jeeinfo
Your JEE Guide

CBSE Class XII · Physics (042)

Sample Question Paper 5 · Session 2026-27

Time allowed: 3 hours **Maximum marks: 70**

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission.
This is an original practice paper written to the official CBSE 2026-27 design; it is not issued by CBSE.

General instructions:

1. There are 33 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. Section A contains sixteen questions: twelve MCQs and four Assertion–Reasoning questions of 1 mark each. Section B contains five questions of two marks each, Section C seven questions of three marks each, Section D two case study based questions of four marks each and Section E three long answer questions of five marks each.
4. There is no overall choice. However, an internal choice has been provided in two questions in Section B, one question in Section C, and all three questions in Section E.
5. Use of calculators is not allowed.
6. You may use: $c = 3 \times 10^8$ m/s, $m_e = 9.1 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C, $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}, $h = 6.63 \times 10^{-34}$ J s, $\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 N^{-1} m^{-2}.

Section A

1.	The number of electrons that make up a charge of 1 C is about: (A) 1.6×10^{19} (B) 6.25×10^{-19} (C) 9×10^{9} (D) 6.25×10^{18}	1
2.	Electric field lines: (A) start on negative charges and end on positive charges (B) form closed loops (C) start on positive charges and end on negative charges (D) can cross each other	1
3.	The capacitance of an isolated conducting sphere of radius R is: (A) $4\pi\varepsilon_0 R^2$ (B) $4\pi\varepsilon_0 R$ (C) $\frac{R}{4\pi\varepsilon_0}$ (D) $\frac{4\pi\varepsilon_0}{R}$	1
4.	The mobility of charge carriers is defined as: (A) drift velocity per unit electric field (B) resistance per unit length (C) current per unit area (D) charge per unit volume	1

5.	A galvanometer is converted into an ammeter by connecting: (A) a high resistance in series (B) a high resistance in parallel (C) a low resistance in series (D) a low resistance in parallel	1
6.	The magnetic force on a charge at rest in a magnetic field is: (A) along the field (B) zero (C) qB (D) maximum	1
7.	The inductive reactance of a coil for direct current (f = 0) is: (A) zero (B) infinite (C) equal to its resistance (D) equal to L	1
8.	The average power used in a purely inductive AC circuit is: (A) $I^2 X_L$ (B) $\frac{1}{2} V_m I_m$ (C) zero (D) $V_{rms} I_{rms}$	1
9.	The wavelength range of visible light is about: (A) 400 nm to 700 nm (B) 1 mm to 700 nm (C) 1 nm to 10 nm (D) 10 nm to 400 nm	1
10.	A coin lies 6 cm below the surface of water (n = 4/3). Seen from above, it appears to be at a depth of: (A) 8 cm (B) 6 cm (C) 3 cm (D) 4.5 cm	1
11.	In Young's experiment, if red light is replaced by blue light (all else unchanged), the fringe width: (A) stays the same (B) increases (C) decreases (D) becomes zero	1
12.	The threshold wavelength of a metal of work function 2.48 eV is: (A) 620 nm (B) 500 nm (C) 248 nm (D) 400 nm	1
13.	**Assertion (A):** Two equipotential surfaces never intersect. **Reason (R):** Electric field lines are perpendicular to equipotential surfaces. (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A. (B) Both A and R are true but R is not the correct explanation of A. (C) A is true but R is false. (D) Both A and R are false.	1

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

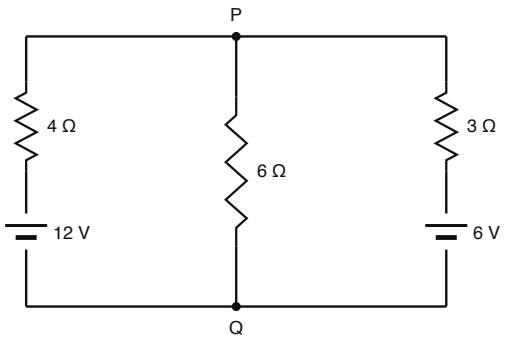
14.	**Assertion (A):** Alloys such as constantan are used to make standard resistors. **Reason (R):** Their resistivity changes very little with temperature. (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A. (B) Both A and R are true but R is not the correct explanation of A. (C) A is true but R is false. (D) Both A and R are false.	1
15.	**Assertion (A):** The magnetic field lines of a bar magnet form closed loops. **Reason (R):** Isolated magnetic poles (monopoles) do not exist. (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A. (B) Both A and R are true but R is not the correct explanation of A. (C) A is true but R is false. (D) Both A and R are false.	1
16.	**Assertion (A):** A ferromagnet loses its strong magnetism when heated above the Curie temperature. **Reason (R):** Above the Curie temperature the domains become more strongly aligned. (A) Both Assertion (A) and Reason (R) are true and R is the correct explanation of A. (B) Both A and R are true but R is not the correct explanation of A. (C) A is true but R is false. (D) Both A and R are false.	1

