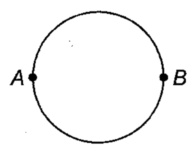
Very Very Important Questions for XIIth Board Exam
[Physics]

1. The force on an electron kept in an electric field in a particular direction is F. What will be the magnitude and direction of the force experienced by a proton kept at the same point in the field? Mass of the proton is about 1836 times the mass of the electron. **1 mark**

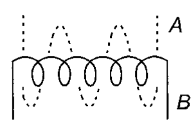
2. A wire of resistance 16R is bent in the form of a circle. What is the effective resistance between the ends of a diameter AB? **1 mark**



3. What is the magnetic moment associated with a coil of a turn, area of cross-section 10^{-4} m^2 and carrying current of 2A? **1 mark**

4. Use the expression F = q (v x B), to define the SI unit of magnetic field. **1 mark**

5. The circuit arrangement given below shows that when an AC passes through the coil A, the current starts flowing in the coil B. State the underlying principle involved. **1 mark**



6. Express the velocity of propagation of an electromagnetic wave in terms of the peak value of the electric and magnetic fields. **1 mark**

7. Will the neutron to proton ratio increases or decreases for nucleus of an element during β-decay? **1 mark**

8. Name an experiment which shows wave nature of electron. Which phenomenon was observed in this experiment using an electron beam? **1 mark**

9. A dipole of dipole moment p, is kept in a uniform electric field B. Write the value of the angle between p and E for which the torque, experienced by the dipole, is **1 mark**
(i) minimum (ii) maximum.

10. An electron is moving along positive x-axis in the presence of uniform magnetic field along positive y-axis. What is the direction of the force acting on it. **1 mark**

11. Two identical loops, one of copper and the other of aluminium, are rotated with the same angular speed in the same magnetic field. Compare the induced emf in two coil loops. **1 mark**

12. Name the part of electromagnetic spectrum of wavelength 10^{-2} m and mention its one application. **1 mark**

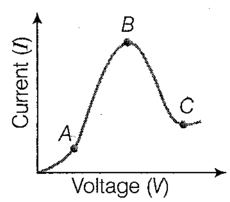
13. Calculate the speed of light in a medium whose critical angle is 300. **1 mark**

14. State the relation the frequency of radiation, emitted by a LED and the band gap energy E of the semiconductor used to fabricate it. **1 mark**

15. Two charges of magnitudes $-2Q$ and $+Q$ are located at points (a, 0) and (4a, 0) respectively. What is the electric flux due to these charges through a sphere of radius 3a with its centre at the origin? **1 mark**

16. How does the mutual inductance of a pair of coils change, when **1 mark**
(i) distance between the coils is increased and
(ii) number of turns in the coils is increased?

17. The graph shown in the figure represents a plot of current versus voltage for a given semiconductor. Identify the region, if any, over which the semiconductor has a negative resistance. **1 mark**



18. Two identical cells, each of emf E, having negligible internal resistance are connected in parallel with each other across an external resistance R. What is the current through this resistance? **1 mark**

19. Define the activity of a given radioactive substance. Write its SI unit. **1 mark**

20. Welders wear special goggles or face masks with glass windows to protect their eyes from electromagnetic radiation. Name the radiations and write the range of their frequency. **1 mark**

21. Write the expression for the de-Broglie wavelength associated with a charged particle having charge q and mass m, when it is accelerated by a potential V. **1 mark**

22. What are permanent magnets? Give one example. **1 mark**

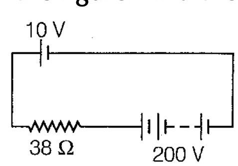
23. What is the geometrical shape of equipotenital surfaces due to a single isolated charge? **1 mark**

24. Which of the following waves can be polarized **1 mark**
(i) Heat waves; or
(ii) Sound waves?
Give reason to support your answer.

25. A capacitor has been charged by a DC source. What are the magnitude of conduction and displacement current, when it is fully charged? **1 mark**

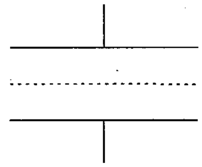
26. Write the relationship between angle of incidence i, angle of prism A and angle of minimum deviations Δ_m for a triangular prism. **1 mark**

27. A 10 V battery of negligible internal resistance is connected across a 200 V battery and a resistance of 38 Ω as shown in the figure. Find the value of the current in the circuit. **1 mark**



28. The emf of a cell is always greater than its terminal voltage. Why? **1 mark**

29. Figure shows a sheet of aluminium foil of negligible thickness placed between the plates of a capacitor. How will its capacitance be affected if **2 marks**

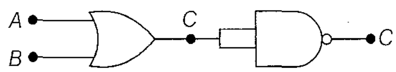


(i) the foil is electrically insulated?

