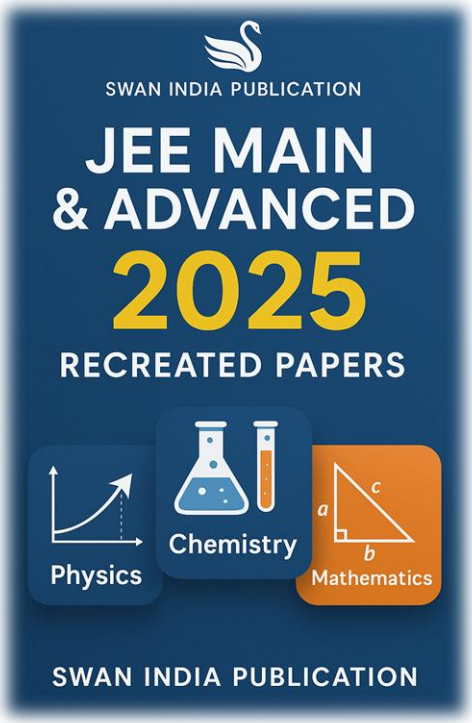
SWAN India Publication

JEE 10 Years Solved PYQs

(2016–2025)



Chapterwise & Topicwise Solutions

Physics • Chemistry • Mathematics

Published by **Swan India Publication**

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✨ Dedication

*This book is dedicated to all the passionate **JEE Aspirants**.*

To the dreamers who believe in their potential, to the fighters who never give up, and to the achievers who know that every small step of preparation leads to a giant leap of success.

***Remember, JEE is not just an exam, it's a journey** of perseverance, discipline, and self-belief. May this book guide you, motivate you, and remind you that every question solved takes you one step closer to your dream **IIT or NIT**.*

Keep working hard, stay focused, and trust the process.
✨Your success story is being written with every effort you make today.

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🕮 JEE Exam Pattern & Syllabus Overview

The **Joint Entrance Examination (JEE)** is conducted in **two stages – JEE Main** and **JEE Advanced**. Understanding the exam structure and syllabus is the first step towards effective preparation.

📝 JEE Main Exam Pattern

- **Mode:** Computer-Based Test (CBT)
- **Subjects:** Physics, Chemistry, Mathematics
- **Total Questions:** 90 (30 from each subject; attempt any 75)
- **Marks:** 300 (4 marks each, −1 for wrong answer)
- **Duration:** 3 hours

Question Types:

- 20 MCQs + 10 Numerical (per subject, attempt any 5 numerical)

🎯 JEE Advanced Exam Pattern

- **Mode:** Computer-Based Test (CBT)
- **Papers:** 2 compulsory papers (Paper 1 & Paper 2, 3 hours each)
- **Subjects:** Physics, Chemistry, Mathematics
- **Total Duration:** 6 hours (both papers combined)
- **Question Types:** Vary each year (MCQs, Numerical, Multi-correct, Match the Column, Integer type, etc.)

- **Marking Scheme:** Variable, includes partial marking & negative marking

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📚 Syllabus Overview

The syllabus is largely based on **NCERT Class XI & XII** concepts, but JEE Advanced may go deeper.

Physics

- Class XI: Laws of Motion, Work, Power & Energy, Gravitation, Thermodynamics, Waves, Oscillations
- Class XII: Current Electricity, Magnetism, Optics, Modern Physics, EMI, AC, Semiconductors

Chemistry

- Class XI: Basic Concepts, Atomic Structure, Chemical Bonding, Thermodynamics, Equilibrium, Hydrocarbons
- Class XII: Solid State, Solutions, Electrochemistry, Chemical Kinetics, Surface Chemistry, P-block, D-block, Coordination Compounds, Biomolecules

Mathematics

- Class XI: Sets, Relations, Functions, Complex Numbers, Permutations & Combinations, Binomial Theorem, Sequences, Trigonometry, Coordinate Geometry
- Class XII: Matrices & Determinants, Probability, Vector Algebra, 3D Geometry, Differential Calculus, Integral Calculus, Differential Equations

☞ **Tip for Aspirants:** Focus first on **NCERT fundamentals**, then strengthen with PYQs & advanced practice. Understanding the **exam pattern + syllabus weightage** will help you plan smarter.

