Chapter 9 – Quick Revision Sheet

Gravitation

🌍 Universal Gravitation Law

Gravitation is the universal force of attraction between any two masses; its strength increases with masses and decreases with square of distance → $F = G (M_1M_2 / r^2)$, where $G = 6.67 \times 10^{-11}$ N m^2/kg^2 (same everywhere in universe).

⚡ Free Fall & Acceleration Due to Gravity

When an object falls only under gravity it is called free fall, during which acceleration remains constant as $g = 9.8$ m/s² acting always towards Earth's centre and independent of object's mass.

📉 Equations of Motion Under Gravity

For free fall replace acceleration 'a' with 'g' → $v = u + gt$, $s = ut + \frac{1}{2}gt^2$, $v^2 = u^2 + 2gs$; for dropped objects initial velocity becomes zero ($u = 0$).

⚖️ Mass and Weight

Mass is the amount of matter (constant everywhere, unit kg) while weight is gravitational force on object → W = mg (changes with location) and becomes 1/6th on the Moon because gravity there is weaker.

📊 Thrust and Pressure

Force acting perpendicular to surface is thrust and pressure is thrust per unit area → Pressure = Thrust / Area; smaller area produces larger pressure (example: sharp knife cuts easily, wide straps reduce pressure).

🌊 Pressure in Liquids

Liquids exert pressure in all directions and pressure increases with depth, which is why dams are constructed thicker at the bottom to withstand greater force.

🛟 Buoyant Force and Floating Condition

Liquids exert upward buoyant force (upthrust) on immersed objects; objects float if their density is less than liquid and sink if their density is greater than liquid.

🧪 Archimedes' Principle & Relative Density

An immersed object experiences upward force equal to weight of displaced liquid (Archimedes' Principle), and relative density compares density of substance with water and has no unit.

🧠 Quick Chapter Revision Flow

Gravitation explains attraction → Universal Law gives formula → g explains falling motion → Mass stays constant but Weight changes → Pressure depends on area & depth → Buoyant force and Archimedes explain floating behaviour.