CBSE · CLASS 12 · PHYSICS

CBSE Class 12 Physics Important Questions 2027

61 question patterns that repeated across past papers · the years show every time each was asked

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Electric Charges and Fields

1. Field of an infinite charged plane sheet (Gauss)

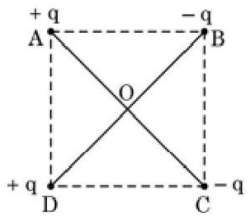
Asked 2× · Board 2026, Sample 2025 · 3 marks

(a) Using Gauss's law, deduce an expression for electric field at a point due to a uniformly charged infinite plane thin sheet. (b) Two large thin plane sheets, each having surface charge density sigma, are held close and parallel to each other in air. What is the net electric field at a point (i) inside and (ii) outside, the sheets?

2. Derive equatorial field of a dipole

Asked 2× · Board 2023, Board 2026 · 5 marks

(i) Derive an expression for the electric field at a point on the equatorial plane of an electric dipole consisting of charges q and -q separated by a distance 2a. (ii) The distance of a far off point on the equatorial plane of an electric dipole is halved. How will the electric field be affected for the dipole? (iii) Two identical electric dipoles are placed along the diagonals of a square ABCD of side sqrt(2) m as shown in the figure. Obtain the magnitude and direction of the net electric field at the centre (O) of the square.



55/1/1 Page 19 of 27 P.T.O.

Electrostatic Potential and Capacitance

3. Derive capacitance with a dielectric slab (t<d)

Asked 2× · Sample 2025, Sample 2026 · 3/5 marks

(A) A dielectric slab of thickness t, is introduced between the plates of parallel plate capacitor of area A and separation d (where t<d). Find an expression for the capacitance with the dielectric slab. (B) A copper sphere of capacitor C is dropped in ocean. Will the capacitance of the sphere increase, decrease or remain same? Justify. (C) A capacitor is connected across a source of potential difference V and then the separation 'd' between the plates is increased using insulating stick. Plot 'V' vs 'd' graph for the given capacitor. [For VI Candidates (C): A capacitor is connected across potential difference V and is then separation between plates 'd' is increased using insulating stick. Will the energy stored in capacitor increase or decrease? Justify]

4. Ratio of surface fields of two connected spheres (MCQ)

Asked 2× · Board 2026, Sample 2025 · 1 marks

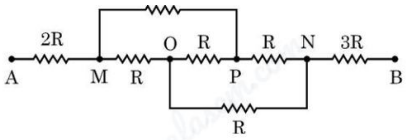
A conducting wire connects two charged metallic spheres A and B of radii r_1 and r_2 respectively. The distance between the spheres is very large compared to their radii. The ratio of electric fields, (E_A/E_B) at the surfaces of spheres A and B will be (A) r_1/r_2 (B) r_2/r_1 (C) r_1^2/r_2^2 (D) r_2^2/r_1^2

Current Electricity

5. Derive Wheatstone bridge balance condition

Asked 3× · Board 2024, Board 2026, Sample 2025 · 3/5 marks

(a) Obtain the condition of balance of a Wheatstone bridge. (b) Find net resistance of the network of resistors connected between A and B, as shown in figure.

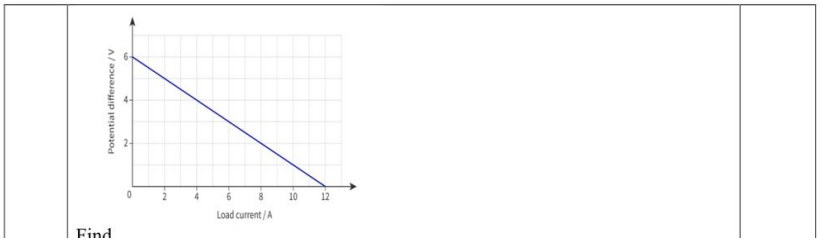


23. A parallel plate capacitor of capacitance C has a dielectric slab between its plates. It is charged to a potential difference V by connecting it across a battery. The battery is then disconnected. If the dielectric slab is now

6. Find emf/internal resistance from terminal-voltage data

Asked 3× · Board 2023, Board 2025, Sample 2026 · 1/2 marks

The following graph shows the potential difference across the terminals of a cell against its load current. [graph: potential difference (V) versus load current (A)] Find, (I) the emf of the cell and (II) the internal resistance of the cell. [For VI candidates: Find the relation between internal resistance, emf, external resistance and the total current in the circuit?]



