

INTERMEDIATE SCIENCE 9
UNIT 1: SPACE
WORKSHEET # 7: THE SOLAR SYSTEM

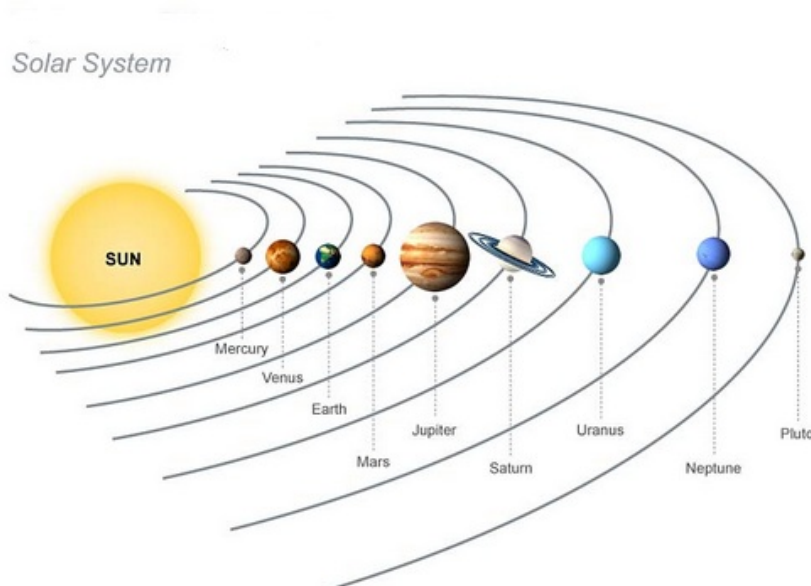


Solar System is everything that centers around the sun. That includes eight planets as well as some smaller objects such as asteroids, comets and meteoroids

Sun is the star at the center of the Solar System and is by far the most important source of energy for life on Earth

Components Of Our Solar System :

- i. the sun
- ii. terrestrial and gas planets
- iii. dwarf planets (Pluto)
- iv. comets
- v. Asteroids
- vi. meteors



Here is a method to remember the order of the planets:

My Very Excellent Mother Just Served Us Nachos

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune

Characteristics of a Planet

- Celestial bodies that orbit one or more stars
- Massive enough for its gravity to hold a spherical shape
- Massive enough (i.e. has enough gravity) to clear its orbital path of debris
- Includes Mercury, Venus, Earth, Mars, Jupiter, Uranus and Neptune

Classifying Planets:

1) Terrestrial Planets are the four innermost planets in the solar system, Mercury, Venus, Earth and Mars.

- Dense and rocky
- Closest to the sun
- Smaller orbits
- Warmer average surface temperatures (-63 C to 467 C)

2) Jovian (Jupiter-like) planets, because they are all gigantic compared with Earth, and they have a gaseous nature.

- The Jovian planets are also referred to as the gas giants,
- Includes Jupiter, Saturn, Uranus and Neptune
- Larger orbits
- Cold surface temperature
- -215 C to -150 C

3) Dwarf Planets (Pluto)

- Celestial bodies that orbit the sun with enough gravity to hold its spherical shape, but...
- They are not massive enough to clear their orbit of debris
- Example Pluto

Comparing Terrestrial Plants and Jovian Plants:

| Criteria | Terrestrial Planets (Inner) | Jovian Planets (Outer) |
|-------------------|-----------------------------------|---|
| Size | Small (all Earth size or smaller) | Large (4 to 11 times larger than Earth) |
| Motion | Slow spinning, small orbits | Faster spinning, large orbits |
| Composition | Solid and rocky | Gaseous |
| Distance from Sun | Closer | Further away |
| Temperature | Warmer, but temperatures vary | Colder, but temperatures vary |
| Density | Greater | Lesser |

TITLE: Strolling Through the Solar System.

PURPOSE: To study the relative distances between planets in the solar system.

SAFETY: Never eat anything in the science room.

MATERIALS:

- materials to model the Sun and planets: ball bearing, or similar-sized ball (~28 mm diameter), coarse and fine-grained sand, salt, cake sprinkles, and small candies or cake decorations.
- 9 index cards
- clear adhesive tape
- 9 sticks (at least 15 cm long)
- measuring tape (100 m)

PROCEDURE:

Part 1: How Do the Sizes of the Planets Compare?

