Last Moment Exam Cheat Sheet

Laws of Motion

- Newton’s First Law states that a body remains at rest or in uniform straight-line motion **only when net external force is zero.**
- The First Law introduces **inertia**, which is the resistance to change in motion and **depends only on mass**, not on speed or force.
- **Inertia has three forms:** rest, motion, and direction, all representing resistance to different types of change in motion.
- Force is **not required to maintain motion;** it is required only to change velocity in magnitude or direction.
- Newton’s Second Law states that force equals **rate of change of momentum,** not velocity directly.
- Momentum is a vector quantity given by p = mv, so **any change in speed or direction changes momentum.**
- For constant mass, Newton’s Second Law reduces to **F = ma**, which is used in all basic numericals.
- For the same force, **greater mass produces smaller acceleration**, and for the same mass, greater force produces greater acceleration.
- The SI unit of force (newton) is derived from the Second Law and equals **kg·m/s².**

- Newton’s Third Law states that **forces always occur in pairs** that are equal in magnitude and opposite in direction.
- Action and reaction forces **act on different bodies**, so they never cancel each other.
- Action–reaction pairs are always simultaneous and belong to the
- **same interaction**, not to the same object.
- **Recoil of a gun**, walking, swimming, and jumping are all direct applications of the Third Law.
- Zero net force implies **equilibrium**, which may mean rest or uniform motion, not necessarily rest.
- **Balanced forces do not change motion** but can change shape of a body.
- **Unbalanced forces always produce acceleration** as per the Second Law.
- **Friction** is an external force that modifies motion predicted by Newton’s laws in real situations.
- **Newton’s laws are valid only for macroscopic objects** at ordinary speeds, not at relativistic or atomic scales.
- **Statements claiming** Newton’s laws work at speeds near light are incorrect in exams.
- If no external force acts, **momentum of a system remains constant**.
- Any MCQ stating **“action and reaction cancel each other”** is always wrong.

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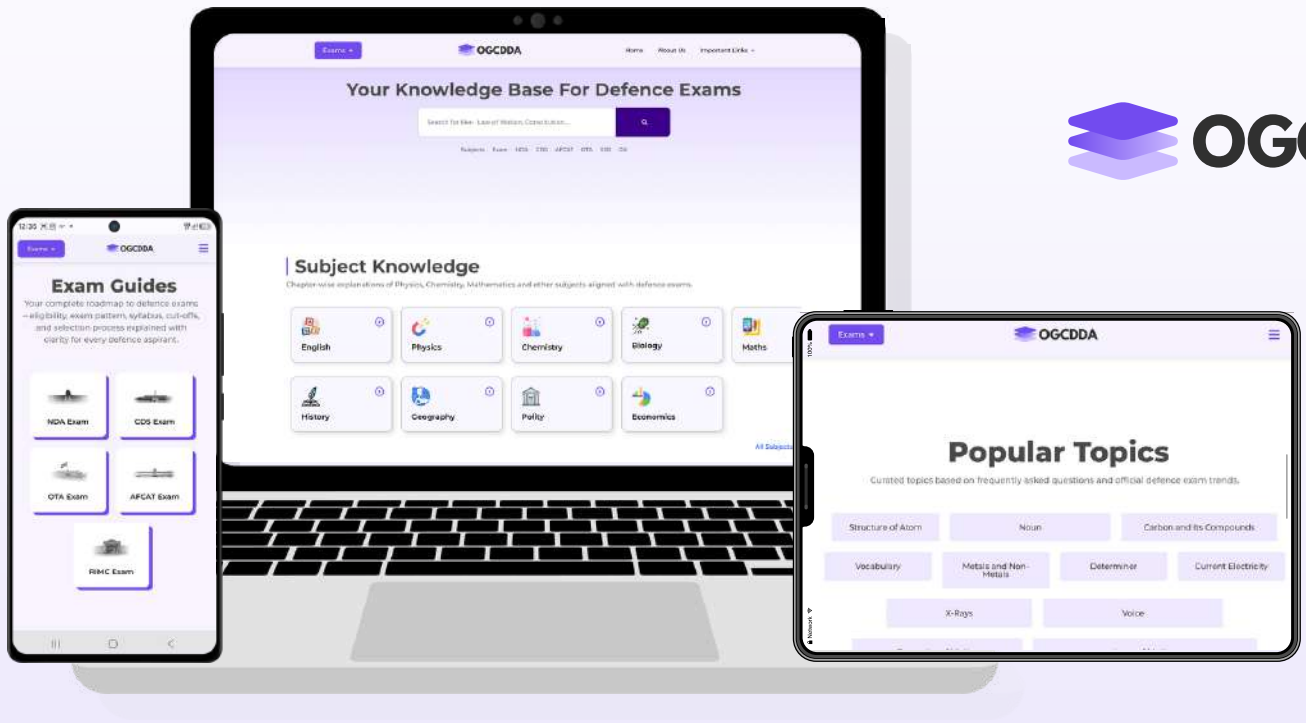

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