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UP BOARD • PREVIOUS 10 YEARS' QUESTION PAPERS

Class 12 (Intermediate) Physics

All ten years in one book — every paper in full, questions only, as printed in the original papers.

Class 12 (Intermediate)
Subject: Physics
Years covered: 2017–2026 | Papers inside: 4 of 10 years
Maximum marks: 70

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Rebuilt in KAMALDNP design for practice. Content identical to the source papers; see Rebuild Notes at the end of each paper. Years not yet found are listed plainly in the Contents — no paper is ever faked.

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Contents

One paper per year, newest first. A year marked “Not found yet” means no complete, verified copy of that year’s paper has been found so far — it will be added when one is verified. 2021 had no board exams.

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2026	346 DX	27 February 2026	70	3
2025	346 JW	date not stated in source	70	8
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2023	346 BS	1 March 2023	70	17
2022	—	Not found yet	—	—
2021	—	No board exams were held (COVID-19)	—	—
2020	—	Not found yet	—	—
2019	—	Not found yet	—	—
2018	—	Not found yet	—	—
2017	—	Not found yet	—	—

Source: third-party transcriptions of the original UP Board papers (no official UP Board previous-year archive exists). English text only; the originals are bilingual (Hindi + English).

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UP BOARD • CLASS 12 (INTERMEDIATE)

Class 12 Physics 2026

Set 346 DX — 3 hours 15 minutes — Maximum Marks: 70

Exam: 27 February 2026, 2:00 PM – 5:15 PM | Time allowed: 3 hours 15 minutes | Maximum marks: 70 | Total questions: 30

General Instructions

1. 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 is of multiple choice type and each question carries 1 mark.
4. Section B is of very short answer type and each question carries 1 mark.
5. Section C is of short answer type-I and carries 2 marks each.
6. Section D is of short answer type-II and carries 3 marks each.
7. Section E is of long answer type. Each question carries 5 marks. In all four questions of this section internal choices have been given. You have to do only one question from the choices given in the question.
8. The symbols used in the question paper have usual meaning.

> **Note:** General instructions follow the standard UP Board format as printed on the 2025 paper; the 2026 transcription source did not carry them.

Section A

Multiple Choice Questions — 1 mark each

Q. 1 In the followings, dimension of electric field is: **[1 mark]**

(A) $[M\ L\ T^{2}\ A]$ (B) $[M\ L\ T^{-1}\ A^{-1}]$
(C) $[M\ L\ T^{-3}\ A^{-1}]$ (D) $[M\ L^{2}\ T^{-3}\ A^{-1}]$

Q. 2 In photoelectric emission, the frequency of incident light is doubled. Kinetic energy of emitted photoelectrons will become: **[1 mark]**

(A) double (B) somewhat more than double
(C) less than double (D) four times

Q. 3 Two resistances are connected in parallel. Equivalent resistance of combination is 6/5 Ω. When one resistance is broken out, resistance becomes 2 Ω. The resistance of broken wire was: **[1 mark]**

(A) 2/5 Ω (B) 2 Ω (C) 3 Ω (D) 5/2 Ω

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Q. 4 Following charged particles are projected perpendicular to a uniform magnetic field with same velocity. Which one will experience maximum force? **[1 mark]**

(A) electron (B) proton (C) α particle (D) deuteron

Q. 5 In L–C–R circuit power factor will be 1, if: **[1 mark]**

(A) $\omega L = \omega C$ (B) $\omega L = 1/\omega C$
(C) $(\omega L - 1/\omega C) = R$ (D) None of these

Q. 6 Convex lens of focal length f_1 is placed in contact with a concave lens of focal length f_2. For $f_1 > f_2$ combination will behave: **[1 mark]**

(A) like a concave lens (B) like a convex lens
(C) like a plane glass slab (D) none of these

Section B

Very Short Answer Questions — 1 mark each

Q. 7 On increasing temperature of a semiconductor, what will be effect on its conductivity? **[1 mark]**

Q. 8 In a nuclear fusion reaction mass defect is 0.2%. What will be amount of energy released in the fusion of 1 kg mass? **[1 mark]**

Q. 9 What is the phenomena of radioactivity? **[1 mark]**

Q. 10 Explain the meaning of work function of a photosensitive surface. **[1 mark]**

Q. 11 Electric field lines do not intersect. Why? **[1 mark]**

Q. 12 Radiation of some definite frequency are either absorbed or emitted by the atoms. Explain the reason. **[1 mark]**

Section C

Short Answer Type-I — 2 marks each

Q. 13 An object is placed between centre of curvature and infinity in front of a concave mirror. Draw ray diagram for image. **[2 marks]**