7. Resistance change on stretching a wire

Asked 2× · Board 2025, Sample 2025 · 1/3 marks

(i) A conductor of length l is connected across an ideal cell of emf E. Keeping the cell connected, the length of the conductor is increased to 2l by gradually stretching it. If R and R' are initial and final values of resistance and v_d and v_d' are initial and final values of drift velocity, find the relation between (i) R' and R and (ii) v_d' and v_d. (ii) When electrons drift in a conductor from lower to higher potential, does it mean that all the 'free electrons' of the conductor are moving in the same direction?

8. Two cells in parallel: equivalent emf, r and current

Asked 2× · Board 2025, Board 2026 · 3/5 marks

(a) Two cells of emf E_1 and E_2 with internal resistances r_1 and r_2 respectively, are connected in parallel by connecting their positive terminals together and negative terminals together. Deduce an expression for equivalent emf and equivalent internal resistance of the combination. (b) A parallel combination, as stated in (a) above, of two cells of emfs E and 3E and internal resistances R each is connected across a resistance 2R. Find the current that flows through resistance 2R.

9. Derive current-drift velocity relation

Asked 2× · Board 2024, Board 2026 · 2/3 marks

What is the order of magnitude of drift velocity of electrons in a conductor? Deduce the relation between the current flowing through a conductor and drift velocity of electrons in it.

Moving Charges and Magnetism

10. Convert a galvanometer into an ammeter (shunt resistance)

Asked 3× · Board 2024, Board 2026, Sample 2026 · 1/5 marks

[case context: moving coil galvanometer conversion.] A galvanometer with coil of resistance 20 ohm shows full scale deflection for a current of 5 mA. To convert it into an ammeter of range (0 – 10 A), a resistance of (A) 0.05 ohm should be connected in series with it. (B) 0.05 ohm should be connected in parallel with it. (C) 0.01 ohm should be connected in parallel with it. (D) 0.01 ohm should be connected in series with it.

11. Magnetic field of a current-carrying wire (uniform cross-section) via Ampere's law

Asked 2× · Board 2026, Sample 2025 · 1 marks

A long straight wire of circular cross-section (radius a) carries a steady current I. The current is uniformly distributed across this cross-section. The magnitude of the magnetic field produced at a point at a distance (a/2) from the axis of the wire will be (A) Zero (B) mu_0 I/(2 pi a) (C) mu_0 I/(4 pi a) (D) mu_0 I/(6 pi a)

12. Current sensitivity vs voltage sensitivity of a galvanometer

Asked 2× · Board 2026, Sample 2025 · 1 marks

[case context: moving coil galvanometer converted to ammeter/voltmeter with suitable resistances.] The best way to increase current sensitivity of a galvanometer is by (A) increasing number of turns of the coil (B) increasing area of coil and magnetic field strength (C) decreasing area of coil and magnetic field strength (D) increasing torsional constant of the hair spring

13. Force between two parallel current-carrying wires / define the ampere

Asked 2× · Board 2023, Sample 2026 · 2/5 marks

Write an expression for the magnetic force per unit length between two parallel thin current carrying wires. Hence define one ampere.

14. Radial magnetic field gives constant torque / linear scale

Asked 2× · Board 2025, Board 2026 · 1 marks

[case context: A galvanometer detects/measures small currents; it works on the deflecting torque on a current-carrying coil in a magnetic field, related to current, number of turns, coil area and field; a hair spring gives a counter torque; it can be converted to an ammeter or voltmeter using suitable resistances.] The torque on the coil remains constant irrespective of the coil's orientation during rotation due to (A) use of soft iron core which increases the magnetic field. (B) radial magnetic field (C) hair spring which provides the counter torque (D) eddy current in the iron core which causes damping.

