but let me point out some information that might be less obvious. The Period of Revolution column shows that the farther a planet is from the Sun, the longer the period of revolution is for that planet. This is because the Sun's gravitational attraction decreases as the distance from the Sun increases. The Period of Rotation column shows the length of the planet's day. Notice that Jupiter has the shortest period of rotation, making its day just under ten hours, while Venus has the longest day of any planet. In fact, Venus' period of rotation is longer than its period of revolution, which makes Venus' day longer than its year. The Eccentricity column is extensively covered by the Eccentricity Equation section within this book. For a quick review, the lower the eccentricity value, the more circular the orbit will be. Since all planets have an eccentricity value greater than zero, they all orbit the Sun in elliptical

orbits. For the Equatorial Diameter column, you will have to use the ratio of these diameter measurements to compare two or more diagrammed circles representing the planet's size. For example, circles representing Venus and Earth will be almost the same size, while a diagram of Mars will be half the size of the one representing the Earth. The Mass column gives the Earth's mass as 1. All other masses are compared to this standard. In the Density column an interesting fact is revealed. Saturn, one of the giant gaseous planets, has a density less than 1. This planet would float in water, assuming we can find a body of water large enough to place it in. Notice that the terrestrial planets (also known as the rocky planets), as expected, have a higher density than the Jovian planets (giant gaseous planets). The bottom row, Earth's Moon, gives information about our only natural satellite. Notice that the moon's period of revolution and period of rotation are the same. That is why we only see one side of the moon from Earth.

Additional Information:

- The asteroid belt, consisting of thousands of large rocks, is located between Mars and Jupiter.
- Venus is the hottest planet due to its dense carbon dioxide atmosphere, producing a run-away greenhouse effect.
- Planet Earth is the only known planet to have abundant liquid water on its surface.
- Perigee and Apogee – Perigee is a point in which an object in orbit has its closest approach to the body it is orbiting. Apogee is a point in which an object in orbit is farthest from the the body it is orbiting. At perigee the object will have its greatest orbital speed. At apogee the orbiting object will have its slowest orbital speed.
- The apparent diameter is the size of the celestrial object as seen from the Earth. Its size appears to change as its orbital distance from the Earth increases or decreases. This is very evident by an apparently large full moon when it is in its perigee position.
- In the geocentric model of our solar system, all celestrial objects revolved around the non-rotating Earth.
- In the heliocentric model of our solar system, all celestrial objects revolve around the Sun.

Set 1 — Solar System Data

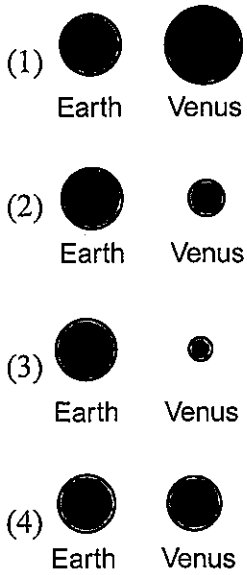
1. Which planet is approximately 20 times farther from the Sun than Earth is?

   (1) Jupiter (3) Uranus
   (2) Saturn (4) Neptune 1 _____

2. Which planet would float if it could be placed in water?

   (1) Mercury (3) Saturn
   (2) Earth (4) Jupiter 2 _____

3. Which scale diagram best compares the size of Earth with the size of Venus?



3 _____

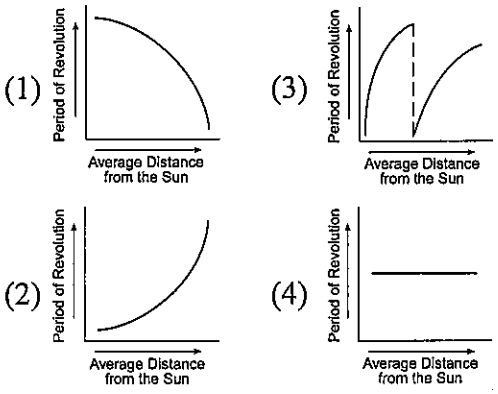
4. Which planet's orbit around the Sun is most nearly circular?

   (1) Mercury (3) Earth
   (2) Neptune (4) Venus 4 _____

5. How do Jupiter's density and period of rotation compare to Earth's?

   (1) Jupiter is less dense and has a longer period of rotation.
   (2) Jupiter is less dense and has a shorter period of rotation.
   (3) Jupiter is more dense and has a longer period of rotation.
   (4) Jupiter is more dense and has a shorter period of rotation. 5 _____

6. Which graph best represents the relationship between a planet's average distance from the Sun and the time the planet takes to revolve around the Sun?



