

Planetary Nebulae

I. Physical Characteristics

1. Define the term planetary nebulae.

Planetary Nebulae - ejection of ionized gas from a red giant

2. Planetary Nebulae are related to planets.

Circle One : True False

3. There are more than 3,500 known Planetary Nebulae (2023).

4. What causes a Red Giant Star to become a Planetary Nebula?

Collapse of a red giant core
(releases UV radiation) (produces stellar wind)

5. Planetary Nebulae shapes are extremely complex.

Circle One : True False

6. One-fifth of all Planetary Nebulae are round in shape.

7. The shapes of Planetary Nebulae are influenced by :

- Binary Star Systems
- Stellar Winds
- Magnetic Fields

II. Examples of Planetary Nebulae

1. List the constellations in which the following Planetary Nebulae can be located.

1. Dandelion Nebula : Aquila (The Eagle)

2. Bug Nebula : Scorpius (The Scorpion)

3. Dumbbell Nebula : Vulpecula (The Fox)

4. Eskimo Nebula : Gemini (The Twins)

5. Twin Jet Nebula : Ophiuchus (The Serpent Bearer)

6. Spirograph Nebula : Lepus (The Hare)

III. Existence & Fate of Planetary Nebulae

1. How long do Planetary Nebulae typically exist?

10,000 years

2. Planetary Nebulae expand at a rate of 10 miles / second.

3. Identify the two different phases of the lifespan of a Planetary Nebula.

Phase 1 : Star gets hotter (100,000 K) - Stays bright

Phase 2 : Star cools (Gas cloud no longer visible)

4. What stage of stellar evolution do Planetary Nebulae exist?

Near the end of star life

5. What is the future of a Planetary Nebula after its existence?

White Dwarf

IV. Planetary Nebulae Discovery

1. How did each of the following advance the understanding of Planetary Nebulae?

Charles Messier : (1764) - Discovered 1st Planetary Nebula (Dumbbell Nebula)

William Herschel : (1764) - Incorrectly labeled them "planetary"

William Huggins : (1864) - Studied spectra of planetary nebulae

Late 1800's : Helium found in planetary nebulae (Thought to be a new element - nebulium)

Hubble Space Telescope : (1990's) - Showed complexity of nebulae