15. Force on a current-carrying wire in vector magnetic field (F = I L x B)

Asked 2× · Board 2024, Board 2025 · 1 marks

A 1 cm segment of a wire lying along x-axis carries current of 0.5 A along +x direction. A magnetic field B = (0.4 mT) j^ + (0.6 mT) k^ is switched on, in the region. The force acting on the segment is: (A) (2 j^ + 3 k^) mN (B) (-3 j^ + 2 k^) muN (C) (6 j^ + 4 k^) mN (D) (-4 j^ + 6 k^) muN

16. Biot-Savart: field of a circular loop on axis and at centre

Asked 2× · Board 2023, Board 2025 · 3/5 marks

Using Biot-Savart law, derive expression for the magnetic field (B) due to a circular current carrying loop at a point on its axis and hence at its centre.

Magnetism and Matter

17. Magnetic field-line behaviour in dia- vs paramagnetic materials

Asked 2× · Board 2023, Sample 2026 · 1/2 marks

Draw a diagram representing the behaviour of magnetic field lines for (A) diamagnetic & (B) paramagnetic substance. [For VI-Candidates: State Gauss's law of magnetism? Hence find the magnetic flux linked with the sphere enclosing a current carrying solenoid?]

Electromagnetic Induction

18. Maximum emf of a coil rotating in a magnetic field (numerical)

Asked 2× · Board 2023, Sample 2026 · 1/3 marks

A conducting coil of 50 turns and area 5/pi cm^2 is rotating along the axis of solenoid of length 50cm and 2000 turns, carrying current of 5 A. What will be the value of maximum emf generated?

19. Self-inductance of a solenoid (derive / apply to find turns)

Asked 2× · Board 2025, Board 2026 · 1/5 marks

(a) State Faraday's law of electromagnetic induction. (b) Derive an expression for the self-inductance of an air-filled long solenoid of length l and cross-sectional area A having N turns. (c) A conducting rod of length 50 cm, with one end pivoted, is rotated with angular speed of 60 rpm in a uniform magnetic field of 4.0 mT directed perpendicular to the plane of rotation of rod. Find the emf induced in the rod.

Alternating Current

20. Transformer: working, turns/current ratio and energy-conservation numerical

Asked 3× · Board 2024, Board 2026, Sample 2025 · 5 marks

(a) Draw a labelled diagram of a step-up transformer. State the principle on which it works and obtain the ratio of secondary voltage to primary voltage in terms of number of turns and currents in the two coils. (b) The ratio of the number of turns in the primary to the secondary of an ideal transformer is 1 : 5. If 5 kW power at 200 V is supplied to the primary, find (i) current in the primary, and (ii) output voltage.

21. Voltage across the inductor when the capacitor is short-circuited

Asked 2× · Board 2026, Sample 2025 · 1 marks

In a series LCR circuit, the voltage across the resistor, capacitor and inductor is 10 V each. If the capacitor is short circuited, the voltage across the inductor will be (A) 10 V (B) 5√2 V (C) 5/√2 V (D) 10√2 V

22. Average power in an AC circuit (P = (1/2) v0 i0 cos phi)

Asked 2× · Board 2024, Board 2025 · 1/3 marks

A voltage $v = v_0 \sin \omega t$ applied to a circuit drives a current $i = i_0 \sin(\omega t + \phi)$ in the circuit. The average power consumed in the circuit over a cycle is: (A) Zero (B) $i_0 v_0 \cos \phi$ (C) $i_0 v_0 / 2$ (D) $(i_0 v_0 / 2) \cos \phi$

23. Derive impedance of a series AC circuit using a phasor diagram

Asked 2× · Board 2023, Board 2024 · 3/5 marks

(i) A resistor and a capacitor are connected in series to an ac source $v = v_m$ sin omega t. Derive an expression for the impedance of the circuit. (ii) When does an inductor act as a conductor in a circuit? Give reason for it. (iii) An electric lamp is designed to operate at 110 V dc and 11 A current. If the lamp is operated on 220 V, 50 Hz ac source with a coil in series, then find the inductance of the coil.

