MOST IMPORTANT TOPICS FOR JEE MAINS PHYSICS 2020

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IIT BOMBAY

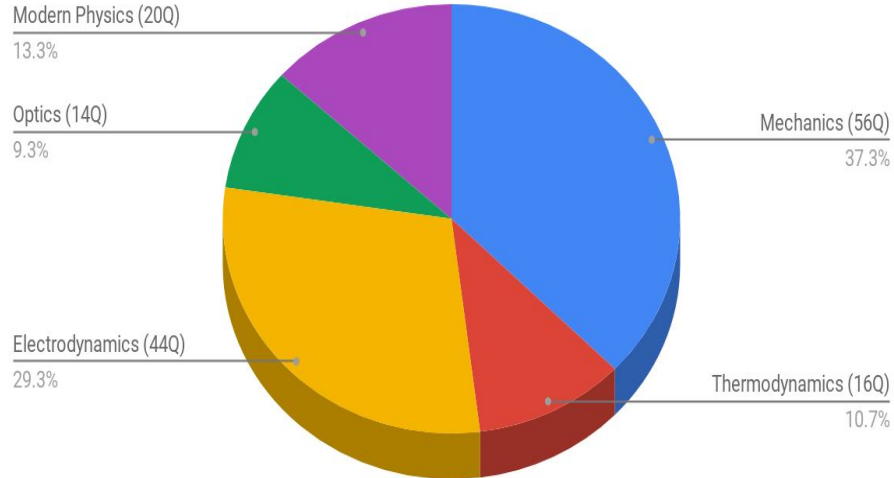# Overall Analysis
JEE MAIN JANUARY 2020

All papers (7/8/9 Jan) = **150 Questions**

Modern Physics (20Q)
13.3%

Optics (14Q)
9.3%

Electrodynamics (44Q)
29.3%

Mechanics (56Q)
37.3%

Thermodynamics (16Q)
10.7%

Most Important Units

1. Mechanics
2. Electromagnetism
3. Modern physics

Next Important Units

4. Waves

5. Heat & Thermodynamics

6. Optics

Must do chapters

- **Electrostatics and capacitance**
- **Current electricity**
- **Rotational motion**

Let's look at the most important concepts from each chapter

CHAPTER	MOST IMPORTANT CONCEPTS(repeated)
Motion in 1D	- Stopping distance - Equation of motion - Free fall-two bodies at the same time - Graphs
Motion in 2D	- Projectile motion - vectors
Laws of motion	- String -block and pulley-block. - Apparent weight inside a lift - Equilibrium of a body - Coefficient of friction - Block on a inclined plane(most repeated) - Block held stationary against a wall - Problems are combined with rotational motion

CHAPTER	MOST IMPORTANT CONCEPTS(repeated)
Elasticity	- Change in length of a wire due to stress - Work done in stretching - Problems from this section are generally combined with thermal expansion, SHM, waves on a string and mechanics - Bulk modulus
Thermal expansion	- Thermal stress(two rods fixed between rigid support then heated or cooled) - Relation among coefficients of expansion
Calorimetry & heat transfer	- Calorimetry problems are similar as they all involve just equating heat lost to heat gained - Effective thermal resistance of composite slab, concentric cylinders or spheres. - Temperature at the interface of two slabs, T shape, Y shape or any other shape. - Stefan's law- power radiated by a body- radiant energy received on earth

CHAPTER	MOST IMPORTANT CONCEPTS(repeated)
Work, power and energy and collisions	➔ Vertical circle ➔ Work calculation when force and displacement are given in vector form ➔ Work done by spring force- ➔ spring -mass ➔ Combined with collisons(Energy loss due to collision/ final speed after collision) ➔ Power
COM & Rotational motion	➔ Body breaks into two parts during motion, velocity of COM ➔ Finding coordinates of COM ➔ MOI of rigid body using theorem of perpendicular and parallel axis ➔ Torque and rotational equilibrium ➔ Angular velocity and conservation of angular momentum ➔ Circular disk or cylinder as pulley, cylinder and rope ➔ Rod pivoted at one end ➔ Rolling without slipping

CHAPTER	MOST IMPORTANT CONCEPTS(repeated)
Gravitation	- Gravitational potential energy - Energy required to launch a satellite into a orbit + energy to move from one orbit to another+ orbital time period - Escape velocity - Variation of g with altitude and depth - graphs
Fluid mechanics	- Pressure due to two immiscible liquids - Terminal velocity - Excess pressure - soap bubble(work done to blow a bubble) and water droplet - Work done by surface tension - Buoyant force - Equation of continuity and bernoulli's theorem - Velocity of efflux