Q. 14 State Gauss' law in electrostatics. Charge inside a Gaussian surface is zero. Comment on the electric field intensity at each point of the surface. **[2 marks]**

Q. 15 Explain the meaning of the electrical capacity of a conductor. How capacity of a conductor can be increased? **[2 marks]**

Q. 16 What are isotone nuclei? In a nucleus average mass of nucleons is 1.67×10^{-27} kg. Find the density of nucleus. [Given $R_0 = 1.2\times10^{-15}$ m.] **[2 marks]**

Section D

Short Answer Type-II — 3 marks each

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Q. 17 An atom makes a transition on receiving energy from an external source, as shown in the figure. Depict the lines of possible spectrum and calculate the wavelength of any two spectral lines. (Energy levels: n = 1 at 0, n = 2 at 4.86 eV, n = 3 at 6.67 eV, n = 4 at 8.80 eV.) **[3 marks]**

> **Figure:** Energy-level diagram of an atom: n = 1 at 0, n = 2 at 4.86 eV, n = 3 at 6.67 eV, n = 4 at 8.80 eV. (Diagram not reproduced; energy levels as printed in the source.)

Q. 18 Give formula for power loss in an alternating circuit. Find the e.m.f. of source in the circuit and the phase difference between resultant potential and the current flowing in the circuit. (Series R-L-C driven by an AC source with V_r = 40 V across the resistor, V_l = 50 V across the inductor and V^c = 20 V across the capacitor.) **[3 marks]**

> **Figure:** Series R-L-C circuit diagram. (Diagram not reproduced.)

Q. 19 Find the formula for the couple acting on a magnetic dipole placed in a magnetic field. On its basis, define magnetic dipole moment. **[3 marks]**

Q. 20 What are matter waves? Write the de-Broglie formula for matter waves. The de-Broglie wavelength for a photon and an electron are same. Which will have greater energy? **[3 marks]**

Q. 21 Write down the difference between displacement current and conduction current. The equation of an electromagnetic wave is $B_Y = 2\times10^{-7}\sin(500x + 1.5\times10^{11}t)$ Tesla. Find the equation of the electric field of the wave, the direction of propagation and the wavelength of the wave. **[3 marks]**

Q. 22 What is the need of doping of intrinsic semiconductors? Ideal diodes are used in the given circuits. Find the value of current in both the circuits. **[3 marks]**

> **Figure:** Two circuits using ideal diodes. (Diagrams not reproduced; circuit topology was not given in the source text.)

Q. 23 State the important characteristics of electromagnetic waves. **[3 marks]**

Q. 24 How can a galvanometer be converted into a voltmeter? Explain with the help of a circuit diagram. **[3 marks]**

Q. 25 Option 1: Write the 'lens maker' formula for a thin lens. The refractive index of the material of a thin lens is n and its focal length is f. The lens is placed in a medium of refractive index n. Find the focal length of the lens in the medium. **[3 marks]**

— OR —

Option 2: What is the difference between unpolarized and polarized light? Two polaroids A and B are placed such that light polarized by A cannot pass through B. Can some light be obtained by using a third polaroid?

Q. 26 Define current density ($\vec{J}$) and write its unit. Prove that $\vec{J} = \sigma\vec{E}$, where σ is the specific conductivity (conductivity) of the conductor and $\vec{E}$ the electric field inside the conductor. **[3 marks]**

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Section E

Long Answer Questions — 5 marks each (attempt any one option in each question)

Q. 27 Option 1: Write down the definition of electric dipole moment. Derive the formula for the electric field intensity at an axial point of an electric dipole. **[5 marks]**

> **Figure:** Combination of capacitors connected across a 22 V supply, containing capacitors of 4 μF, 2 μF, 1 μF, 2 μF, 1 μF and 12 μF. (Diagram not reproduced; network topology was not given in the source text.)

— OR —

Option 2: In the given combination of capacitors (connected across a 22 V supply), find out (i) the total capacitance, (ii) the charge on the 4 μF capacitor and (iii) the total stored energy. The network contains capacitors of 4 μF, 2 μF, 1 μF, 2 μF, 1 μF and 12 μF.

Q. 28 Option 1: Depict the series and the parallel combination of cells. When is the series and when is the parallel combination suitable? A cell of e.m.f. E and internal resistance r is connected with an external resistance R. Draw a graph between the voltage V across R and the current i flowing in it. **[5 marks]**

— OR —

Option 2: State Ampere's circuital law and, on its basis, find the formula for the magnetic field produced at a point due to an infinitely long straight current-carrying wire. A current of 10^{-4} A flows in a rectangular coil of dimensions 1.0 cm × 1.5 cm. The plane of the coil is parallel to a magnetic field of 0.6 N/A m. The coil has 30 turns. Calculate the torque acting on the coil.