6 _____

7. Terrestrial planets move more rapidly in their orbits than the Jovian planets because terrestrial planets are

   (1) rotating on a tilted axis
   (2) more dense
   (3) more massive
   (4) closer to the Sun 7 _____

8. Which of the following planets has the lowest average density?

(1) Mercury (3) Earth
(2) Venus (4) Mars 8 _____

9. Which statement correctly compares the size, composition, and density of Neptune to Earth?

(1) Neptune is smaller, more gaseous, and less dense.
(2) Neptune is larger, more gaseous, and less dense.
(3) Neptune is smaller, more solid, and more dense.
(4) Neptune is larger, more solid, and more dense. 9 _____

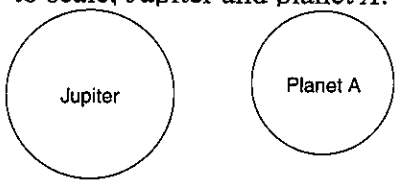
10. Compared to Mars, Mercury moves more rapidly in its orbit because Mercury

(1) is larger
(2) is more dense
(3) is closer to the Sun
(4) has a more elliptical orbit 10 _____

11. The planets known as "gas giants" include Jupiter, Uranus, and

(1) Venus (3) Mars
(2) Saturn (4) Earth 11 _____

12. The diagram below represents two planets in our solar system drawn to scale, Jupiter and planet *A*.



Planet *A* most likely represents

(1) Earth (3) Saturn
(2) Venus (4) Uranus 12 _____

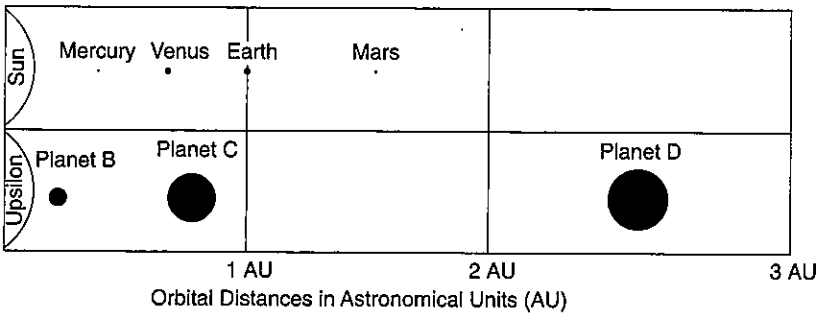
13. The same side of the Moon always faces Earth because the

(1) Moon's period of rotation is longer than its period of revolution around Earth
(2) Moon's period of rotation is shorter than its period of revolution around Earth
(3) Moon rotates once as it completes one revolution around Earth
(4) Moon does not rotate as it completes one revolution around Earth 13 _____

14. Planet *D*'s diameter is 10 times greater than Earth's diameter.

What planet in our solar system has a diameter closest in size to the diameter of planet *D*?

_____



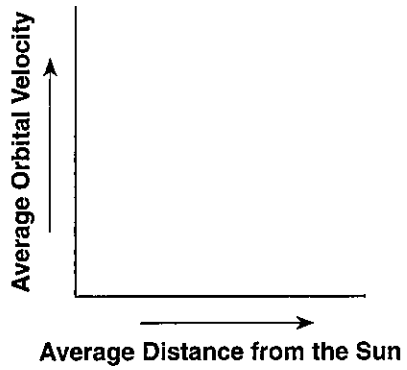
15. Why does Planet *B* revolve faster than Planet *C*? _____

Base your answers to question 16 on the accompanying data table, which shows the average distance from the Sun, the average surface temperature, and the average orbital velocity for each planet in our solar system.

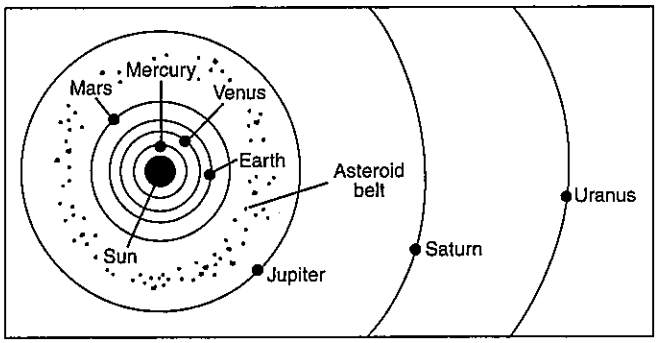
Data Table

Planet	Average Distance from Sun (millions of km)	Average Surface Temperature (°C)	Average Orbital Velocity (km/sec)
Mercury	58	167	47.9
Venus	108	457	35.0
Earth	150	14	29.8
Mars	228	–55	24.1
Jupiter	778	–153	13.1
Saturn	1427	–185	9.7
Uranus	2869	–214	6.8
Neptune	4496	–225	5.4

16. On the graph below, draw a line to indicate the general relationship between a planet's average distance from the Sun and its average orbital velocity.



Base your answer to question 17 on the accompanying diagram. This diagram shows a portion of the solar system.



(Not drawn to scale)

17. What is the average distance, in millions of kilometers, from the Sun to the asteriod belt? _____

Base your answers to questions 18*a* and *b* on the accompanying data table, which provides information about four of Jupiter's moons.

Data Table

Moons of Jupiter	Density (g/cm^3)	Diameter (km)	Distance from Jupiter (km)
Io	3.5	3630	421,600
Europa	3.0	3138	670,900
Ganymede	1.9	5262	1,070,000
Callisto	1.9	4800	1,883,000

18. *a*) Identify the planet in our solar system that is closest in diameter to Callisto.

_____

b) In 1610, Galileo was the first person to observe, with the aid of a telescope, these four moons orbiting Jupiter. Explain why Galileo's observation of this motion did not support the geocentric model of our solar system.

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