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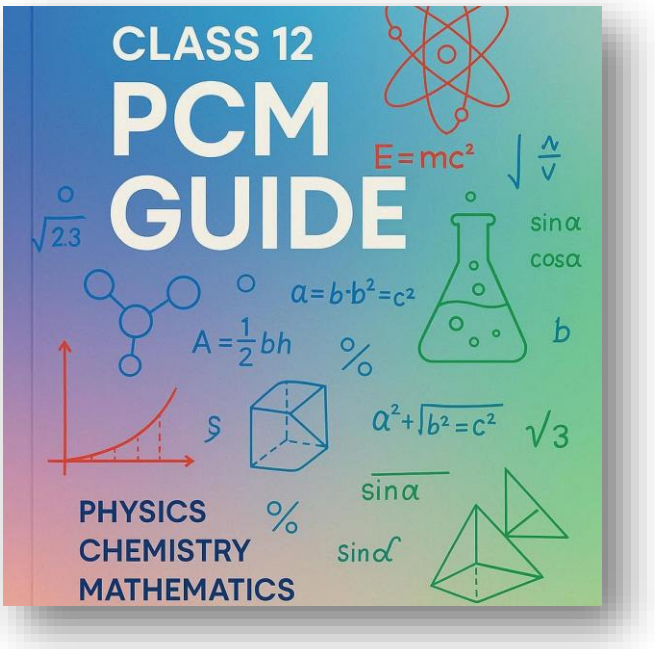
CBSE Class 12 PCM Previous Year Question Papers (2025–2016) with Solutions



Complete Guide for Board Exam 2026 | Physics • Chemistry • Mathematics | Latest CBSE Pattern

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♥ Dedication

"Every great achievement begins with a small step — and every small step begins with belief."

— SWAN India Publication

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Important Tips & Strategies for Board Exam 2026

Success in the CBSE Class 12 Board Examination depends on a smart balance between **conceptual clarity, disciplined practice, and effective time management**. This book will guide you through content, but your approach to preparation will define your results. The following strategies have been compiled to help you plan, practice, and perform efficiently.

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1. Understand the Syllabus Thoroughly

Before beginning your preparation, read the complete CBSE syllabus for Physics, Chemistry, and Mathematics. Focus on what is *prescribed*, not what is *extra*. Many students waste time studying irrelevant topics — clarity of scope saves time and energy.

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2. Master the NCERT Textbooks First

The CBSE Board strictly follows the NCERT pattern. Every formula, derivation, and concept explained in the NCERT books has direct

or indirect relevance to board questions. Ensure that you solve each example and exercise problem at least twice.

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3. Analyze Previous Year Papers

Use this book to understand question trends from 2016 to 2025. Identify topics that are frequently repeated — such as Electrostatics, Chemical Kinetics, and Integration. Consistent patterns often indicate priority topics.

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4. Focus on Competency-Based & Application Questions

The 2026 board exams will continue to emphasize **competency-based and real-life application questions**. Practice these regularly to build analytical thinking and problem-solving ability.

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5. Maintain a Formula & Concept Notebook

Prepare a separate notebook for formulas, reactions, definitions, and short concepts from all three subjects. Revise it daily during the last month before the exam. This will help in quick recall and reduce stress during revision.

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6. Practice Writing Stepwise Solutions

In CBSE exams, marks are awarded for every correct step, not just the final answer. Present your answers neatly, underline formulas,

and label diagrams clearly. Follow the step-by-step presentation used in this book for maximum marks.

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7. Time Management is Key

During exam preparation, allocate daily slots for each subject. In the actual exam, avoid spending too much time on one question. Learn to move ahead and return to unsolved ones later. Regular timed practice papers will help improve speed and confidence.

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8. Revise Smartly Before the Exam

In the final two weeks, avoid new topics. Focus on revision and solving mock papers. Spend equal time on all subjects, and analyze your mistakes carefully. The goal is *clarity, not quantity.*

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9. Stay Calm and Positive

Mental stability is as important as preparation. Take breaks, sleep well, and stay positive. A calm mind remembers better and performs better.