Q. 29 L, C and R are connected in series with an alternating current source. When will there be resonance in the circuit? What will be the nature of impedance during resonance? **[5 marks]**

— OR —

State the Faraday's laws of electromagnetic induction. Define self induction, state the Lenz's law regarding direction of self induced current. In a coil, due to change of current at the rate of 1 A/s an e.m.f. of 1 V is produced. What will be the coefficient of self inductance of the coil?

Q. 30 Derive the formula $n/v - 1/u = (n - 1)/R$ due to refraction of light on a spherical surface. **[5 marks]**

— OR —

Draw a circuit diagram of p-n junction full wave rectifier and describe its working. Also, give the graphical representation of input and output current.

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Rebuild Notes

This paper was rebuilt in KAMALDNP design from a third-party transcription of the original UP Board paper. Questions, order and marks are as printed in the source; answers and solutions are not included. Where the transcription was unclear or contradicted the Hindi original, the point is flagged below.

1. Q25 carries an OR choice inside Section D, although the source article states internal choice is only in Section E — reproduced as printed.
2. Figures in Q17 (energy-level diagram), Q18 (R-L-C circuit), Q22 (ideal-diode circuits) and Q27 (capacitor network) were placeholder images in the source; the diagrams themselves are not reproduced — a figure note with the data given in the text is printed instead.

Source (third-party transcription): https://collegedunia.com/articles/e-737-up-board-class-12-physics-question-paper-2026-set-346-dx-with-solutions

English text only. The original paper is bilingual (Hindi + English); a Hindi side is a follow-up round, not this one. No official UP Board previous-year archive exists, so every paper in this volume is third-party-source.

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UP BOARD • CLASS 12 (INTERMEDIATE)

Class 12 Physics 2025

Set 346 JW — 3 hours — Maximum Marks: 70

Time allowed: 3 hours | Maximum marks: 70 | Total questions: 30

General Instructions

1. 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 is of multiple choice type and each question carries 1 mark.
4. Section B is of very short answer type and each question carries 1 mark.
5. Section C is of short answer type-I and carries 2 marks each.
6. Section D is of short answer type-II and carries 3 marks each.
7. Section E is of long answer type. Each question carries 5 marks. In all four questions of this section with internal choices have been given. You have to do only one question from the choices given in the question.
8. The symbols used in the question paper have usual meaning.

Section A

Multiple Choice Questions — 1 mark each

Q. 1(a) A charge q enters with speed v in the direction of magnetic field B. The force on the charge in magnetic field will be: **[1 mark]**

(A) qvB/2 (B) qvB (C) 2qvB (D) zero

Q. 1(b) Electrostatic force between two point charges placed in a medium of dielectric constant k is F_1. On changing the medium, electrostatic force between the charges becomes F_2. Dielectric constant of the medium will be: **[1 mark]**

(A) $F_1/(kF_2)$ (B) $F_2/(kF_1)$ (C) kF_1/F_2 (D) F_1F_2/k

Q. 1(c) A concave lens of focal length −18 cm is placed in contact with a convex lens of focal length +12 cm. The focal length of the combination will be: **[1 mark]**

(A) 36 cm (B) −36 cm (C) 48 cm (D) −48 cm

Q. 1(d) Resistance of an ideal p-n junction diode in reverse bias is: **[1 mark]**

(A) zero
(B) infinite
(C) in between zero and infinite
(D) none of these

Q. 1(e) Resistivity of a conducting wire depends on: **[1 mark]**

(A) the length of the wire
(B) the resistance of the wire
(C) the material of the wire
(D) the thickness of the wire

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Q. 1(f) On connecting a cell of e.m.f. 1.5 volt* with an external resistance of 1.9 Ω, the current flowing is 0.75 A. The internal resistance of the cell is: **[1 mark]**

(A) 0.5 ohm (B) 0.2 ohm (C) 0.1 ohm (D) 0.6 ohm

Section B

Very Short Answer Questions — 1 mark each

Q. 2(a) Write down Einstein's equation for the photoelectric effect. **[1 mark]**

Q. 2(b) Write de-Broglie formula for the wavelength of matter waves. **[1 mark]**

Q. 2(c) Equation of electric field of a plane electromagnetic wave is given as: $E_u = 60 \sin(500x + 1.5 \times 10^{11}t)$ V/m. Write the equation for the magnetic field of the wave. **[1 mark]**

Q. 2(d) In an alternating circuit, the reading of the voltmeter is 220 V. Write the peak value of the voltage. **[1 mark]**