1. Prepare the Sun and each planet using the dimensions shown in the table below. Use the tape to stick the material to the index cards.

| Solar System Object | Actual Diameter (km) | Scale Diameter (mm) | Model Material |
|---------------------|----------------------|---------------------|---|
| Sun | 1 400 000 | 28.00 | Ball bearing |
| Mercury | 4 900 | 0.10 | Grain of fine-grained sand |
| Venus | 12 100 | 0.24 | Grain of salt |
| Earth | 12 800 | 0.25 | Grain of salt |
| Mars | 6 800 | 0.14 | Grain of coarse-grained sand (half the salt-grain size) |
| Jupiter | 143 000 | 2.90 | Cake decoration of appropriate size |
| Saturn | 120 000 | 2.40 | Cake decoration of appropriate size |
| Uranus | 51 800 | 1.00 | Cake decoration of appropriate size |
| Neptune | 49 500 | 0.99 | Cake decoration of appropriate size |

Part 2 How Do the Distances to the Planets Compare?

- Use the tape to attach the sticks to the index cards you used for your models. You will be sticking your models in the ground.
- Take the planet models you made in Part 1 to a playing field outside. Place the model of the Sun at the goal line of the playing field. All measurements will be made from this point.
- Using the measuring tape and the table below, determine the scale distance of the objects in the solar system. Place each model in the correct position relative to the Sun. (1 m = 50 million km)

[2]

| Solar System Object | Actual Distance from Sun (km) | Scale Distance from Sun (m) | Distance from Previous Planet (m) |
|---------------------|-------------------------------|-----------------------------|-----------------------------------|
| Sun | | | |
| Mercury | 58 million | | |
| Venus | 108 million | | |
| Earth | 150 million | | |
| Mars | 228 million | | |
| Asteroid belt | ~ 400 million | | |
| Jupiter | 778 million | | |
| Saturn | 1 430 million | | |
| Uranus | 2 870 million | | |
| Neptune | 4 500 million | | |

PART A: MULTIPLE CHOICE

- What is the largest celestial body in the Solar System?
 - Jupiter
 - the Sun
 - Saturn
 - Netpune
- Which of the following is the smallest?
 - Earth
 - Universe
 - Galaxy
 - Sun
- What causes planets to orbit around the sun?
 - Comets
 - Gravity
 - Solar Radiation
 - Solar Wind
- Which two planets are out of order in this list of our solar system? The planets are listed in order of distance from the sun.

Mercury-Earth-Venus-Mars-Jupiter-Saturn-Uranus-Neptune-Pluto

 - Mercury and Earth
 - Earth and Venus
 - Saturn and Jupiter
 - Uranus and Neptune

5. Which of the following lists the planets in correct order of increasing distance from the Sun?
- (A) Pluto, Neptune, Uranus, Saturn, Jupiter, Mars, Earth, Venus, Mercury
 - (B) Saturn, Pluto, Uranus, Mercury, Neptune, Jupiter, Mars, Earth, Venus
 - (C) Earth, Venus, Mars, Jupiter, Saturn, Pluto, Uranus, Neptune, Mercury
 - (D) Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto
6. Which are characteristics of outer planets?
- (A) Large radius, made mostly of gas
 - (B) Large radius, rocky
 - (C) Small radius, made mostly of gas
 - (D) Small radius, rocky
7. The four inner planets are rocky and small. Which description best fits the next four outer planets?
- (A) They are also rocky and small.
 - (B) They are very large and made of ice.
 - (C) They are small and made of ice.
 - (D) They are very large and made of gases
8. Which of the following is not an 'Outer Planet' ?
- (A) Saturn
 - (B) Uranus
 - (C) Jupiter
 - (D) Mars
9. Which of the following is not an 'Inner Planet' ?
- (A) Mercury
 - (B) Venus
 - (C) Mars
 - (D) Jupiter
10. What is the largest planet in the solar system?
- (A) Jupiter
 - (B) Mars
 - (C) Neptune
 - (D) Saturn
11. Which of the following planets has the least mass in our solar system?
- (A) Jupiter
 - (B) Neptune
 - (C) Saturn
 - (D) Venus
12. Which of the following is a dwarf planet
- (A) Earth
 - (B) Jupiter
 - (C) Neptune
 - (D) Pluto
13. Why is Pluto considered a dwarf planet?
- (A) It does not have a spherical shape
 - (B) It orbits more than one star
 - (C) It cannot clear other objects out of its path.
 - (D) It has no mass

14. Between which two planets are asteroids mainly found ?
- (A) Earth and Mars
 - (B) Jupiter and Saturn
 - (C) Mars and Jupiter
 - (D) Saturn and Uranus
15. What is a special characteristic of Jupiter, Saturn, Neptune and Uranus?
- (A) They are planets in our solar system.
 - (B) They spin slowly.
 - (C) They revolve around the sun.
 - (D) They have rings.
16. Which planet has the most extensive ring structure?
- (A) Jupiter
 - (B) Neptune
 - (C) Pluto
 - (D) Saturn

ANALYZE:

