

# Exoplanets

## I. Physical Characteristics

### 1. Define the term exoplanet.

Exoplanet - planet located outside the Solar System

### 2. Identify the following regarding exoplanets. (2023)

Known Identified Exoplanets : 5,332

Known Planetary Systems : 3,931

Known Planetary Systems With More Than 1 Exoplanet : 855

3. Most discovered exoplanets are gas giants that are the size of Jupiter or larger.

### 4. Define the term rogue planet.

Rogue Planet - planets not gravitationally bound by a star system

## II. Types Of Exoplanets

### 1. Identify examples of each type of exoplanet. (2023)

Exoplanet in a Sun-sized habitable zone : Kepler-22b

Closest exoplanet to Earth : Proxima Centauri b

Smallest discovered exoplanet : Kepler-20e

Largest discovered exoplanet : TrES-4

Exoplanet in a quadruple star system : 30 Arietis

## III. The Search For Life

### 1. What is the main motivation for discovering exoplanets?

- Search for extraterrestrial life

### 2. Define the term Goldilocks Zone.

Goldilocks Zone - area around a star where it is not too hot and not too cold for liquid water to exist on the surface of surrounding planets

3. Why is the discovery of a Goldilocks Zone important for exoplanet discovery?

- Could potentially house advanced life
  - (
    - Proper temperature
    - Proper atmospheric pressure
    - Support liquid water)
- ↑ (Key for life?)

4. How many Earth-sized planets within a Goldilocks Zone could exist in the Milky Way?

40 billion

#### IV. Exoplanet Discovery

1. Who first developed the theory that other planets orbit other star systems?

Giordano Bruno (16<sup>th</sup> Century)

2. Who discovered the first exoplanet, in what year, and what was it named?

Aleksander Wolszczan / Dale Frail 1992  
PSR B1 257+12 B and C

3. When was the Kepler Space Telescope launched? 2009

4. Identify the following characteristics of Kepler 22-b.

Year Discovered : 2011      Distance Away : 600 light years  
Type of Surface : Ocean-like      Times Larger Than Earth : 2.4 X

5. Identify each of the following unusual exoplanets?

- |                               |  |
|-------------------------------|--|
| 1. <u>J.</u> 55 Cancri e      | A. Exoplanets no longer attached to a star system      |
| 2. <u>G.</u> HAT-P-7b         | B. Exoplanet where it rains glass sideways             |
| 3. <u>B.</u> HD 189773b       | C. The hottest exoplanet (4,300°C)                     |
| 4. <u>D.</u> HR 5183b         | D. The "whiplash exoplanet"; Highly elliptical orbit   |
| 5. <u>F.</u> K2-18b           | E. Neptune-sized exoplanet stripped of gases           |
| 6. <u>C.</u> KELT-9b          | F. Rocky exoplanet with watery layer, Extremely hot    |
| 7. <u>A.</u> Rogue Exoplanets | J. A diamond exoplanet (immense pressure; 2,700 °C)    |
| 8. <u>E.</u> TOI 849 b        | G. Ultra-hot Jupiter, dark as charcoal, sapphire sky   |
| 9. <u>H.</u> TrES-2b          | H. The darkest exoplanet (reflects less than 1% light) |
| 10. <u>I.</u> WASP-12b        | I. Puffed up exoplanet being torn apart by its star    |