Q. 2(e) Do two equipotential surfaces intersect each other? Answer with reason. **[1 mark]**

Q. 2(f) On which principle does a nuclear reactor work? **[1 mark]**

Section C

Short Answer Type-I — 2 marks each

Q. 3(a) What is the meaning of electrical capacity of a conductor? Find the unit of the electrical capacity of the conductor. **[2 marks]**

Q. 3(b) Write down the equation for Lorentz force. An electron passes undeviated from a place where an electric field 5×10^4 V/m and magnetic field of 5×10^{-2} weber/m^2 are applied. Calculate the velocity of the electron. **[2 marks]**

Q. 3(c) Explain the meaning of binding energy of a nucleus. Write the dependency of binding energy per nucleon on the mass number of the nucleus. **[2 marks]**

Q. 3(d) Give pictorial representation of polarized and unpolarised light. Polarizing angle for a transparent medium is 60°. Find the value of angle of refraction and refractive index of the medium. **[2 marks]**

Section D

Short Answer Type-II — 3 marks each

Q. 4(a) Name the waves of longest wavelength and highest frequency in the given electromagnetic waves — microwaves, X-rays, radio waves, and γ-rays. What is meant by displacement current? **[3 marks]**

Q. 4(b) What is the meaning of stationary orbit of atom? Deriving formula for the energy of the electron in the stationary orbit of the hydrogen atom, mention its relation with the radius of the orbit of electron. **[3 marks]**

Q. 4(c) Define magnetic dipole. Obtain expression for torque on magnetic dipole in magnetic field. **[3 marks]**

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Q. 4(d) With the help of the given circuit, find out the total resistance of the circuit and the current flowing through the cell. **[3 marks]**

> **Figure:** Circuit diagram. (Diagram not reproduced; circuit topology was not given in the source text.)

Q. 4(e) What is an astronomical telescope? Draw ray diagram for an astronomical telescope when final image is formed at infinity. **[3 marks]**

Q. 5(a) State Gauss's law in electrostatics. On the basis of it, obtain the formula for the electric field produced due to a plane charged plate. **[3 marks]**

Q. 5(b) Explain the working method of p-n junction diode in reverse bias with the help of a circuit diagram. **[3 marks]**

Q. 5(c) In A.C. circuits, what is the difference between impedance and reactance? Write the formula for power factor in L-C-R circuit. **[3 marks]**

Q. 5(d) Which nature of light is supported by Young's double slit experiment? The light used in Young's double slit experiment contains two wavelengths, 6000 Å and 5000 Å. Separation between the slits is 10^{-3} m and the screen is at a distance of 1 m from the slits. Find minimum distance from the central maxima where bright fringes for both the wavelengths are coincident. **[3 marks]**

— OR —

What is photoelectric effect? What nature of light does it show? For a metal, the threshold frequency is 3.3×10^{14} Hz*. If the frequency of incident light is 8.2×10^{14} Hz, what will be the stopping potential? Calculate work function of the metal also.

Q. 5(e) Derive the formula for the capacitance of a parallel plate capacitor partially filled with a dielectric medium between the plates. **[3 marks]**

Section E

Long Answer Questions — 5 marks each (attempt any one option in each question)

Q. 6 With the help of given circuit, find out: (i) Equivalent capacity of the combination (ii) Charge on capacitor C_1 (iii) Total stored energy of the combination. **[5 marks]**

> **Figure:** Capacitor circuit diagram. (Diagram not reproduced; circuit topology was not given in the source text.)

— OR —

What is meant by magnetic effect of electric current? Derive the expression for the force acting between two parallel current-carrying conducting wires. On this basis, define the unit of electric current 'ampere'.

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Q. 7 State Huygens' principle of secondary wavelets. With the help of this principle, explain the laws of reflection of light. **[5 marks]**

— OR —

Mention the most important conclusion of Rutherford's alpha-particle scattering experiment. Define isotopic, isobaric, and isotonic nuclei. Find the energy equivalent to one atomic mass unit in joules and MeV (1 u = 1.6605×10^{-27} kg).

Q. 8 Explain the difference between self-inductance and mutual inductance. Define the coefficient of self-inductance and coefficient of mutual inductance. A plane coil of area 100 cm^2 is rotating in a magnetic field of 2 weber/m^2 with angular velocity 20 rad/s. What will be the maximum induced electromotive force in the coil? **[5 marks]**

— OR —

State Kirchhoff's law related to electrical circuits. In the given metre bridge, balance point is obtained at D. On connecting a resistance of 12 ohm parallel to S, balance point shifts to D′. Find the values of resistances R and S.

