RELATIVITY THEORY SUMMARY

Special Relativity (1905)

$$E = mcÂ²$$

- **Principle:** Physics laws are identical in all inertial frames.
- **Constant:** The speed of light (c) is absolute for all observers.
- **Time Dilation:** Time slows down for objects moving at high speeds.
- **Length Contraction:** Objects shorten in the direction of motion.

General Relativity (1915)

$$Gî¼î½ + Î›gî¼î½ = Î°Tî¼î½$$

- **Equivalence:** Gravity and acceleration are indistinguishable.
- **Spacetime:** Gravity is the curvature of spacetime caused by mass/energy.
- **Geodesics:** Objects follow the shortest path in curved space.
- **Light Bending:** Gravity deflects the path of photons.

Key Phenomena & Definitions

- **Event Horizon:** The boundary around a black hole where escape velocity exceeds c.
- **Gravitational Redshift:** Light loses energy (reddens) escaping a gravity well.
- **Relativistic Mass:** Mass increases as velocity approaches the speed of light.
- **Singularity:** A point of infinite density where spacetime curvature is infinite.