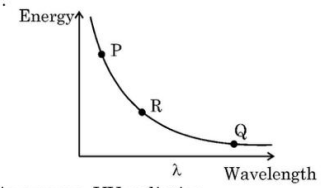
Electromagnetic Waves

24. Order/compare EM spectrum regions by energy & wavelength

Asked 2× · Board 2025, Sample 2026 · 1 marks

The given diagram exhibits the relationship between the wavelength of the electromagnetic waves and the energy of photon associated with them. The three points P, Q and R marked on the diagram may correspond respectively to: (A) X-rays, microwaves, UV radiation (B) X-rays, UV radiation, microwaves (C) UV radiation, microwaves, X-rays (D) Microwaves, UV radiation, X-rays

respectively to : 1



(A) X-rays, microwaves, UV radiation
(B) X-rays, UV radiation, microwaves
(C) UV radiation, microwaves, X-rays
(D) Microwaves, UV radiation, X-rays

4

25. Identify EM spectrum region from its use/application

Asked 2× · Board 2022, Board 2026 · 1/3 marks

Electromagnetic waves used in a diagnostic tool in medicine have a wavelength range (A) 1 nm to 10^{-3} nm (B) 400 nm to 1 nm (C) 1 mm to 700 nm (D) 0.1 m to 1 mm

Ray Optics and Optical Instruments

26. Compound microscope ray diagram & magnification numerical

Asked 3× · Board 2022, Sample 2025, Sample 2026 · 3/5 marks

A compound microscope consists of an objective lens of focal length 0.82 cm and an eyepiece lens of focal length 2.9 cm. An object is placed 0.91 cm from the objective lens. The image is formed at the near point (25 cm) from the eye. (I) Calculate the angular magnification of the microscope. (II) Draw the ray diagram of compound microscope in normal adjustment.

27. Telescope ray diagram & angular magnification

Asked 3× · Board 2022, Board 2026, Sample 2025 · 3/5 marks

(a) Draw the ray diagram to show the image formation by a refracting telescope and write the expression for angular magnification for the telescope in normal adjustment. (b) Give two reasons to explain why a reflecting telescope is preferred over a refracting telescope.

28. Derive lens maker's formula (+ application)

Asked 2× · Board 2026, Sample 2026 · 5 marks

(a) Using the relation for refraction at a curved spherical surface, derive the expression for lens maker's formula. (b) Three lenses L_1, L_2 and L_3, each of focal length 40 cm, are placed coaxially. The distance between L_1 and L_2 and between L_2 and L_3 are 120 cm and 20 cm respectively. An object is kept at a distance of 80 cm to the left of lens L_1. Find the distance of the final image formed from the object.

29. Derive prism relation (A+delta=i+e) & minimum deviation

Asked 2× · Board 2024, Sample 2026 · 5 marks

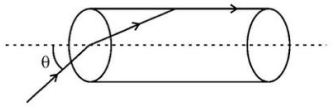
(A) Define angle of deviation in a prism? (B) Obtain the relation A+delta=i+e for a prism where A is the angle of prism, delta is the angle of deviation, i is the angle of incidence and e is the angle of emergence. Write this relation for the minimum deviation? (C) Write the condition for minimum deviation.

30. Critical angle / grazing incidence - find angle or refractive index

Asked 2× · Board 2025, Sample 2025 · 2/3 marks

A transparent solid cylindrical rod (refractive index 2/sqrt(3)) is kept in air. A ray of light incident on its face travels along the surface of the rod, as shown in figure. Calculate the angle theta.

ray of light incident on its face travels along the surface of the rod, as shown in figure. Calculate the angle θ. **2**

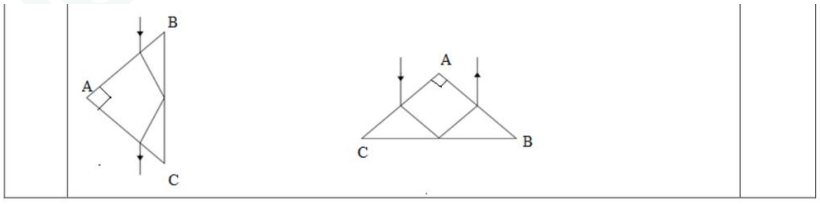


30. Prove that, in Bohr model of hydrogen atom, the time period of revolution

31. Trace/identify ray path through prism undergoing TIR

Asked 2× · Board 2023, Sample 2026 · 1 marks

A glass prism has internal angles of 45°, 45° and 90°. The glass has a critical angle of 45°. Which of the following ray diagrams depicts the possible path of the light through the prism? [options (A), (B), (C), (D) are ray diagrams]