Q. 9 On the basis of energy band diagram in solids, explain the difference between conductor, semiconductor, and insulator. What is the need of doping in pure semiconductors? Write the value of current in the ideal diodes D_1 and D_2 in the given circuit. **[5 marks]**

> **Figure:** Circuit with ideal diodes D_1 and D_2. (Diagram not reproduced; circuit topology was not given in the source text.)

— OR —

Write down the formula for refraction of light from a spherical surface and with the help of this, derive the relation $1/f = (n - 1)(1/R_1 - 1/R_2)$ for a thin lens. Also show that, the focal length for concave lens will be negative.

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Rebuild Notes

This paper was rebuilt in KAMALDNP design from a third-party transcription of the original UP Board paper. Questions, order and marks are as printed in the source; answers and solutions are not included. Where the transcription was unclear or contradicted the Hindi original, the point is flagged below.

1. Q1(f): the transcription prints e.m.f. “0.5 volt”, which is physically impossible with the given 1.9 ohm and 0.75 A (it would give a negative internal resistance) and contradicts the Hindi original, which says 1.5 V. Printed as 1.5 V (marked *); with 1.5 V the internal resistance is 0.1 ohm, option (C).
2. Q4(c) is absent from the English transcription altogether; its text is taken from the Hindi original (PYQ Vault): “Define magnetic dipole. Obtain expression for torque on magnetic dipole in magnetic field.”
3. Q5(c): the English transcription says “impedance and resistance”; the Hindi original says “impedance and reactance” (प्रतिघात). Printed as reactance.
4. Q5(d) OR: the English transcription gives the threshold frequency as 2.3×10^{14} Hz; the Hindi original gives 3.3×10^{14} Hz. Printed as 3.3×10^{14} Hz (marked *).
5. Q1(b) option (D): the transcription lays the fraction out ambiguously; rendered as F_1F_2/k.
6. Figures in Q4(d) (circuit), Q6 (capacitor circuit), Q8 OR (metre bridge) and Q9 (diode circuit) were not given in the source text — a figure note is printed instead.
7. Exam date: the source PDF does not state the 2025 Physics exam date, so no date is printed on the paper.

Source (third-party transcription): https://image-static.collegedunia.com/public/image/UP_Board_Class_12_Physics_346_JW_2025_Question_Paper_with_Solutions_1381a9e610aebf1f9e221c3f4e8b057c.pdf

Cross-checked against: https://www.pyqvault.com/question-papers/up-board-12/physics/2025-346-jw

English text only. The original paper is bilingual (Hindi + English); a Hindi side is a follow-up round, not this one. No official UP Board previous-year archive exists, so every paper in this volume is third-party-source.

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UP BOARD • CLASS 12 (INTERMEDIATE)

Class 12 Physics 2024

Set 346 FS — 3 hours 15 minutes — Maximum Marks: 70

Exam: 4 March 2024, 2:00 PM – 5:15 PM | Time allowed: 3 hours 15 minutes | Maximum marks: 70 | Total questions: 30

General Instructions

1. 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 is of multiple choice type and each question carries 1 mark.
4. Section B is of very short answer type and each question carries 1 mark.
5. Section C is of short answer type-I and carries 2 marks each.
6. Section D is of short answer type-II and carries 3 marks each.
7. Section E is of long answer type. Each question carries 5 marks. In all four questions of this section internal choices have been given. You have to do only one question from the choices given in the question.
8. The symbols used in the question paper have usual meaning.

> **Note:** General instructions follow the standard UP Board format as printed on the 2025 paper; the 2024 transcription source did not carry them.

Section A

Multiple Choice Questions — 1 mark each

Q. 1 The Louis de Broglie wavelength of a particle having kinetic energy E is: **[1 mark]**

(A) $\lambda = h/\sqrt{(2mE)}$ (B) $\lambda = h/\sqrt{(mE)}$ (C) $\lambda = \sqrt{(2mE)}/h$ (D) $\lambda = \sqrt{(mE)}/h$

Q. 2 If drift velocity of electron be vd and intensity of electric field E, then which relation among the following obeys Ohm's law? **[1 mark]**

(A) $v_d \propto E^2$ (B) v_d = Constant
(C) $v_d \propto E$ (D) $v_d \propto \sqrt{(E)}$

Q. 3 The path of scattered α-particle is: **[1 mark]**

(A) Circular (B) Parabolic (C) Elliptical (D) Hyperbolic

Q. 4 The maximum focal length of convex lens is for: **[1 mark]**

(A) Blue light (B) Green light (C) Red light (D) Yellow light

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Q. 5 The power consumed in alternating current in a circuit containing only a capacitor will be: **[1 mark]**