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10. Believe in Your Preparation

Confidence is built on consistent practice. Trust yourself and your efforts. Remember, every question you solve brings you one step closer to success.

“Preparation builds confidence,
and confidence creates success.”

Physics

Time: 3 Hours | Maximum Marks: 70

⚡ General Instructions:

1. All questions are compulsory.
2. Internal choices are provided where applicable.
3. Use of scientific calculator is allowed.
4. Draw labeled diagrams wherever necessary.
5. Show all steps clearly for numerical questions.

Section A (1 Mark Each)
(Each question carries 1 mark)

Q1. Define electric flux. Write its SI unit.

Answer:
Electric flux (Φ) is the measure of the number of electric field lines passing normally through a given surface.
SI Unit: $\mathbf{N \cdot m^2/C}$

Q2. What happens to the capacitance of a parallel plate capacitor when a dielectric slab is inserted?

Answer:
When a dielectric slab is inserted, capacitance **increases by a factor of K** (dielectric constant).
New capacitance, **C' = K × C**

Q3. State one advantage of alternating current (AC) over direct current (DC).

Answer:
AC can be **easily transmitted over long distances** with low power loss using transformers, while DC cannot be transformed easily.

Q4. What is the effect of increasing slit separation in Young's Double Slit Experiment on fringe width?

Answer:
Fringe width (β) is inversely proportional to slit separation (d).
So, if slit separation increases, **fringe width decreases**.

Formula: **$\beta = \lambda D/d$**

Q5. Write one application of infrared rays.

Answer:
Infrared rays are used in **remote controls, night vision cameras**, and **medical therapy** for muscle pain relief.

Q6. What is the relationship between the radii of curvature of mirrors in an astronomical telescope?

Answer:
In a reflecting telescope, **focal length of objective > focal length of eyepiece**.
Thus, $\mathbf{R_1 > R_2}$ (since f = R/2).

Q7. Define modulation in communication systems.

Answer:
Modulation is the process of **superimposing a low-frequency signal (information)** onto a **high-frequency carrier wave** for transmission over long distances.

Section B (2 Marks Each)

Q8. State Gauss's theorem and apply it to determine the electric field due to an infinitely long straight uniformly charged wire.

Answer:
Gauss's Theorem: The total electric flux through a closed surface is equal to $1/\varepsilon_0$ times the total charge enclosed by the surface.

Formula: $\mathbf{\Phi = q / \varepsilon_0}$

For an infinite wire with charge per unit length λ:
Electric field at a distance r is given by:
$\mathbf{E \times (2\pi rL) = \lambda L / \varepsilon_0}$
So, $\mathbf{E = \lambda / (2\pi \varepsilon_0 r)}$

Q9. A cell of emf 2.5 V and internal resistance 0.5 Ω is connected to a 4 Ω resistor. Find:
(a) Current in the circuit
(b) Terminal voltage of the cell

Answer:

(a) I = E / (R + r)
= 2.5 / (4 + 0.5)
= 0.555 A

(b) V = E - I × r
= 2.5 - 0.555 × 0.5
= 2.22 V

Q10. Derive the expression for the force experienced by a current-carrying conductor placed in a uniform magnetic field.

Answer:
Force on a current-carrying conductor:
$\mathbf{F = B \times I \times L \times \sin\theta}$
where:
B = magnetic field strength,
I = current,
L = length of conductor,
θ = angle between field and conductor.

When θ = 90°, F = BIL (maximum).

Q11. Write any two differences between step-up and step-down transformers.

Answer:

Step-Up Transformer	Step-Down Transformer
Increases voltage	Decreases voltage
Secondary turns > Primary turns	Secondary turns < Primary turns

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Section C (3 Marks Each)

Q12. A circular coil of radius 10 cm and 50 turns carries a current of 3 A. Calculate the magnetic field at its center.

Answer:
Formula: $\mathbf{B = \mu_0 \times N \times I / (2R)}$

Substitute values:
B = (4π × 10^-7 × 50 × 3) / (2 × 0.1)
B = 9.42 × 10^-4 T

Q13. State Faraday's laws of electromagnetic induction. Explain how emf is induced when magnetic flux linked with a coil changes.