(ii) the foil is connected to the upper plate with a conducting wire?

30. How many disintegrations per second will occur in one gram of $^{238}_{92}U$, If is half-life 1.42×10^{17} s? **2 marks**

31. Draw the logic circuit for combination of gates in figure and also write truth table for same. **2 marks**



32. What is antenna? What should be the length of a dipole antenna? **2 marks**

33. A large circular coil, of radius R and a small circular coil radius r, are put in vicinity of each other. If the coefficient of mutual induction for this pair, equals 1 mH, what would be the flux linked with the larger coil when a current of 0.5 A flows through the smaller coil? When the current in the smaller coil falls to zero, what would be its effect in the larger coil? **2 marks**

Or

Current in a circuit falls steadily from 2.0 A to 0,0 A in 10 ms. If an average emf of 200 V is induced, calculate the self inductance of the circuit.

34. Distinguish between the terms 'effective value' and 'peak value' of an alternating current. An alternating current from a source is represented by I = 10 sin(314t). Write the corresponding values of **2 marks**

(i) its 'effective value'. (ii) frequency of the source.

35. Name the following constituent radiations of electromagnetic spectrum which produce intense heating effect

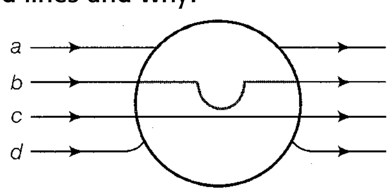
(i) is absorbed by the ozone layer in the atmosphere.

(ii) is used for studying crystal structure. Write one more application for each of these radiations.

36. Differentiate between a ray and a wavefront. Draw a diagram to show refraction of a plane wavefront incident in a convex lens and hence draw the refracted wavefront. **2 marks**

37. Draw the circuit diagram of a potentiometer which can be used to determine the internal resistance r of a given cell of emf E. Explain briefly how the internal resistance of the cell is determined? **2 marks**

38. A metallic sphere is placed in a uniform electric field as shown in the figure. Which path is followed by electric field lines and why? **2 marks**



39. Depict the field-line pattern due to a current carrying solenoid of finite length. **2 marks**

(i) In what ways do these lines differ from those due to an electric dipole?

(ii) Why cannot two magnetic field lines intersect each other?

40. In an electromagnetic wave propagating along the x-direction, the magnetic field oscillates at a frequency of 3×10^{10} Hz and has an amplitude of 10^{-7} T, acting along the y-direction. **2 marks**

(i) What is the wavelength of the wave?

(ii) Write the expression representing the corresponding oscillating electric field

41. **(i)** A plane wavefront approaches a plane surface separating two media. If medium 'one' is optically denser and medium 'two' is optically rarer, using Huygen's principle, explain and show how a refracted wavefront is constructed? **2 marks**

(ii) When a light wave travels from a rarer to a denser medium, the speed decreases. Does it imply reduction in its energy? Explain.

42. By what percentage will the transmission range of a TV tower be affected when the height of the tower is increased by 21%? **2 marks**

43. Deduce an expression for the electric potential due to an electric dipole at any point on its axis. Mention one contrasting feature of electric potential of a dipole at a point as compared to that of due to a single charge. **2 marks**

44. A slab of material of dielectric constant K has the same area as that of the plates of a parallel plate capacitor but has the thickness d/2, where d is the separation between the plates. Find out the expression for its capacitance, when the slab is inserted between the plates of the capacitor. **2 marks**

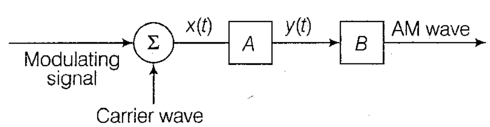
45. Explain the term 'drift velocity' of electrons in conductor. Hence, obtain the expression for the current through a conductor in terms of 'drift velocity'. **2 marks**

Or

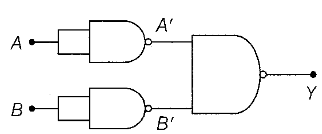
Describe briefly with the help of a circuit diagram, how a potentiometer is used to determine the internal resistance of a cell.

46. A convex lens of focal length f_1 is kept in contact with a concave lens of focal length f_2. Find the focal length of the combination. **2 marks**

47. In the block diagram of a simple modulator for obtaining an AM signal, shown in the figure, identity the boxes A and B. Write their function. **2 marks**



48. In the circuit shown in the figure, identity the equivalent gate of the circuit and make its truth table. **2 marks**



49. **(i)** For given AC, i = im sin ωt, show that the average power dissipated in a resistor R over a complete cycle is $\frac{1}{2} i_m^2 R$. **2 marks**

(ii) A light bulb is rated at 100W for a 220 V AC supply. Calculate the resistance of the bulb.