(A) P = −1 (B) P = 0

(C) P = +1 (D) None of the above

Q. 6 Force of 80 Newton works between two point charges placed at a fixed distance apart in air. When these charges are placed at the same distance apart in a dielectric medium, then the force of 8 Newton works on it. The dielectric constant of the medium will be: **[1 mark]**

(A) K = −10 (B) K = 10 (C) K = 0.01 (D) K = −0.01

Section B

Very Short Answer Questions — 1 mark each

Q. 7 Find the ratio of the focal length of lens in air and that of lens when it is immersed in liquid. **[1 mark]**

Q. 8 In hydrogen atom, what is the ionization potential of the electron in the ground state? **[1 mark]**

Q. 9 Write the definition and dimensional formula of electrical conductivity. **[1 mark]**

Q. 10 Which value of current does the ammeter used in A.C. circuit measure? **[1 mark]**

Q. 11 How much charge is there on a hole? Draw the circuit symbol of p-n junction diode. **[1 mark]**

Q. 12 Between radio waves and microwaves, which one has a higher frequency? **[1 mark]**

Section C

Short Answer Type-I — 2 marks each

Q. 13 Define the mass defect and binding energy of nucleus. **[2 marks]**

Q. 14 A double concave lens has to be made from crown glass. How much should the radii of surfaces of lens be kept to make the power of lens −2.5 D? Refractive index of crown glass is 1.65. **[2 marks]**

Q. 15 Explain the operation of p-n junction diode in forward bias. **[2 marks]**

Q. 16 What is the effect on range and sensitivity of an ammeter when the value of its shunt resistance increases? **[2 marks]**

Section D

Short Answer Type-II — 3 marks each

Q. 17 If a thin prism of glass is immersed in water, then prove that the minimum deviation produced by the prism becomes one-fourth with respect to air. Given refractive index of glass with respect to air = 3/2 and that of water with respect to air = 4/3. **[3 marks]**

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Q. 18 Discuss the significance of displacement current and find the phase difference between it and the conduction current. **[3 marks]**

Q. 19 Explain nuclear fission and nuclear fusion with examples. **[3 marks]**

Q. 20 A plastic ball P of mass 3.2×10^{-15} kg is suspended between two horizontal parallel charged plates in a balanced state. How many electrons on the ball will be increased or decreased? ($g = 10\ m/s^2$) **[3 marks]**

Q. 21 What are electromagnetic waves? Draw their propagation diagram. Show the electric field amplitude and magnetic field amplitude in propagation diagram. **[3 marks]**

Q. 22 Define interference. Mention the condition for constructive and destructive interference. **[3 marks]**

Q. 23 The atomic mass of ^{16}O is 16.0000 amu. Calculate its binding energy per nucleon. Mass of electron = 0.00055 amu, mass of proton = 1.007593 amu, mass of neutron = 1.008982 amu, and 1 amu = 931 MeV. **[3 marks]**

Q. 24 Determine the nature of force acting between two parallel current-carrying conductors when: (i) Current is in the same direction in conductors, (ii) Current is in the opposite direction in conductors. **[3 marks]**

Q. 25 Establish the relation between resistances of arms of Wheatstone bridge in balanced condition. **[3 marks]**

— OR —

The resistance of a wire is 16 ohms. By melting it, the wire is stretched to half of its original length. What will be the resistance of the new wire?

Q. 26 Obtain the expression for capacity of a parallel plate capacitor. How will the capacity of the capacitor be increased? **[3 marks]**

Section E

Long Answer Questions — 5 marks each (attempt any one option in each question)

Q. 27 Option 1: What is Bohr's quantum condition postulate? How is it explained by de Broglie? What are the shortcomings of Bohr's atomic model? **[5 marks]**

— OR —

Option 2: Energy of a particle at absolute temperature T is of the order of kT. Calculate the wavelength of thermal neutrons at 27°C. Find the energy of a photon having the same wavelength. Here, k is the Boltzmann constant.

Q. 28 Option 1: By drawing a ray diagram, explain the formation of image in a compound microscope. Establish the formula for magnifying power for it. **[5 marks]**

— OR —

Option 2: In a circuit, the equation for alternating voltage V is represented by $V = 40 \sin(100\pi t)$ volt. Here t is in seconds. Draw the time-voltage (t-V) graph with proper scale for one cycle. Calculate the root mean square value of voltage.

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Q. 29 Option 1: What is atomic model of magnetism? Differentiate between paramagnetic, diamagnetic, and ferromagnetic substances on this basis. Also, give one example of each. **[5 marks]**

— OR —

Option 2: There is minimum deviation of light ray on passing through a prism (n = √(3)). If the angle of incidence is twice the angle of refraction for this ray, then what will be the angle of prism and the angle of refraction?