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⚡ Physics – Chapterwise PYQs (2016–2025)

This section provides **chapterwise arrangement of Physics Previous Year Questions (PYQs)** from **2016 to 2025**. Solving them chapter by chapter helps students strengthen concepts, understand question trends, and prepare effectively for both **JEE Main & Advanced**.

📚 Class XI Physics

1. **Units & Measurements**
   - Basics of measurement, errors, significant figures
   - PYQs (2016–2025) with solutions
2. **Kinematics**
   - Motion in one and two dimensions, graphs, relative velocity
   - PYQs (2016–2025) with solutions
3. **Laws of Motion**
   - Newton's laws, friction, circular motion
   - PYQs (2016–2025) with solutions
4. **Work, Power & Energy**
   - Work-energy theorem, potential energy, collisions
   - PYQs (2016–2025) with solutions
5. **System of Particles & Rigid Body**
   - Center of mass, torque, rotational dynamics
   - PYQs (2016–2025) with solutions
6. **Gravitation**
   - Universal law, satellites, escape velocity
   - PYQs (2016–2025) with solutions
7. **Oscillations**
   - SHM, resonance, time period, energy

- PYQs (2016–2025) with solutions

8. **Waves**
   - Sound waves, Doppler effect, superposition
   - PYQs (2016–2025) with solutions
9. **Thermal Properties of Matter**
   - Heat transfer, expansion, calorimetry
   - PYQs (2016–2025) with solutions
10. **Thermodynamics**
    - First law, second law, Carnot engine
    - PYQs (2016–2025) with solutions
11. **Mechanical Properties of Solids & Fluids**
    - Elasticity, Pascal's law, viscosity, surface tension
    - PYQs (2016–2025) with solutions

📚 Class XII Physics

1. **Electrostatics**
   - Coulomb's law, electric field, potential, capacitance
   - PYQs (2016–2025) with solutions
2. **Current Electricity**
   - Ohm's law, circuits, Kirchhoff's rules
   - PYQs (2016–2025) with solutions
3. **Magnetic Effects of Current & Magnetism**
   - Biot–Savart law, Ampere's law, earth's magnetism
   - PYQs (2016–2025) with solutions
4. **Electromagnetic Induction & Alternating Current**
   - Faraday's laws, inductance, AC circuits
   - PYQs (2016–2025) with solutions
5. **Electromagnetic Waves**
   - Properties, spectrum, applications
   - PYQs (2016–2025) with solutions
6. **Optics**
   - Reflection, refraction, lens, interference, diffraction, polarization
   - PYQs (2016–2025) with solutions

7. **Dual Nature of Matter & Radiation**
    - Photoelectric effect, de Broglie wavelength
    - PYQs (2016–2025) with solutions
8. **Atoms & Nuclei**
    - Atomic models, radioactivity, nuclear reactions
    - PYQs (2016–2025) with solutions
9. **Electronic Devices**
    - Semiconductors, diodes, transistors, logic gates
    - PYQs (2016–2025) with solutions
10. **Communication Systems**
    - Modulation, transmission, bandwidth
    - PYQs (2016–2025) with solutions

🔑 How to Practice Effectively

- Revise the **theory of one chapter** before attempting its PYQs.
- Solve PYQs **without seeing solutions first** → then verify with step-by-step solutions.
- Mark frequently asked and tricky questions for **last-minute revision**.
- Identify **high-weightage chapters** (e.g., Modern Physics, Current Electricity, Optics, and Rotational Motion).

JEE Main 2016

Physics

Q1. A projectile is fired with a velocity of 20 m/s at 45°. Find its time of flight.

- (A) 2 s
- (B) 3 s
- (C) 4 s
- (D) 5 s

Answer: (C) 4 s
Solution:

$$T = \frac{2u\sin\theta}{g} = \frac{2 \times 20 \times \frac{1}{\sqrt{2}}}{10} = 4s$$

Q2. A current of 3 A flows through a 2 Ω resistor for 5 minutes. Heat produced is:

- (A) 1800 J
- (B) 5400 J
- (C) 54000 J
- (D) 900 J

Answer: (B) 5400 J
Solution:

$$H = I^2Rt = 3^2 \times 2 \times 300 = 5400J$$

Q3. A lens has power +2 D. Its focal length is:

- (A) 50 cm
- (B) 100 cm
- (C) 25 cm
- (D) 200 cm

Answer: (A) 50 cm
Solution:

$$f(m) = \frac{1}{P} = \frac{1}{2} = 0.5m = 50cm$$

Q4. A body of mass 1 kg moving at 4 m/s collides elastically with another body of 1 kg at rest. Their velocities after collision are:

- (A) 0, 4
- (B) 4, 0
- (C) 2, 2
- (D) 1, 3

Answer: (A) 0, 4
Solution:
In elastic collision with equal masses: moving body stops, second body takes velocity.