CHAPTER	MOST IMPORTANT CONCEPTS (repeated)
Kinetic theory of gases	➢ rms speed ➢ Molar specific heats ➢ Mixture of gases - ratio of Cp and Cv, calculation of thermal energy, internal energy and total energy ➢ Mean free path
Thermodynamics	➢ Calculation of work done or change in internal energy of system using first law of thermodynamics for various processes ➢ Adiabatic process ➢ Work done and efficiency of cyclic process ➢ Carnot engine ➢ Indicator diagrams (representation of same process in different state variables)

CHAPTER	MOST IMPORTANT CONCEPTS (repeated)
SHM	- Equation of SHM - Phase difference - Spring-block system (parallel and series combination) - Change in time period of pendulum with length and mass - Time period when point of suspension accelerates(lift, inclined plane and circular turn)
String Waves & Sound waves	- General equation of travelling wave - Interference of waves - Stationary waves - Organ pipes and resonance column - Intensity of wave - Doppler effect+beats

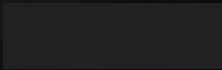| CHAPTER	MOST IMPORTANT CONCEPTS(repeated)
Electrostatic field	- Charge configuration in equilibrium - Force between two charged conductors after contact - Field due to variable charge density (density as a function of r) - Flux involving cube - Field due to dipole
Electrostatic potential	- Work done in moving a charge between two points - Potential of concentric spherical shells - Graph of variation of potential and electric field with distance - Potential energy of system of charges
Capacitance	- Dielectric filled between capacitor plates - Equivalent capacitor - Energy stored in a capacitor - Charging and discharging

CHAPTER	MOST IMPORTANT CONCEPTS
Current electricity	➜ Equivalent resistance ➜ Power and heating effect ➜ Potentiometer and metre bridge ➜ Combination of cells
Moving charges and magnetic effects of current	➜ Lorentz force and circular motion of a charged particle in magnetic field ➜ Net magnetic field at a point due to current carrying conductors in various shapes ➜ Magnetic field of circular loops (two loops arranged parallel and perpendicular to each other) ➜ Solenoid and toroid ➜ Galvanometer ➜ Magnetic moment
Electromagnetic induction and Alternating current and	➜ Induced emf (varying magnetic field, varying area, rotation of loop) ➜ Motional emf ➜ Mutual inductance and self induction ➜ LCR circuit problems, Power factor ➜ Phase difference ➜ Resonant frequency ➜ Efficiency of transformer

CHAPTER	MOST IMPORTANT CONCEPTS(repeated)
Ray optics	- Inclined mirrors + number of images formed - Mirror equation - Lateral shift - Apparent depth - Relation between critical angle and refractive index (fish looking up through water surface - Minimum deviation and prism - Lens makers formula +thin lens equation - Combination of lenses (concave and convex lens separated by a distance, plano concave and plano convex lens) - Lenses and glass slab (shift in the position of images) - Magnification of compound microscope and telescope
Wave optics	- Interference conditions, maximum and minimum intensity - Diffraction due to single slit - Young's double slit experiment - Malus law

CHAPTER	MOST IMPORTANT CONCEPTS(repeated)
Dual nature of matter	- De Broglie wavelength - Photoelectric effect -work function , threshold frequency, maximum velocity (kinetic energy) of ejected electrons, stopping potential - graphs
atoms	- Energy required for electron excitation - Transition of electrons(diagram, frequency and wavelength of emitted radiation) - Radii and energy levels of possible orbitals for a given central potential U(r)
nuclei	- Decay constant, half life - Binding energy - Energy released due to fission - Alpha and beta decay

CHAPTER	MOST IMPORTANT CONCEPTS (repeated)
EMW	- Equation of electromagnetic wave - Relation between electric field component and magnetic field component - Force on charged particle due to electromagnetic wave - Energy density
Semiconductors	- Concentration of electrons and holes - Mobility of electrons - Diodes circuit - Zener diode as voltage regulator - Logic gates + boolean expression + input and output signals

WORKING SMART DOESN'T MEAN WORKING LESS. IT MEANS WORKING HARD ON WHAT TRULY MATTERS

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