

## Explain the terms Dark Energy and Dark Matter

### 1. Introduction:

Dark energy and dark matter are mysterious components that make up a significant portion of the universe's mass-energy content. They cannot be directly observed with current technology.

### 2. Dark Matter:

Dark matter is a hypothetical form of matter that does not emit, absorb or reflect light, making it invisible and detectable only through its gravitational effects on visible matter.

#### a. Invisible Matter:

Dark matter

is a theoretical form of matter that does not interact with electromagnetic forces, rendering it invisible and undetectable by electromagnetic radiation such as light

### b. Gravitational Effects:

Its existence is inferred primarily through gravitational effects on visible matter. Galaxies rotate at speeds that cannot be explained by the visible mass alone; dark matter is thought to provide the additional gravitational pull necessary to explain these observations

### c. Abundance:

Dark matter is estimated to constitute about 27% of the mass-energy

content of the universe.

#### d. Composition:

The exact nature of dark matter remains unknown, various theoretical particles exists including Weakly Interacting Massive Particles and Axions. These particle if exist, would interact very weakly with normal matter

### 3. Dark Energy:

Dark energy is a form of energy thought to be responsible for the observed accelerated expansion of the universe.

#### a. Accelerated Expansion:

Dark energy is a form of energy associated with the observed

accelerated expansion of the universe. It acts as a repulsive force on cosmological scales, countering the attractive force of gravity.

### b. Cosmological Constant:

The simplest explanation for dark energy is the cosmological constant. It represents a constant energy density filling space homogeneously.

### c. Uniform Distribution:

Dark energy is thought to be uniformly distributed throughout space, not clumping like dark matter. Its influence becomes more pronounced on larger scales, causing galaxies

and galaxies clusters to move apart at an accelerating rate.

## d. Dominant Component:

Dark energy makes up about 68% of the total mass-energy content of the universe. Its dominance in the cosmic budget became apparent through observations of distant supernovae, cosmic microwave background radiation and large-scale structure survey

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