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"What one man calls God, another calls the laws of physics."

-Nikola Tesla

TOPIC 4:
MASS, WEIGHT, DENSITY

THE ABOUT

CHAPTER ANALYSIS

MASTERY

- Straightforward topic
- Study definitions
- Need to be careful about units & conversions

EXAM

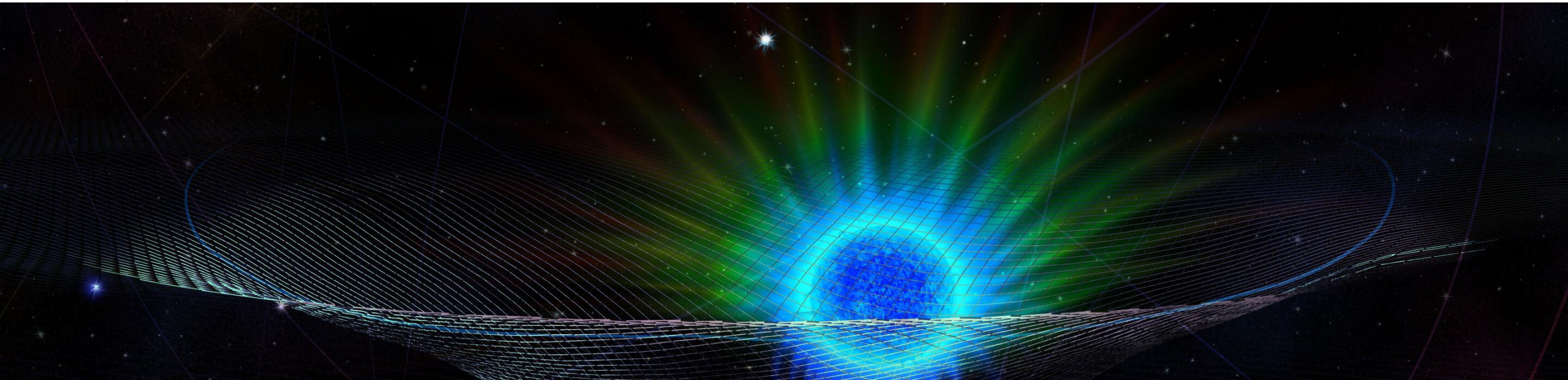
- Tested in MCQ and Section A
- Important chapter that is closely linked to chapter like Force & Work Done

WEIGHTAGE

- Light overall weightage
- Constitute to around **2.5%** of marks for past 5 year papers