Answer:
First Law: Whenever magnetic flux linked with a coil changes, an emf is induced.
Second Law: The magnitude of induced emf is directly proportional to the rate of change of magnetic flux.

Formula: **$e = - d\Phi / dt$**

The negative sign shows the induced emf opposes the change (Lenz's Law).

Q14. Write the principle of a moving coil galvanometer. Why is a radial magnetic field used in it?

Answer:
Principle: It works on the principle that a current-carrying coil placed in a magnetic field experiences a torque.

Radial magnetic field is used so that **the torque remains proportional to current (uniform rotation)** at all positions of the coil.

Section D (5 Marks Each)

Q15. (a) Explain the working of a transformer with the help of a labeled diagram.
(b) Mention two sources of energy loss in a transformer and suggest methods to minimize them.

Answer:
Working: Based on **mutual induction**, a transformer transfers energy between two coils without direct contact.

Losses:

1. **Eddy Current Loss:** Reduced by laminating iron core.
2. **Hysteresis Loss:** Reduced by using soft iron.
3. **Copper Loss:** Reduced by using thick, low-resistance wires.

Q16. Using a ray diagram, derive the mirror formula for a concave mirror.

Answer:
Consider object AB, image A'B', mirror M.

Using geometry:
$1/f = 1/u + 1/v$
where:
f = focal length,
u = object distance,
v = image distance.

Q17. (a) What are semiconductors? Explain intrinsic and extrinsic types.
(b) With a diagram, explain the working of a p-n junction diode in forward bias condition.

Answer:
(a) Substances whose conductivity lies between conductors and insulators.

- **Intrinsic:** Pure semiconductor (Si or Ge).
- **Extrinsic:** Doped semiconductor to increase conductivity.

(b) **Forward Bias:** p-side connected to positive terminal.
Barrier decreases → current flows.

Section E (Numerical – 5 Marks Each)

Q18. A parallel plate capacitor with air as dielectric has plate area 0.2 m^2 and separation 0.01 m. It is connected to a 200 V supply.
Find:
(a) Capacitance
(b) Charge stored
(c) Energy stored
(d) Energy after inserting dielectric constant K = 5

Answer:

$C = \varepsilon_0 \times A / d$
$= 8.85 \times 10^{-12} \times 0.2 / 0.01$
$= 1.77 \times 10^{-10}$ F

$Q = C \times V = 1.77 \times 10^{-10} \times 200 = 3.54 \times 10^{-8}$ C

$U = 0.5 \times C \times V^2 = 0.5 \times 1.77 \times 10^{-10} \times 200^2 = 3.54 \times 10^{-6}$ J

With dielectric,
$C' = K \times C = 5 \times 1.77 \times 10^{-10} = 8.85 \times 10^{-10}$ F

$U' = 0.5 \times C' \times V^2 = 0.5 \times 8.85 \times 10^{-10} \times 200^2 = 1.77 \times 10^{-5}$ J

Section F (Case Study – 4 Marks)

Q19. A student constructs an optical fiber communication system to transfer data signals using light.

(a) Explain the principle of total internal reflection used in optical fibers.
(b) Write two advantages of optical fiber communication.
(c) What will happen if the refractive indices of the core and cladding are equal?

Answer:
(a) When light enters at an angle greater than the critical angle, it undergoes **total internal reflection**, allowing signal transmission.
(b) Advantages: **High speed, minimum signal loss, noise-free transmission.**
(c) If refractive indices are equal, **no reflection occurs**, hence signal fails.

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Thank You Note

With the completion of this book, I take a moment to express my heartfelt gratitude to everyone who has been a part of this journey.

To all the **students**, your curiosity, dedication, and perseverance are the true inspiration behind this work. Your continuous effort to learn, improve, and achieve excellence motivates the creation of every educational resource at SWAN India Publication.

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To my **family and friends**, thank you for your patience, encouragement, and unwavering faith. Your love and support have been my foundation throughout this journey.

Finally, to every reader holding this book — thank you for trusting it as a part of your preparation. May this guide strengthen your confidence, sharpen your understanding, and help you achieve the success you truly deserve in the **CBSE Class 12 Board Examination 2026**.

With sincere gratitude and best wishes,