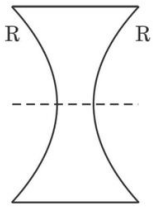
** Please note that the assessment scheme of the Academic Session 2024-25 will continue in the current session i.e. 2025-26.*

32. Lens cut perpendicular to principal axis - focal length/power of each half

Asked 3× · Board 2022, Board 2024, Board 2025 · 1 marks

[case context] Refraction at a spherical surface and lens-power passage. An equiconcave lens of focal length 'f' is cut into two identical parts along the dotted line (perpendicular to the principal axis) as shown in the figure. The focal length of each part will be: (i) f/4; (ii) f/2; (iii) f; (iv) 2f.

each part will be :



... f

33. Why reflecting/Cassegrain telescope is preferred

Asked 2× · Board 2023, Sample 2025 · 2/3 marks

(I) Draw a ray diagram for the formation of image by a Cassegrain telescope. (II) Why these types of telescopes are preferred over refracting type telescopes? (Write 2 points)

34. Image by refraction at a single spherical surface

Asked 2× · Board 2022, Sample 2025 · 1 marks

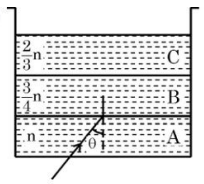
A point object is placed at the centre of a glass sphere of radius 6 cm and refractive index 1.5. The distance of virtual image from the surface of the sphere is (A) 2 cm (B) 4 cm (C) 6 cm (D) 12 cm

35. Define TIR and state its conditions

Asked 2× · Board 2023, Board 2026 · 2/3 marks

(a) State the two conditions under which total internal reflection occurs. (b) A transparent container contains layers of three immiscible transparent liquids A, B and C of refractive indices n, (3/4)n and (2/3)n, respectively. A laser beam is incident at the interface between A and B at an angle theta as shown in figure. Prove that the beam does not enter region C at all for sin theta ≥ 2/3.

(b)



A transparent container contains layers of three immiscible

3 2

36. Power of combination of two thin lenses in contact

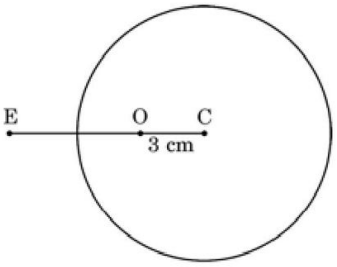
Asked 2× · Board 2022, Board 2024 · 1 marks

[case context] Lens power P = 1/f; lenses in contact add algebraically. — Two convex lenses of focal lengths 60 cm and 20 cm are held coaxially in contact with each other. The power of the combination is: (A) 6.6 D (B) 15 D (C) (1/15) D (D) (1/80) D

37. Refraction-at-spherical-surface relation (identify/derive)

Asked 2× · Board 2022, Board 2023 · 1/5 marks

(i) A spherical surface of radius of curvature R separates two media of refractive indices n_1 and n_2. A point object is placed in front of the surface at distance u in medium of refractive index n_1 and its image is formed by the surface at distance v, in the medium of refractive index n_2. Derive a relation between u and v. (ii) A solid glass sphere of radius 6.0 cm has a small air bubble trapped at a distance 3.0 cm from its centre C as shown in the figure. The refractive index of the material of the sphere is 1.5. Find the apparent position of this bubble when seen through the surface of the sphere from an outside point E in air.