KEY CONCEPT

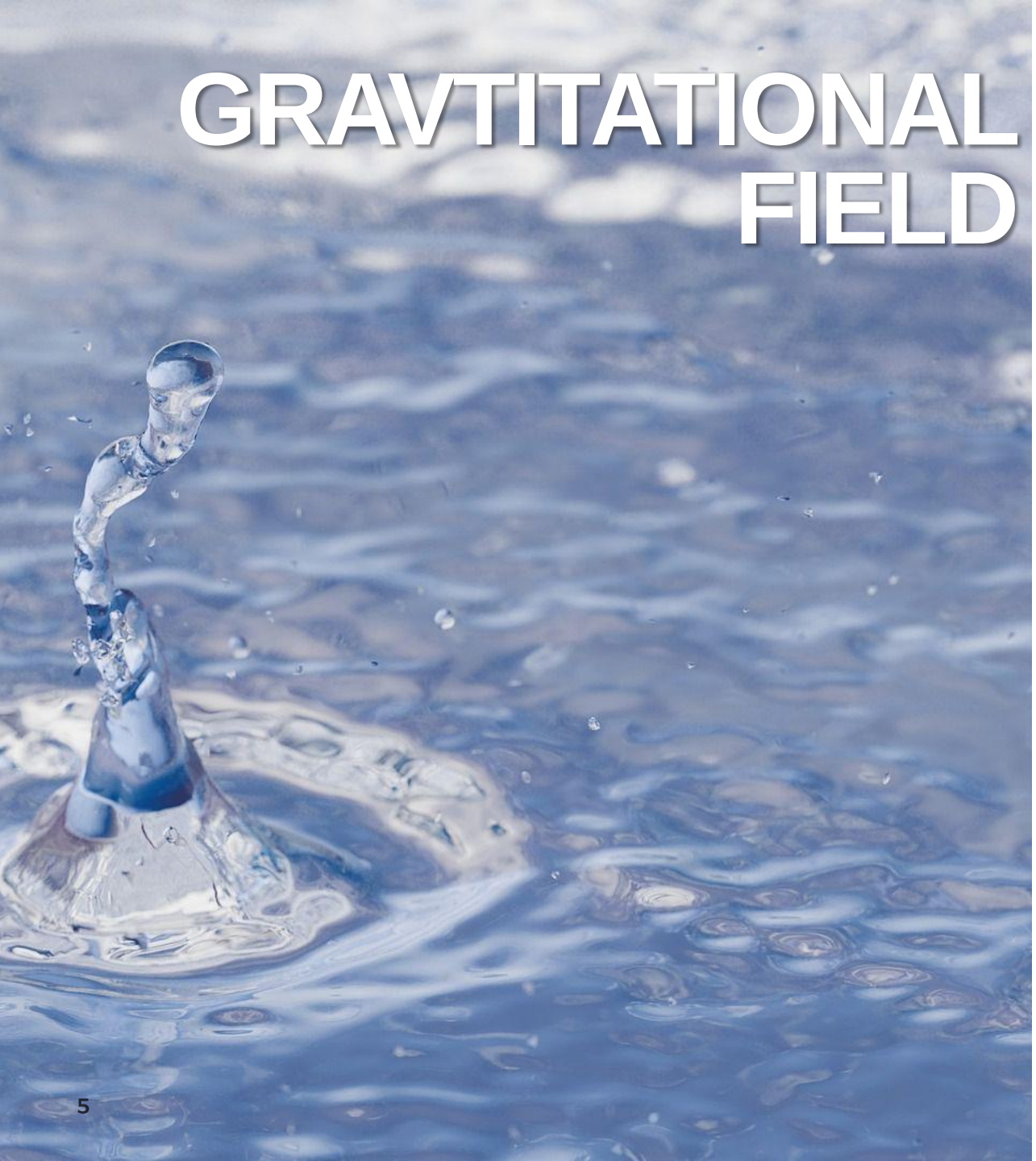
MASS & WEIGHT
GRAVITATIONAL FIELD
DENSITY



MASS & WEIGHT

	Mass	Weight
Definition	Mass is defined as the **amount of substance** in a body.	Weight is a **measure of the gravitational force** acting on an object due to the gravitational field.
SI Unit	kg	N
Quantity	Scalar quantity	Vector quantity
Formula	---	W = mg
Gravity	Mass is constant & is not affected by gravity.	Weight is dependent on the gravitational field.
Measurement	Beam Balance Lever Balance **Electronic Balance**	**Spring Balance**

GRAVTITATIONAL FIELD



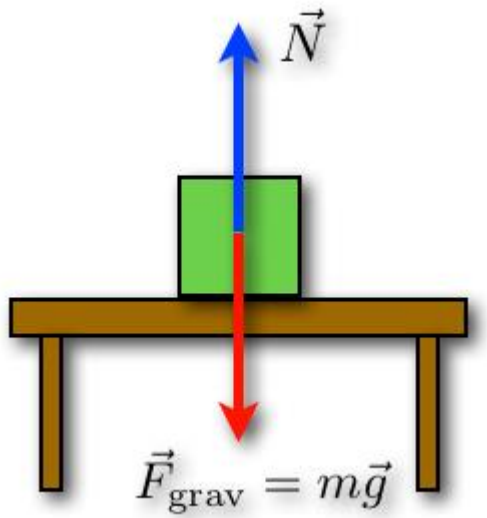
Gravitational Field

Gravitational field is a region of space where a **body with mass** will **experience gravitational force** due to gravitational attraction.

Gravitational field strength, g, is defined as the gravitational force per unit mass.

Formula:

Weight = mg



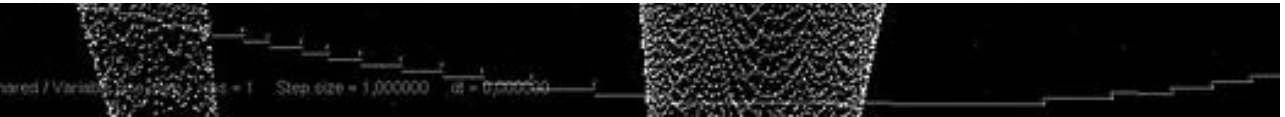
DENSITY

$$p = \frac{m}{v}$$

mass → m; density → p; volume → v

$$13.6\ \frac{g}{cm^3} = 13.6 \times \frac{g}{cm^3} \times \frac{10^{-3}\ Kg}{g} \times \frac{cm^3}{10^{-6}\ m^3}$$

$$\therefore 13.6\ g/cm^3 = 13.6 \times 10^3\ Kg/m^3$$



Density

Density is defined as mass per unit volume. (Unit: kgm^{-3})

Conversion:

$$1\ kg = 1000\ g$$

$$1\ g = \frac{1}{1000}\ kg = 10^{-3}\ kg$$

$$1\ m = 100\ cm$$

$$1\ m^3 = (100)^3\ cm^3 = 10^6\ cm^3$$

$$1\ cm^3 = \frac{1}{10^6}\ m^3 = 10^{-6}\ m^3$$

$$1\ \frac{g}{cm^3} = \frac{10^{-3}\ kg}{10^{-6}\ m^3} = 10^3\ \frac{kg}{m^3}$$

$$\therefore 2.70\ \frac{g}{cm^3} = 2.70 \times 10^3\ \frac{kg}{m^3} = 2700\ \frac{kg}{m^3}$$

Conversion tips:
1 gcm^{-3} = 1000 kgm^{-3}
1 kgm^{-3} = 0.001 gcm^{-3}

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