Section B

17.	Find the electric field at a point 20 cm from a short dipole of moment 2×10^{-9} C m, on its equatorial line. **OR** Capacitors of 2 μF and 3 μF are connected in parallel to a 100 V supply. Find the total charge and the total energy stored.	2
18.	A wire 2 m long with a cross-section of 0.5 mm^2 has a resistance of 4 Ω. Find the resistivity of its material.	2
19.	Two long parallel wires 10 cm apart carry currents of 5 A and 10 A in the same direction. Find the force on 1 m of either wire. Is it attractive or repulsive?	2
20.	An alternating emf is e = 200 sin 314t volts. Find its peak value, rms value and frequency. **OR** Why does a capacitor allow alternating current but block direct current?	2
21.	The radius of the first Bohr orbit of hydrogen is 0.53 Å. Find the radius of the third orbit and the energy of the electron in it.	2

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

Section C

22.	Charges of 5×10^{-8} C and -3×10^{-8} C are 16 cm apart. At what points on the line through them is the electric potential zero?	3
23.	Use Kirchhoff's rules to find the current in each branch of the circuit shown. The cells have negligible internal resistance.  	3
24.	Using Ampere's circuital law, find the magnetic field at distance r from a long straight wire carrying current I. Find the field 5 cm from a wire carrying 10 A.	3
25.	Derive an expression for the mutual inductance of two long coaxial solenoids of the same length l, with turns per unit length n_1 (inner, radius r_1) and n_2. **OR** A jet plane with a wing span of 25 m flies horizontally at 1800 km/h where the Earth's magnetic field is 5×10^{-4} T and the angle of dip is 30°. Find the emf between the wing tips.	3
26.	Two thin lenses of focal lengths +10 cm and −15 cm are placed in contact. Find the focal length and power of the combination, and the position of the image of an object 40 cm away.	3
27.	In Young's experiment, a beam containing wavelengths 650 nm and 520 nm is used. The slits are 2 mm apart and the screen is 1.2 m away. Find the least distance from the central maximum at which bright fringes of both wavelengths coincide.	3
28.	Light of photon energy 4 eV falls on a metal of work function 2 eV. (i) Find the maximum kinetic energy of the photoelectrons. (ii) What happens to it if the intensity is doubled? (iii) What happens if photons of 1.5 eV are used instead?	3

Section D

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

29.	**Case study.** A defibrillator delivers a quick burst of electrical energy to restart a heart. It stores the energy in a capacitor charged to a high voltage and then discharges it through the patient's chest in a few milliseconds. (i) Write the expression for the energy stored in a capacitor of capacitance C charged to V. *[1]* (ii) Find the energy stored when a 50 μF capacitor is charged to 2 kV. *[1]* (iii) If the charging voltage is doubled, the stored energy becomes: (A) twice (B) four times (C) half (D) unchanged *[1]* (iv) Why is a dielectric placed between the plates of such capacitors? *[1]*	4
30.	**Case study.** When a hydrogen atom falls from a higher to a lower energy level, it emits a photon. Transitions ending on n = 1 form the Lyman series, on n = 2 the Balmer series and on n = 3 the Paschen series. The energy of level n is $-13.6/n^2$ eV. (i) In which region of the spectrum does the Lyman series lie? (A) infrared (B) visible (C) ultraviolet (D) microwave *[1]* (ii) Which series lies partly in the visible region? *[1]* (iii) Find the longest wavelength in the Lyman series. *[1]* (iv) What is the ionisation energy of hydrogen in its ground state? *[1]*	4

Section E

31.	(a) Derive an expression for the electric potential at a distance r from a point charge q. (b) Charges of +4 μC and −4 μC are 10 cm apart. Find the potential and the electric field at the midpoint. **OR** (a) Derive the capacitance of a parallel plate capacitor with a dielectric slab of thickness t (t < d) and dielectric constant K placed between its plates. (b) Find it for A = 0.01 m², d = 5 mm, t = 2 mm, K = 4.	5
32.	(a) Draw the phasor diagram of a series LCR circuit and obtain expressions for its impedance and the phase angle. (b) In such a circuit R = 30 Ω, X_L = 70 Ω and X_C = 30 Ω, connected to a 200 V AC supply. Find the impedance, the current and the power factor. **OR** (a) With a labelled diagram, explain the construction and working of a transformer. (b) A transformer with 90% efficiency steps 2200 V down to 220 V and delivers 11 kW. Find the input power and the primary current.	5

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

33.	(a) What is total internal reflection? Derive the relation between the critical angle and refractive index. (b) Find the critical angle for light going from water (n = 4/3) into air. (c) Give one application of total internal reflection. **OR** (a) State Bohr's postulates for the hydrogen atom. (b) Using them, derive the expression for the radius of the nth orbit.	5

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

Answers and Marking Scheme

Marks for each step are shown in brackets. Any correct alternative method gets full credit.