Q. 30 Option 1: Compare features of p-type and n-type semiconductors. Draw circuit diagram of half-wave rectifier of p-n junction diode and explain it. **[5 marks]**

— OR —

Option 2: State Gauss's Law in electrostatics. Using it (i) find electric field due to a point source charge q and (ii) deduce Coulomb's law between source charge q and test charge q_0.

Rebuild Notes

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1. Q5 options are as printed in the original (P = −1, 0, +1, None of the above); confirmed against the text solutions PDF.
2. Q25 carries an OR choice inside Section D, although the source article states internal choice is only in Section E — reproduced as printed.
3. Q23 gives the atomic mass of ^{16}O as 16.0000 amu with no subscript 8 in the source transcription; reproduced as printed.
4. Figures in Q21 (propagation diagram), Q28 (compound microscope ray diagram and t-V graph) and Q30 (half-wave rectifier circuit) were diagrams in the original; the diagrams themselves are not reproduced.

Source (third-party transcription): https://collegedunia.com/articles/e-737-up-board-class-12-physics-question-paper-2024-code-346-fs

Cross-checked against: https://images.collegedunia.com/public/image/UP_Board_2024_Class_12th_Physics_346_FS_Solutions_4898d2b329a306d8dc0586d933cba825.pdf

English text only. The original paper is bilingual (Hindi + English); a Hindi side is a follow-up round, not this one. No official UP Board previous-year archive exists, so every paper in this volume is third-party-source.

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UP BOARD • CLASS 12 (INTERMEDIATE)

Class 12 Physics 2023

Set 346 BS — 3 hours 15 minutes — Maximum Marks: 70

Exam: 1 March 2023, 2:00 PM – 5:15 PM | Time allowed: 3 hours 15 minutes | Maximum marks: 70 | Total questions: 30

General Instructions

1. 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 is of multiple choice type and each question carries 1 mark.
4. Section B is of very short answer type and each question carries 1 mark.
5. Section C is of short answer type-I and carries 2 marks each.
6. Section D is of short answer type-II and carries 3 marks each.
7. Section E is of long answer type. Each question carries 5 marks. In all four questions of this section internal choices have been given. You have to do only one question from the choices given in the question.
8. The symbols used in the question paper have usual meaning.

> **Note:** General instructions follow the standard UP Board format as printed on the 2025 paper; the 2023 transcription source did not carry them.

Section A

Multiple Choice Questions — 1 mark each

Q. 1 The dielectric constant (k) of silver is **[1 mark]**

(A) k = 0
(B) k = +1
(C) k = −1
(D) k = ∞ (infinity)

Q. 2 N-P-N transistor is arranged as in the following figure. This circuit is of **[1 mark]**

(A) common-base amplifier
(B) common-emitter amplifier
(C) common-collector amplifier
(D) none of these

Q. 3 What will be the refractive index of a thin prism material if its refracting angle and angle of deviation are the same? **[1 mark]**

(A) 1.5
(B) 2.0
(C) 1.33
(D) 0 (zero)

Q. 4 The equation $^{4}_{1}H \rightarrow {}^{4}_{2}He + 2\beta^{0} + Q$ represents **[1 mark]**

(A) nuclear fission
(B) nuclear fusion
(C) nuclear disintegration
(D) none of these

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Q. 5 Among the following, which one is not the fundamental particle? **[1 mark]**

(A) Positron (B) Electron (C) α-particle (D) Neutrino

Q. 6 Resistance R, inductance L and capacitor C are connected in series. The frequency of the alternating current source is n and resonant frequency is n_r. Under which condition does the current lag behind the voltage? **[1 mark]**

(A) $n = 0$ (B) $n < n_r$ (C) $n = n_r$ (D) $n > n_r$

Section B

Very Short Answer Questions — 1 mark each

Q. 7 Write any two main features of electromagnetic waves. **[1 mark]**

Q. 8 What is meant by threshold wavelength? **[1 mark]**

Q. 9 What will be the effect on focal length and nature of convex lens of refractive index n = 3/2 dipped in a liquid of refractive index n = 3/2? **[1 mark]**

Q. 10 What is meant by the current gain (β) of a transistor? **[1 mark]**

Q. 11 Calculate the charge on nucleus $^{14}_{7}N$ in coulomb. **[1 mark]**

Q. 12 Define 1 henry of self-inductance. **[1 mark]**

Section C

Short Answer Type-I — 2 marks each

Q. 13 An electron of energy 45 eV is revolving in a circular path in magnetic field of intensity 9×10^{-5} weber/m². Find the radius of the circular path. **[2 marks]**