50. (i) Write the necessary conditions for the phenomenon of total internal reflection to occur.
(ii) Write the relation between the refractive index and critical angle for a given pair of optical media. **2 marks**

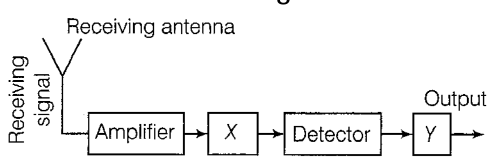
51. State Lenz's law. A metallic rod held horizontally along East-West direction, is allowed to fall under gravity. Will there be an emf induced at its ends? Justify your answer. **2 marks**

52. A convex lens of focal length 25 cm is placed coaxially in contact with a concave lens of focal length 20 cm. Determine the power of the combination. Will the system be converging or diverging in nature? **2 marks**

53. An ammeter of resistance 0.80 Ω can measure current upto 1.0 A. **2 marks**
(i) What must be the value of shunt resistance to enable the ammeter to measure current upto 5.0 A?
(ii) What is the combined resistance of the ammeter and the shunt?

54. (i) An electromagnetic wave is travelling in a medium, with a velocity $v = v\hat{i}$. Draw a sketch showing the propagation of the electromagnetic wave, indicating the direction of the oscillating electric and magnetic fields. **2 marks**
(ii) How are the magnitudes of the electric and magnetic fields related to velocity of the electromagnetic wave?

55. Block diagram of a receiver is shown in the figure **2 marks**



(i) Identify X and Y. (ii) Write their functions.

56. A circular coil of 200 turns and radius 10 cm is placed in a uniform magnetic field of 0.5 T, normal to the plane of the coil. If the current in the coil is 3.0 A, calculate the **3 marks**
(i) total torque on the coil.
(ii) total force on the coil.
(iii) average force on each electron in the coil, due to the magnetic field.
Assume the area of cross-section of the wire to be 10^{-5} m^2 and the free electron density is 10^{29} m^{-3}.

57. A series L–C–R circuit is made by taking R = 100W, $L = \frac{2}{\pi}$ H, $C = \frac{100}{\pi}\mu F$. This series combination is connected across an AC source of 220 V, 50 Hz. Calculate **3 marks**
(i) the impedance of the circuit and
(ii) the peak value of the current flowing in the circuit.
(iii) Calculate the power factor of this circuit and compare this value with the one at its resonant frequency.

OR

A resistor of $200\,\Omega$ and a capacitor of $40\,\mu F$ are connected in series to 220 VAC source with angular frequency $(\omega) = 300$ Hz, Calculate the voltage (rms) across the resistor and the capacitor, why is the algebraic sum of these voltages more than the source voltage? How do you resolve this paradox?

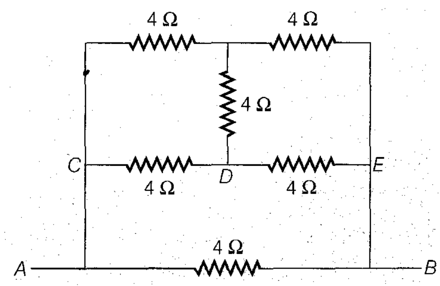
58. Use the mirror equation to show that **3 marks**

(i) Use the lens equation deduce algebraically that an object placed with in the focus of a convex lens produces a virtual and enlarged image.

(ii) a convex mirror always produces a virtual image independent of the location of the object.

An object placed between the pole and focus of a concave mirror produces a virtual and enlarged image.

59. Six resistors, each of value 4Ω are joined together in a circuit as shown in figure. Calculate equivalent resistance across the points A and B. If a cell of emf 2 V is connected across AB, compute the current through the arms AB and DF of the circuit. **3 marks**



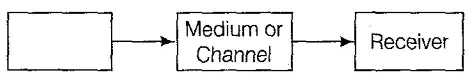
60. (i) What is meant by half-life of a radioactive element? **3 marks**

(ii) The half-life of a radioactive substance is 50 s. Calculate

(a) the decay constant and

(b) time taken for the sample to decay by 3/4th of the initial value.

61. Complete the following block diagram depicting the essential elements of a basic communication system. **3 marks**



Name the two basic modes of communication. Which of these modes is used for telephonic communication?