1. The planets are typically described as inner (Mercury, Venus, Earth, and Mars) and outer (Jupiter, Saturn, Uranus, and Neptune). Based on your scale models, describe what you notice about the following:

(a) the size of the inner planets compared with the outer planets [1]

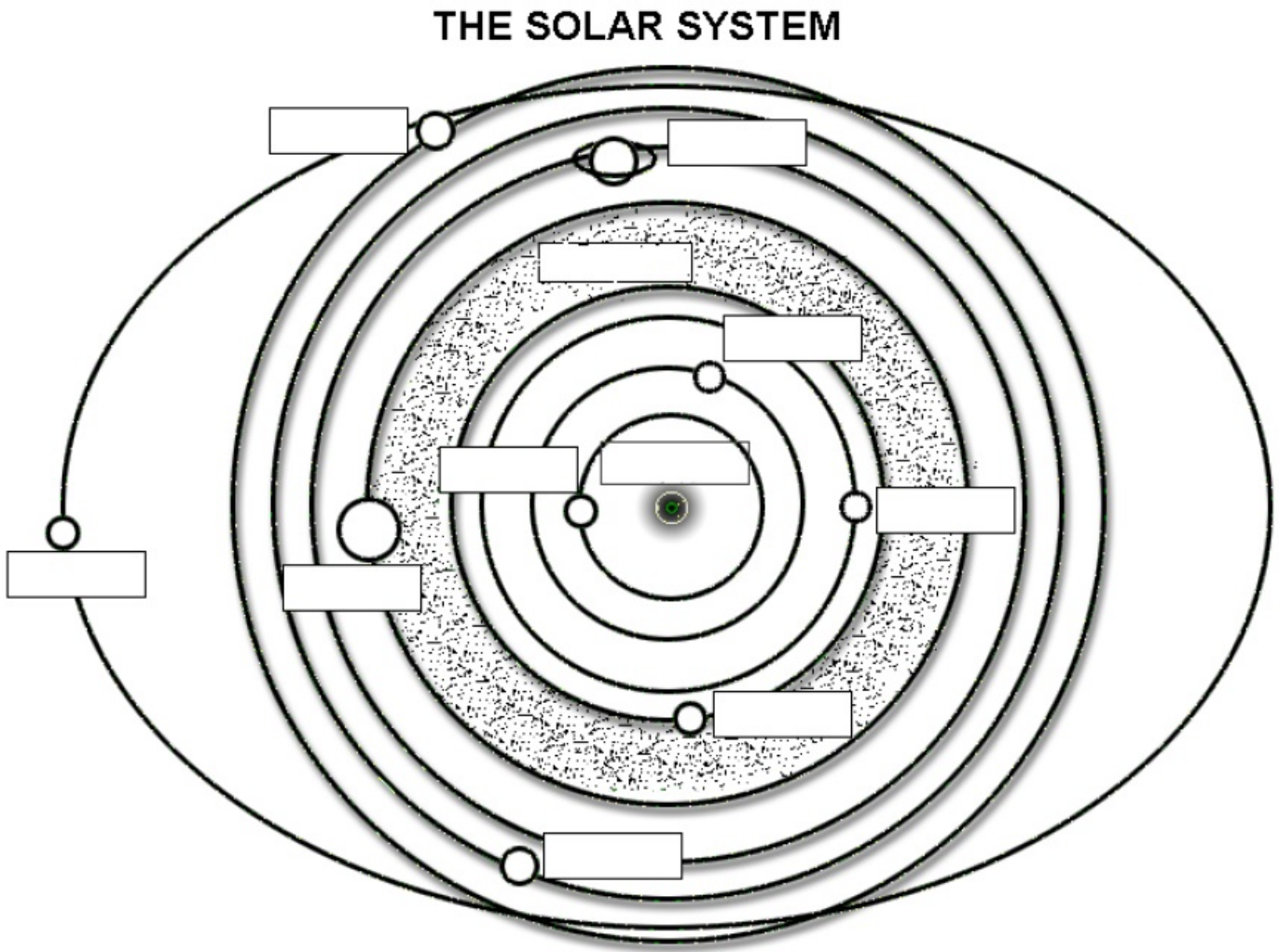
(b) the distances to the outer planets compared with the inner planets. [1]

2. Use a scale of 1 m = 50 million km to calculate the scale distance (in metres) to Proxima Centauri (the nearest star to the Sun). The real distance from the Sun to Proxima Centauri is 30 000 000 000 million km. [1]

3. Based on your scale model, explain why it seems unlikely that humans will ever journey outside the orbit of Neptune. [1]

4. Label the following diagram.

[3]



5. Arrange the planets from largest to smallest

[2]

_____ ⇒ Largest

_____ ↓

_____ ↓

_____ ↓

_____ ↓

_____ ↓

_____ ↓

_____ ⇒ Smallest