Wave Optics

38. Coherent sources - conditions for interference

Asked 2× · Board 2026, Sample 2026 · 1 marks

Four independent waves are expressed as (i) $y_1 = A_1$ sin omega t (ii) $y_2 = A_2$ sin 2 omega t (iii) $y_3 = A_3$ cos omega t (iv) $y_4 = A_4$ sin(omega t + pi/3). The interference between two of these waves is possible in (A) (i) and (iii) only (B) (iii) and (iv) only (C) (i), (iii) and (iv) only (D) All of them

39. Two-wavelength fringe coincidence in YDSE

Asked 2× · Board 2026, Sample 2025 · 2 marks

In a Young's double-slit experimental set-up with slit separation 0.6 mm a beam of light consisting of two wavelengths 440 nm and 660 nm is used to obtain interference pattern on a screen kept 1.5 m in front of the slits. Find the least distance of the point from the central maximum where the bright fringes due to both the wavelengths coincide.

40. Resultant intensity at a given path difference (YDSE)

Asked 2× · Board 2025, Sample 2025 · 2 marks

In a Young's double-slit experiment, two light waves, each of intensity I_0, interfere at a point, having a path difference lambda/8 on the screen. Find the intensity at this point.

41. Fringe width & angular width numerical (YDSE)

Asked 2× · Board 2023, Board 2025 · 5 marks

(i) (1) What are coherent sources? Why are they necessary for observing a sustained interference pattern? (2) Lights from two independent sources are not coherent. Explain. (ii) Two slits 0.1 mm apart are arranged 1.20 m from a screen. Light of wavelength 600 nm from a distant source is incident on the slits. (1) How far apart will adjacent bright interference fringes be on the screen? (2) Find the angular width (in degree) of the first bright fringe.

42. Huygens' principle - refraction & verify Snell's law

Asked 2× · Board 2022, Board 2023 · 2/3 marks

Using Huygens' principle, draw a ray diagram showing the propagation of a plane wave refracting at a plane surface separating two media. Also verify Snell's law of refraction.

Dual Nature of Radiation and Matter

43. Work function / stopping potential numerical

Asked 3× · Board 2026, Sample 2025 · 1/2 marks

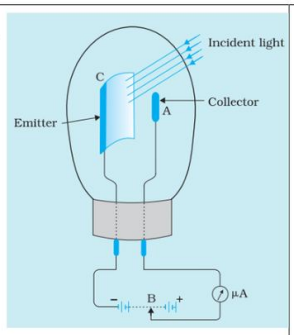
In a photoelectric experiment, the emitter plate is irradiated with radiation of 200 nm. The photocurrent becomes zero when the collector plate potential is −0.80 V. Calculate the work function (in eV) of the emitter.

44. Condition/threshold for photoemission

Asked 2× · Sample 2025, Sample 2026 · 1/2 marks

[case context: photoelectric effect — light of suitable frequency on emitter C ejects photoelectrons collected at collector A, giving a photocurrent of a few microamperes read by a microammeter; terminal B sets the applied voltage; platinum work function is 6.35 eV] If infrared radiation of 3 x 10^{11} Hz is used as incident radiation, determine the reading of microammeter? Justify mathematically.

30. Photoelectric effect is phenomenon of the ejection of electrons when the radiation of suitable frequency is made to fall on the surface of a metal. When light of suitable wavelength falls on the emitter C given in the diagram, the photoelectrons are emitted. These photoelectrons are drawn to the collector A. The photoelectric current of the order of a few microamperes can be normally obtained from the device given in figure. The device given converts a change in intensity of illumination into a change in photocurrent. This current can be used to operate control systems and in light measuring devices. The devices are made up of metals with low ionization



45. Assertion-reason on matter waves

Asked 2× · Board 2026, Sample 2025 · 1 marks

Assertion (A): If accelerated electrons are passed through a narrow slit, a diffraction pattern is observed. Reason (R): Electrons behave as both particles and waves. [Standard assertion-reason options: (A) both true, R correct explanation; (B) both true, R not correct explanation; (C) A true, R false; (D) both false]

46. Slope of stopping-potential vs frequency graph

Asked 2× · Board 2025, Board 2026 · 1 marks

[case context: stopping potential vs frequency graph.] Let m be the slope of the graph line for metal B. If e is the value of electron charge, then Planck's constant 'h' is given by (A) me (B) 1/me (C) m/e (D) e/m