Q. 14 A particle of mass m and charge q traverses distance d from rest in a uniform electric field E. Prove that the velocity v attained by the particle is $v = \sqrt{(2qEd/m)}$. **[2 marks]**

Q. 15 The magnifying power of a telescope is 9. When it is adjusted for parallel rays, the distance between the eye lens and objective is 20 cm. Determine the focal lengths of both the lenses. **[2 marks]**

Q. 16 What are meant by ohmic and non-ohmic resistances? Draw the graph between voltage and current for a non-ohmic circuit and define dynamic resistance. **[2 marks]**

Section D

Short Answer Type-II — 3 marks each

Q. 17 Classify nuclei on the basis of atomic number and mass number and define them. **[3 marks]**

Q. 18 What is a NOR gate? Draw its logic symbol and obtain the truth table. **[3 marks]**

Q. 19 The equations of current and voltage in a circuit are as follows: $i = 3.5 \sin(628t + \pi/6)$ ampere, $v = 28 \sin(628t - \pi/6)$ volt. Find: (i) Root mean square value of current, (ii) Time period, (iii) Phase difference between current and voltage. **[3 marks]**

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Q. 20 Write four main properties of γ-rays. Whose wavelength is larger among γ-rays and ultraviolet rays? **[3 marks]**

Q. 21 On suspending a magnet at 30° with the magnetic meridian, it makes an angle of 45° with the horizontal. What will be the actual angle of dip? **[3 marks]**

Q. 22 Equiconcave lens of crown glass has to be made. How much radii of the surfaces of the lens should be kept so that its power would be −2.5 D? The refractive index of crown glass is 1.65. **[3 marks]**

Q. 23 What is a transistor? By drawing the circuit diagram of common emitter configuration, plot the output characteristics. **[3 marks]**

Q. 24 Define the formula for the resonant frequency in a series L-C-R alternating current circuit. **[3 marks]**

Q. 25 Explain Bohr's model of the atom. **[3 marks]**

Q. 26 The energy of an electron of excited hydrogen atom is −3.4 eV. Determine the angular momentum of the electron. **[3 marks]**

Section E

Long Answer Questions — 5 marks each (attempt any one option in each question)

Q. 27 Option 1: Obtain the formula for refractive index of material of prism in terms of angle of minimum deviation and angle of prism. **[5 marks]**

— OR —

Option 2: Explain both the laws of Kirchhoff of electrical circuits.

Q. 28 Option 1: What is the meaning of matter-wave of Louis de Broglie? Deduce the relation for wavelength of de Broglie in terms of kinetic energy. **[5 marks]**

— OR —

Option 2: Derive the formula for the capacitance of a parallel plate capacitor, partially filled with a dielectric.

Q. 29 Option 1: Draw the energy level diagram for hydrogen atom. Show the transitions of Lyman, Balmer, Paschen, Brackett and Pfund series in the diagram. In which region do these spectrum lie? **[5 marks]**

— OR —

Option 2: What do you understand by electromagnetic induction? State Faraday's laws regarding electromagnetic induction.

Q. 30 Option 1: What is the meaning of wavefront? Explain the laws of reflection by explaining Huygens' principle of wavefront. **[5 marks]**

— OR —

Option 2: What is LED? Explain its principle, construction and working.

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1. Q4: the equation is printed as $^{4}_{1}H \rightarrow {}^{4}_{2}He + 2\beta^{0} + Q$ in both the article and the text solutions PDF; reproduced as printed.
2. Q11: the source article renders the nucleus as "^{7}_()N^{14}"; corrected to $^{14}_{7}N$ — the text solutions PDF confirms the nucleus is nitrogen-14 (atomic number 7).
3. Q19: the source article drops the brackets around the sine arguments; restored as i = 3.5 sin(628t + π/6) ampere, v = 28 sin(628t − π/6) volt.
4. Q29: "In which region do these spectrum lie?" is as printed in both the article and the text solutions PDF; reproduced as printed.
5. Figures in Q2 (N-P-N transistor circuit), Q16 (V–I graph), Q18 (NOR gate logic symbol), Q23 (common-emitter circuit) and Q29 (hydrogen energy-level diagram) were diagrams in the original; the diagrams themselves are not reproduced.

Source (third-party transcription): https://collegedunia.com/news/e-737-up-board-class-12-physics-question-paper-2023-with-answer-key-march-1-code-346-bs

Cross-checked against: https://image-static.collegedunia.com/public/image/UP_Board_Class_12_Physics_346_BS_2023_Question_Paper_with_Solutions_c785513c39b60a6abaadb527ed4f6101.pdf

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