Section A

1. **(D)** 6.25 × 10^{18}. *Working:* n = 1/(1.6 × 10^{-19}).

2. **(C)** start on positive charges and end on negative charges. *Working:* By convention lines go from + to −.

3. **(B)** $4\pi\varepsilon_0 R$. *Working:* C = Q/V with V = Q/(4πε$_0$R).

4. **(A)** drift velocity per unit electric field. *Working:* $\mu = v_d / E$.

5. **(D)** a low resistance in parallel. *Working:* The shunt carries most of the current.

6. **(B)** zero. *Working:* F = qvB sin θ with v = 0.

7. **(A)** zero. *Working:* $X_L = 2\pi f L$.

8. **(C)** zero. *Working:* cos ϕ = cos 90° = 0.

9. **(A)** 400 nm to 700 nm. *Working:* Standard range.

10. **(D)** 4.5 cm. *Working:* Apparent depth = real depth / n.

11. **(C)** decreases. *Working:* β ∝ λ and blue has a shorter wavelength.

12. **(B)** 500 nm. *Working:* λ_0 = 1240/2.48 nm.

13. **(B)** Both A and R are true but R is not the correct explanation of A. *Working:* Both are true, but the reason they never intersect is that a point cannot have two different potentials.

14. **(A)** Both Assertion (A) and Reason (R) are true and R is the correct explanation of A. *Working:* A low temperature coefficient keeps the resistance stable.

15. **(A)** Both Assertion (A) and Reason (R) are true and R is the correct explanation of A. *Working:* With no monopoles, lines cannot begin or end anywhere.

16. **(C)** A is true but R is false. *Working:* A is true. R is false: thermal agitation destroys the alignment and the material becomes paramagnetic.

Section B

17. $E = \frac{p}{4\pi\varepsilon_0 r^3}$ (1) $= \frac{9\times10^{9}\times2\times10^{-9}}{(0.2)^3} = 2250$ N/C, opposite to $\vec{p}$ (1).

OR C = 5 μF; Q = CV = 500 μC (1). U = ½CV² = 0.025 J (1).

18. $\rho = \frac{RA}{l}$ (1) $= \frac{4\times0.5\times10^{-6}}{2} = 1\times10^{-6}$ Ω m (1).

19. $F = \frac{\mu_0 I_1 I_2 L}{2\pi d} = \frac{2\times10^{-7}\times50\times1}{0.1}$ (1) $= 1\times10^{-4}$ N, attractive (1).

20. Peak 200 V; rms 200/√2 ≈ 141 V (1). ω = 314 rad/s, so f = 314/2π ≈ 50 Hz (1).

OR $X_C = \frac{1}{2\pi f C}$ (1). For DC, f = 0 and X_C is infinite, so no steady current flows; for AC, X_C is finite and the capacitor charges and discharges every cycle (1).

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

21. $r_n = n^2 r_1 = 9 \times 0.53 = 4.77$ Å (1). $E_3 = -\frac{13.6}{9} = -1.51$ eV (1).

Section C

22. Let the point be x cm from the positive charge. Between the charges: $\frac{5}{x} = \frac{3}{16-x}$, x = 10 cm (1½). Beyond the negative charge: $\frac{5}{x} = \frac{3}{x-16}$, x = 40 cm (1½).

23. With V the potential of P above Q: $\frac{12-V}{4} + \frac{6-V}{3} = \frac{V}{6}$ (1), giving $V = \frac{20}{3}$ V (1). Currents: $\frac{4}{3}$ A through the 12 V branch, $\frac{10}{9}$ A through 6 Ω, and $\frac{2}{9}$ A into the + terminal of the 6 V cell (1).

24. Take a circular loop of radius r around the wire; by symmetry B is tangential and constant: B(2πr) = $\mu_0 I$ (1), so $B = \frac{\mu_0 I}{2\pi r}$ (1). B = 2 × 10^{-7} × 10/0.05 = 4 × 10^{-5} T (1).

25. Current I_2 in the outer solenoid gives B = $\mu_0 n_2 I_2$ inside it (1). Flux linked with the inner solenoid: $N_1\Phi_1 = (n_1 l)(\mu_0 n_2 I_2)\pi r_1^2$ (1). $M = \mu_0 n_1 n_2 \pi r_1^2 l$ (1).

OR v = 500 m/s (½). Vertical component $B_V = B\sin 30^\circ = 2.5 \times 10^{-4}$ T (1). $\varepsilon = B_V l v$ = 2.5 × 10^{-4} × 25 × 500 ≈ 3.1 V (1½).