47. Ratio of max KE/speed of photoelectrons

Asked 2× · Board 2024, Board 2026 · 1 marks

[case context: photoelectric effect.] The threshold frequency for a metal surface is v_0. If the radiation of frequency $3v_0$ illuminates the surface, the maximum kinetic energy (KE) of photoelectrons is E_1. If the frequency were increased to $6v_0$, the maximum KE of the photoelectrons becomes E_2. Then (E_1/E_2) equals (A) 1/3 (B) 1/2 (C) 2/5 (D) 3/4

48. Compare de Broglie wavelengths of particles

Asked 2× · Board 2022, Board 2025 · 1/2 marks

Let λ_e, λ_p and λ_d be the wavelengths associated with an electron, a proton and a deuteron, all moving with the same speed. Then the correct relation between them is: (A) $\lambda_d > \lambda_p > \lambda_e$ (B) $\lambda_e > \lambda_p > \lambda_d$ (C) $\lambda_p > \lambda_e > \lambda_d$ (D) $\lambda_e = \lambda_p = \lambda_d$

49. Assertion-reason on photoelectric effect

Asked 2× · Board 2023, Board 2024 · 1 marks

Assertion (A): In photoelectric effect, the kinetic energy of the emitted photoelectrons increases with increase in the intensity of the incident light. Reason (R): Photoelectric current depends on the wavelength of the incident light. [Codes: (A) Both A and R true, R is correct explanation of A; (B) Both A and R true, R is NOT the correct explanation of A; (C) A true, R false; (D) A false and R false]

Atoms

50. Assertion-reason on Bohr energy/centripetal force

Asked 3× · Board 2025, Board 2026, Sample 2026 · 1 marks

Assertion (A): In Bohr model of hydrogen atom, the energy levels are discrete and quantised. Reason (R): In a hydrogen atom, the electrostatic force on the electron provides the necessary centripetal force to it to revolve around the nucleus. [Standard assertion-reason options: (A) both true, R correct explanation; (B) both true, R not correct explanation; (C) A true, R false; (D) both false]

51. Distance of closest approach numerical

Asked 3× · Board 2022, Board 2026, Sample 2025 · 1/3 marks

The 'distance of closest approach' of an alpha-particle is 'd' when it moves with a velocity v head-on towards the target nucleus. If the velocity of alpha particle is halved, the new 'distance of closest approach' will be (A) d/2 (B) 2d (C) d/4 (D) 4d

52. n-dependence of Bohr orbit radius/period

Asked 2× · Board 2023, Board 2025 · 1/2 marks

Prove that, in Bohr model of hydrogen atom, the time period of revolution of an electron in n^{th} orbit is proportional to n^3.

Nuclei

53. Nuclear density independent of mass number

Asked 3× · Board 2023, Board 2024, Sample 2026 · 1/3 marks

The ratio of the nuclear densities of two nuclei having the mass numbers 8 and 27 is (A) 8:27 (B) 3:2 (C) 2:3 (D) 1:1

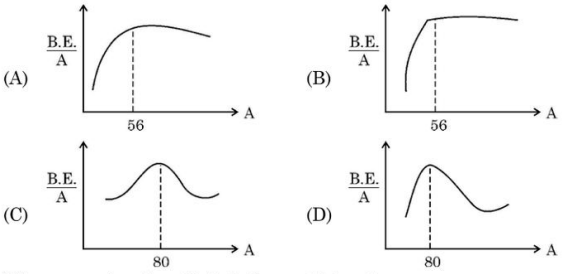
54. Binding energy per nucleon curve

Asked 3× · Board 2023, Board 2025, Sample 2025 · 1/2/3 marks

Which of the following figures correctly represent the shape of curve of binding energy per nucleon as a function of mass number? (Options A, B, C, D show different curves of B.E./A versus mass number A.)