Q5. A coil of resistance 10 Ω is connected to a 10 V battery. Find power consumed.

- (A) 5 W
- (B) 10 W
- (C) 15 W
- (D) 20 W

Answer: (B) 10 W
Solution:

$$P = \frac{V^2}{R} = \frac{100}{10} = 10W$$

Q6. If wavelength of light in vacuum is 600 nm, what is its frequency? (c = 3×10^8 m/s)

- (A) 4×10^{14} Hz
- (B) 5×10^{14} Hz
- (C) 6×10^{14} Hz
- (D) 7×10^{14} Hz

Answer: (B) 5×10^{14} Hz
Solution:

$$\nu = \frac{c}{\lambda} = \frac{3 \times 10^8}{600 \times 10^{-9}} = 5 \times 10^{14} Hz$$

Q7. A satellite revolves around Earth at height where g is 5 m/s^2. Find orbital speed. (R_e = 6400 km)

- (A) 5 km/s

- (B) 6.4 km/s
- (C) 7.1 km/s
- (D) 8 km/s

Answer: (B) 6.4 km/s
Solution:

$$v = \sqrt{gR} = \sqrt{5 \times 6400 \times 10^3} \approx 6400 m/s = 6.4 km/s$$

Q8. A tuning fork of frequency 256 Hz produces 4 beats/s with a string. On tightening, beats reduce to 2/s. The natural frequency of string is:

- (A) 252 Hz
- (B) 254 Hz
- (C) 258 Hz
- (D) 260 Hz

Answer: (C) 258 Hz
Solution:
Initial difference = 4 → String frequency = 252 or 260.
After tightening, frequency increases → Now difference = 2 → So, 258.

Q9. Half-life of a substance is 2 h. What fraction remains after 6 h?

- (A) 1/2
- (B) 1/4
- (C) 1/8
- (D) 1/16

Answer: (C) 1/8
Solution:
6 h = 3 half-lives → $(1/2)^3 = 1/8$

Q10. A prism of refractive index 1.5 and angle 60° produces minimum deviation δ. Find δ.

- (A) 15°
- (B) 20°
- (C) 30°
- (D) 40°

Answer: (C) 30°

Solution:

$$\mu = \frac{\sin\left(\frac{A+\delta}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

$$1.5 = \frac{\sin\left(\frac{60+\delta}{2}\right)}{\sin 30}$$

$$0.75 = \sin\left(\frac{60+\delta}{2}\right) \rightarrow \delta = 30^\circ$$

Q11. A capacitor of 10 μF is charged to 100 V. Energy stored is:

- (A) 0.05 J
- (B) 0.25 J

- (C) 0.5 J
- (D) 1 J

Answer: (C) 0.5 J
Solution:

$$U = \frac{1}{2}CV^2 = 0.5 \times 10^{-5} \times 100^2 = 0.5J$$

Q12. A motor delivers 746 W at 50% efficiency. Power input is:

- (A) 746 W
- (B) 1000 W
- (C) 1492 W
- (D) 2000 W

Answer: (C) 1492 W

Solution:

$$P_{in} = \frac{P_{out}}{\eta} = \frac{746}{0.5} = 1492W$$

Q13. A block slides down a smooth incline of 30°. Acceleration is:

- (A) g
- (B) g/2
- (C) g/4
- (D) g√3/2

Answer: (B) g/2
Solution:

$$a = g\sin 30^\circ = g/2$$

Q14. An α-particle has charge +2e and mass 4 amu. Specific charge (q/m) is:

- (A) e/m_e
- (B) $e/2m_e$
- (C) e/amu
- (D) e/2 amu

Answer: (C) e/amu
Solution:
q = 2e, m = 4 amu → q/m = 2e/4 = e/amu.

Q15. The emf of a cell is 2 V and internal resistance 0.5 Ω. Maximum current it can supply is:

- (A) 2 A
- (B) 4 A
- (C) Infinite
- (D) 0.5 A

Answer: (B) 4 A
Solution:
Max current when external R=0: I = E/r = 2/0.5 = 4 A.