26. $\frac{1}{F} = \frac{1}{10} - \frac{1}{15} = \frac{1}{30}$, F = 30 cm, P ≈ +3.3 D (1½). $\frac{1}{v} = \frac{1}{30} - \frac{1}{40}$, v = 120 cm on the other side (1½).

27. Need $n\lambda_1 = m\lambda_2$: 4 × 650 = 5 × 520 = 2600 nm (1½). $y = \frac{4\lambda_1 D}{d} = \frac{2600\times10^{-9}\times1.2}{2\times10^{-3}} = 1.56$ mm (1½).

28. (i) 4 – 2 = 2 eV (1). (ii) It is unchanged; only the number of electrons increases (1). (iii) No electrons are emitted, since 1.5 eV is less than the work function (1).

Section D

29. (i) $U = \frac{1}{2}CV^2$.
(ii) ½ × 50 × 10^{-6} × $(2000)^2$ = 100 J.
(iii) (B) four times.
(iv) It increases the capacitance and allows a higher voltage without breakdown, so more energy can be stored in a small size.

30. (i) (C) ultraviolet.
(ii) The Balmer series.
(iii) n = 2 → 1: ΔE = 10.2 eV, λ = 1240/10.2 ≈ 122 nm.
(iv) 13.6 eV.

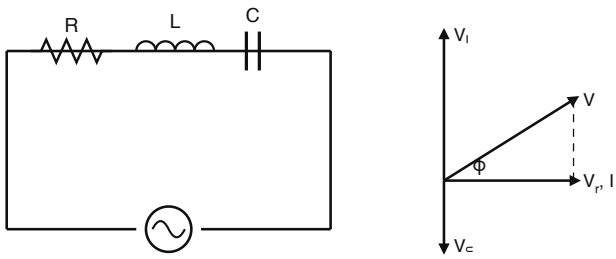
Section E

31. (a) $V = -\int_\infty^r \vec{E}\cdot d\vec{r} = -\int_\infty^r \frac{q}{4\pi\varepsilon_0 r^2}dr = \frac{q}{4\pi\varepsilon_0 r}$ (3). (b) V = 0 at the midpoint (1). $E = 2 \times \frac{9\times10^9\times4\times10^{-6}}{(0.05)^2} \approx 2.9\times10^7$ N/C, towards the negative charge (1).

OR (a) The field is E_0 in air and E_0/K in the slab (1); $V = E_0(d-t) + \frac{E_0}{K}t$ (1); $C = \frac{\varepsilon_0 A}{d - t + t/K}$ (1).
(b) $C = \frac{8.85\times10^{-12}\times0.01}{3\times10^{-3}+0.5\times10^{-3}} \approx 25$ pF (2).

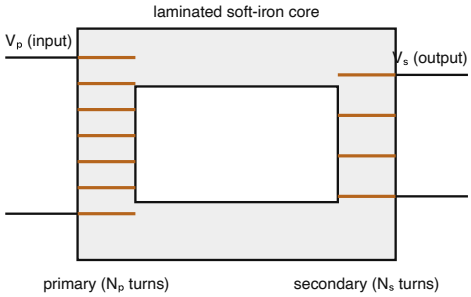
32. (a) Circuit and phasors (1):

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.



$V^2 = V_R^2 + (V_L - V_C)^2$, so $Z = \sqrt{R^2 + (X_L - X_C)^2}$ (1); $\tan\varphi = \frac{X_L - X_C}{R}$ (1). (b) Z = √(30² + 40²) = 50 Ω; I = 4 A; cos ϕ = 30/50 = 0.6 (2).

OR (a) Diagram (1):



Two coils on a laminated soft-iron core; an AC current in the primary produces a changing flux that links the secondary and induces an emf; $\frac{V_s}{V_p} = \frac{N_s}{N_p}$ (2). (b) Input = 11 kW / 0.9 ≈ 12.2 kW; $I_p = \frac{12\,222}{2200} \approx 5.6$ A (2).

33. (a) When light travels from a denser to a rarer medium at an angle greater than the critical angle, it is entirely reflected back (1). At the critical angle r = 90°, so n sin C = 1 and sin C = 1/n (1). (b) sin C = 3/4, C ≈ 48.6° (2). (c) Optical fibres, or totally reflecting prisms, or the sparkle of diamonds (1).

OR (a) Electrons move in certain stable orbits without radiating; only orbits with angular momentum nh/2π are allowed; radiation is emitted only when an electron jumps between orbits, $h\nu = E_i - E_f$ (3). (b) $\frac{mv^2}{r} = \frac{e^2}{4\pi\varepsilon_0 r^2}$ and $mvr = \frac{nh}{2\pi}$ give $r_n = \frac{n^2 h^2 \varepsilon_0}{\pi m e^2}$ (2).

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.