Cynthia Senior Secondary School, Haldwani

SUMMER VACATION HOMEWORK: PHYSICS INVESTIGATORY PROJECT

Academic Session: 2026-27 | Class: XII A

Subject: Physics (Code: 042)

Submitted To: Mr. I D Joshi

Project Weightage: 3 Marks (Direct Board Exam Weightage)

Submission Timeline: First Day of School Reopening

I. PROJECT PARAMETERS & FORMAT GUIDELINES

Every student must plan, research, and format an individual handwritten Physics Investigatory Project during the summer recess. This project serves as a cornerstone for your final CBSE practical assessment and the accompanying external viva-voce.

- **Strict Handwritten Mandate:** The entire body text of the project report must be handwritten neatly by the student. Printed texts or digital type-faces for the content pages will face immediate rejection.
- **Filing Specification:** Submit your report on premium quality one-sided ruled A4 sheets (Interleaf sheets), neatly organized inside a secure, professional lace-bound folder. Do not use spiral binding.
- **Structural Sequencing:** Every project file must follow this exact order: *Cover Page → Bonafide Certificate → Acknowledgement → Index → Statement of Objective/Aim → Introduction & Theoretical Background → Materials/Apparatus Requirements → Experimental Circuit or Ray Diagrams → Systematic Procedure → Observation Tables (with exact SI units) → Step-wise Calculations & Graphical Plots → Result/Inference → Precautions & Potential Sources of Error → Bibliography/References.*

Correct Implementation Practices (DOs):

- Construct all schematic diagrams, ray paths, and data graphs strictly using a

Prohibited Practices (DON'Ts):

- Do not color-bleed or over-decorate pages with glitter, sketch pens, or stylized

sharp pencil on the blank side of the interleaf pages.

- Always define physical variables and maintain consistent SI units across all your mathematical derivations and tables.
- If using online resources or simulators (e.g., Amrita OLabs or PhET), log your specific data values and print the raw simulated graphs to attach alongside your writing.

headings. Prioritize clean, academic-grade layout presentation.

- Do not use components or concepts belonging to deleted syllabus modules (e.g., completely avoid Potentiometers, Transistors, or Logic Gates).
- Do not forge data tables. Any back-calculated or perfectly uniform fabricated values are instantly spotted by board evaluators.

II. ROLL NUMBER-WISE PROJECT TOPIC ALLOCATION

The topics listed below are curated **strictly in accordance with the current CBSE Class 12 Physics Syllabus**. No student is permitted to change or swap their assigned topic without prior written approval from Mr. I D Joshi.

Roll No.	Assigned Investigatory Project Topic
1	To estimate the charge induced on each of two identical styrofoam balls suspended in a vertical plane using Coulomb's Law.
2	To study the variation of electrostatic potential energy stored in a parallel plate capacitor by changing the plate separation distance.
3	To study the effect of introducing different dielectric materials (such as glass, mica, plastic) on the capacitance of a parallel plate capacitor.
4	To analyze the electric field lines and equipotential surfaces of various charge configurations using open-source graphic simulations (PhET/GeoGebra).
5	To study the factors affecting the internal resistance of a primary cell (concentration, temperature, and distance between electrodes).
6	To study the temperature dependence of resistance in a given metal wire (Verification of temperature coefficient of resistance).
7	To study the operational performance of a Wheatstone bridge circuit by finding an unknown resistance using standard resistors.
8	To study the variation in electrical conductivity of water by varying the concentration of dissolved ionic salts.
9	To study the V-I characteristics of an incandescent lamp filament and analyze its non-ohmic behavior due to heating effects.
10	To study the variation of magnetic field with distance along the axis of a circular current-carrying coil using a Hall effect probe / digital magnetometer sensor.
11	To study the force of attraction/repulsion between two parallel current-carrying conductors (Theoretical and Simulation-based study).

Roll No.	Assigned Investigatory Project Topic
12	To study the conversion of a moving coil galvanometer into an ammeter of a specified range using an appropriate shunt resistance.
13	To study the conversion of a moving coil galvanometer into a voltmeter of a specified range using a series high resistance.
14	To compare the magnetic field parameters and field lines of a bar magnet with a current-carrying solenoid.
15	To study and classify different material samples into diamagnetic, paramagnetic, and ferromagnetic substances based on magnetic susceptibility.
16	To study the principle of electromagnetic induction (Faraday's Law and Lenz's Law) using a bar magnet and a copper coil setup.
17	To study the factors affecting the self-inductance of a coil (number of turns, geometry, and presence of an iron core).
18	To study the variation of inductive reactance (X_L) with the frequency of an AC source in a purely inductive circuit.
19	To study the variation of capacitive reactance (X_C) with the frequency of an AC source in a purely capacitive circuit.
20	To study the resonant frequency and frequency response curve of a series LCR circuit connected to a variable AC source.
21	To study the relationship between the ratio of output/input voltage and the turn ratio of primary/secondary coils in a step-down transformer.
22	To analyze power factor and energy dissipation efficiency in an AC circuit containing different combinations of L, C, and R.
23	To study the parameters and classification of the Electromagnetic Spectrum, highlighting the specific domestic and industrial uses of each wave band.
24	To study the phenomenon of Total Internal Reflection (TIR) and light propagation using a low-power laser pointer and flexible acrylic optical fibers.
25	To find the refractive index of various transparent liquids (water, glycerine, oils) using a concave mirror and a plane mirror setup.

Roll No.	Assigned Investigatory Project Topic
26	To find the refractive index of a liquid medium using a convex lens and a plane mirror combination.
27	To investigate the dependence of the angle of deviation on the angle of incidence using a hollow glass prism filled with different fluids.
28	To study the lens combinations and determine the effective focal length and power of two thin lenses in contact.
29	To study the design, ray-diagram path, and magnifying power of an Astronomical Telescope using discrete lenses.
30	To study the design, ray-diagram path, and magnifying power of a Compound Microscope using discrete lenses.
31	To study the diffraction pattern of light and calculate the width of a thin obstacle (such as a human hair strand) using a diode laser pointer.
32	To observe and study the polarization of light using a pair of polaroids and analyze Malus's Law qualitatively.
33	To investigate the interference pattern of light waves using a simulated Young's Double Slit Experiment (YDSE) model.
34	To study the factors affecting photoelectric current (intensity and frequency of light) based on Einstein's Photoelectric Equation (Simulation study).
35	To study the de Broglie wavelength variation of an electron with changing accelerating potential (Theoretical analysis).
36	To study the alpha-particle scattering experiment (Rutherford's Model) and analyze the impact parameter dependency (Simulation study).
37	To study the energy level spectrum, radius optimization, and line series spectra of a Hydrogen atom using Bohr's Atomic Model.
38	To study the relationship between mass defect, nuclear binding energy, and the stability of different nuclei across the periodic table.
39	To study the forward and reverse bias V-I characteristics of a p-n junction semiconductor diode.

Roll No.	Assigned Investigatory Project Topic
40	To construct a functional Full-Wave Bridge Rectifier circuit using p-n junction diodes and study the smoothing effect of a capacitor filter.

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I D Joshi

Department of Physics

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