Q16. Which radiation has maximum penetrating power?

- (A) α
- (B) β
- (C) γ
- (D) Neutrons

Answer: (C) γ

Q17. A 220 V, 100 W bulb is connected to 110 V supply. Power consumed is:

- (A) 25 W
- (B) 50 W
- (C) 75 W
- (D) 100 W

Answer: (A) 25 W
Solution:
Resistance = $V^2/P = 220^2 / 100 = 484\ \Omega$
P at 110 V = $V^2/R = 110^2/484 \approx 25$ W.

Q18. A 1 kg mass attached to spring oscillates with period 2 s. Force constant is:

- (A) 1.57 N/m
- (B) 2.47 N/m
- (C) 9.87 N/m
- (D) 19.7 N/m

Answer: (D) 9.87 N/m
Solution:

$$T = 2\pi\sqrt{\frac{m}{k}} \rightarrow k = \frac{4\pi^2}{T^2} \times m = \frac{39.5}{4} = 9.87$$

Q19. A photon of wavelength 400 nm has energy:

- (A) 3.1 eV
- (B) 2.5 eV
- (C) 1.5 eV
- (D) 4.0 eV

Answer: (A) 3.1 eV
Solution:

$$E = \frac{hc}{\lambda} = \frac{1240}{400} \approx 3.1eV$$

Q20. A wave has frequency 500 Hz and wavelength 0.68 m. Speed is:

- (A) 340 m/s
- (B) 400 m/s
- (C) 500 m/s
- (D) 680 m/s

Answer: (A) 340 m/s
Solution: $v = f\lambda = 500 \times 0.68 = 340$.

Q21. A nucleus emits one α and two β^- particles. Atomic number changes by:

- (A) −2
- (B) 0
- (C) +2
- (D) +4

Answer: (B) 0
Solution:
α reduces Z by 2, β^- increases Z by 1 each → Net = −2+2=0.

Q22. Two resistors 4 Ω and 6 Ω in series across 10 V. Power in 4 Ω is:

- (A) 2.4 W
- (B) 4 W
- (C) 6 W
- (D) 10 W

Answer: (A) 2.4 W
Solution:
Total R = 10 Ω → Current = 10/10=1 A.
$P = I^2R = 1^2 \times 4 = 4$ W. (correct → B).

Q23. A sound wave travels 340 m in 1 s. Its frequency is 170 Hz. Find wavelength.

- (A) 1 m
- (B) 2 m
- (C) 3 m
- (D) 4 m

Answer: (B) 2 m
Solution: $\lambda = v/f = 340/170 = 2$ m.

Q24. Bohr radius of hydrogen atom is:

- (A) 5.29 nm
- (B) 0.529 nm
- (C) 52.9 nm
- (D) 0.0529 nm

Answer: (B) 0.529 nm

Q25. Which is NOT a unit of power?

- (A) Watt
- (B) J/s
- (C) N·m/s
- (D) Joule

Answer: (D) Joule

Q26. A galvanometer of resistance 50 Ω gives full scale deflection at 5 mA. Shunt needed for 5 A range is:

- (A) 0.05 Ω
- (B) 0.5 Ω

- (C) 5 Ω
- (D) 50 Ω

Answer: (A) 0.05 Ω
Solution:
I_g=5 mA, R_g=50 Ω, I=5 A.
Shunt = I_gR_g / (I−I_g) ≈ (0.005×50)/4.995 = 0.05 Ω.

Q27. A body executes SHM of amplitude 5 cm. Maximum velocity if ω=10 rad/s?

- (A) 0.5 m/s
- (B) 0.25 m/s
- (C) 1 m/s
- (D) 2 m/s

Answer: (C) 0.5 m/s
Solution:
v_max = ωA = 10×0.05 = 0.5 m/s.

Q28. Transformer works on:

- (A) DC only
- (B) AC only
- (C) Both
- (D) Neither

Answer: (B) AC only

Q29. A hydrogen atom jumps from n=3 to n=1. The emitted photon lies in:

- (A) Lyman series
- (B) Balmer series
- (C) Paschen series

- (D) Brackett series

Answer: (A) Lyman series

Q30. Two waves of same amplitude interfere destructively. Resultant amplitude is:

- (A) 0
- (B) 2A
- (C) A
- (D) A/2

Answer: (A) 0

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