(A) $\lambda_d > \lambda_p > \lambda_e$ (B) $\lambda_e > \lambda_p > \lambda_d$
(C) $\lambda_p > \lambda_e > \lambda_d$ (D) $\lambda_e = \lambda_p = \lambda_d$

11. Which of the following figures correctly represent the shape of curve of binding energy per nucleon as a function of mass number ? 1



12. When a p-n junction diode is forward biased 1

55. Assertion-reason on mass defect/binding energy

Asked 2× · Board 2026, Sample 2025 · 1 marks

Assertion (A): The mass of a nucleus is less than the sum of the masses of the constituent nucleons. Reason (R): Energy is absorbed when the nucleons are bound together to form a nucleus. [Standard assertion-reason options: (A) both true, R correct explanation; (B) both true, R not correct explanation; (C) A true, R false; (D) both false]

56. Energy released in a nuclear reaction

Asked 2× · Board 2022, Sample 2026 · 3 marks

A fast-moving neutron collides with the nucleus of Plutonium (Pu), thereby producing Xenon (Xe) and Zirconium (Zr) along with neutrons. (I) Write the nuclear fission reaction. (II) Find the energy released in the above nuclear reaction. Given atomic masses: m($^{239}_{94}$Pu) = 239.052157 u, m($^{103}_{40}$Zr) = 102.926597 u, m($^{134}_{54}$Xe) = 133.905040 u & m($^{1}_{0}$ n) = 1.00866 u.

Semiconductor Electronics: Materials, Devices and Simple Circuits

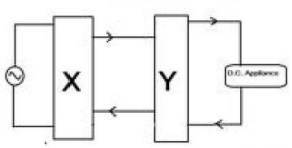
57. Full-wave rectifier working & waveforms

Asked 2× · Sample 2025, Sample 2026 · 3 marks

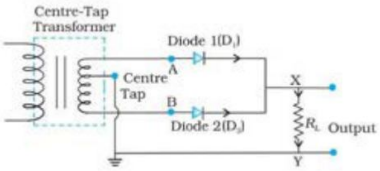
(I) Identify the circuit elements X and Y as shown in the given block diagram and draw the output waveforms of X and Y. (II) If the centre tapping is shifted towards Diode D_1 as shown in the diagram, draw the output waveform of the given circuit.

[SECTION – C] **(07x3=21 marks)**

Q22. (I) Identify the circuit elements X and Y as shown in the given block diagram and draw the output waveforms of X and Y.



(II) If the centre tapping is shifted towards Diode D1 as shown in the diagram, draw the output waveform of the given circuit.



58. Diffusion and drift currents in p-n junction

Asked 3× · Board 2023, Board 2026 · 1/2/3 marks

In an unbiased p-n junction, at equilibrium, which of the following statements is true? (A) Diffusion current is zero but drift current exists. (B) Diffusion current exists but drift current is zero. (C) Diffusion and drift currents are equal and opposite. (D) Both the diffusion and drift currents exist but are unequal.

59. Draw circuit & V-I characteristics of diode

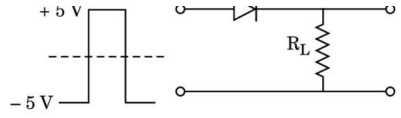
Asked 2× · Board 2023, Board 2025 · 2/3 marks

(a) Draw circuit arrangement for studying V-I characteristics of a p-n junction diode. (b) Show the shape of the characteristics of a diode. (c) Mention two information that you can get from these characteristics.

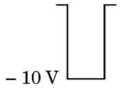
60. Identify rectifier output waveform

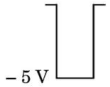
Asked 2× · Board 2023, Board 2024 · 1 marks

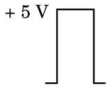
[case context] p-n junction diode as a rectifier. — A signal (a square wave alternating between +5 V and −5 V), as shown in the figure, is applied to a single p-n junction diode in series with load resistance R_L. Identify the output across resistance R_L from the given waveform options: (A) a +10 V pulse (B) a −10 V pulse (C) a −5 V pulse (D) a +5 V pulse.



(A) 

(B) 

(C) 

(D) 

11-55/1/1 21 P.T.O.

61. Effect of doping with an impurity

Asked 2× · Board 2023, Board 2024 · 1 marks

Ge is doped with As. Due to doping, (A) the structure of Ge lattice is distorted. (B) the number of conduction electrons increases. (C) the number of holes increases. (D) the number of conduction electrons decreases.