62. Shobha and Naina are two friends who are married; Shobha is very poor and a childless widow whereas Naina is having a good economic status. Once Naina noticed that Shobha's eyesight has become weak and she was not even able to read big letters of the newspaper. Naina asked Shobha that why she did not take care of this, shobha said she did not have enough amount for its remedy so she did not see the doctor, listening to this Naina took Shobha to an eye specialist and asked the whole expenditure for its remedy. Doctor said that it is the case of Myopia and can be resolved without any major expenditure. After the treatment, Shobha's eyesight were now better than before. **3 marks**

(i) What are the benefits of true friendships? Define philanthropy.

(ii) The far point of Shobha's eye is at a distance of 0.1 m, her power for accommodation is 4D. What power lens is required to see distinct object?

63. Four identical cells, each of emf 8 V and internal resistance 2.5Ω are connected in series and charged by a 100 V DC supply, using a 24Ω resistor in series. **3 marks**

Calculate the following

(i) Charging current in the circuit

(ii) Potential difference across the cells during recharging.

64. A ray of light falls on a transparent right angled isosceles prism made from a glass of reflective index $\sqrt{2}$. Draw a ray diagram for this prism when the light ray falls normally on one of the equal sides of the prism. **3 marks**

65. **(i)** In a Young's double slit experiment, the two slits are kept 2 mm apart and the screen is positioned 140 cm away from the plane of the slits. The slits are illuminated with light of wavelength 600 nm. Find the distance of the third bright fringe, from the central maximum, in the interference pattern obtained on the screen. **3 marks**

(ii) If the wavelength of the incident light were changed to 480 nm, find out the shift in the position of third bright fringe from the central maximum.

66. **(i)** What is amplitude modulation? **3 marks**

(ii) Define modulation index.

(iii) Show amplitude modulation graphically.

67. Draw transfer charactenstics of a common emitter n-p-n transistor. Point out the region in which the transistor operates as an amplifier. Define the following terms used in transistor amplifiers **3 marks**

(i) Input resistance (ii) Output resistance (iii) Current amplification factor

68. **(i)** Using de-Broglie's hypothesis, explain with the help of a suitable diagram, Bohr's second postulate of quantization of energy levels in a hydrogen atom. **3 marks**

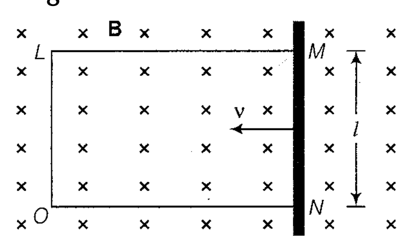
(ii) The ground state energy of hydrogen atom is –13.6 eV. What are the kinetic and potential energies of the electron in this state?

69. Ramesh and his younger brother Raju went to a shopping mall whose doors were automatic with self close and open, Raju asked Ramesh, that, Why these doors are automatically opening and closing without even a single touch?". Ramesh was a graduate but, he did not know the exact reason behind this. Ramesh asked the same from his friend Rakesh who was junior to him Rakesh explained the whole phenomenon agilely to Ramesh and told that this whole phenomenon is based on photo-electric effect given by the great scientist Einstein. **3 marks**

(i) After reading the passage, what are your opinions about the education of Ramesh and describe about all three characters Ramesh, Rakesh and Raju in your words.

(ii) Write photoelectric equation given by Einstein and define photoelectric current.

70. A rectangular conductor LIVINO is placed in a uniform magnetic field of 0.5 T The field is directed perpendicular to the plane of the conductor. When the arm MN of length 20 cm is moved towards left with a velocity of 10 ms^{-1}, calculate the emf induced in the arm. Given, the resistance of the arm to be $5\,\Omega$ (assuming that other arms are of negligible resistance), find the value of the current in the arm.



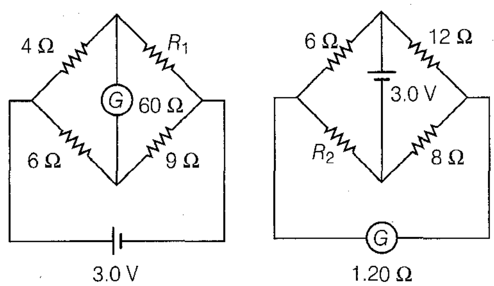
OR

A wheel with 8 metallic spokes each 50 cm long is rotated with a speed of 120 rev/mm in a plane normal to the horizontal component of the Earth's magnetic field, The Earth's magnetic field at the place is 0.4 G and the angle of dip is 60°. Calculate the emf induced between the axle and the rim of wheel. How will the value of emf be affected, if the number of spokes were increased?

71. Define the current sensitivity galvanometer. Write its SI unit. **3 marks**

Figure shows two circuits each having a galvanometer and battery of 3 V.

When the galvanometer in each arrangement do not show any deflection, obtain the ratio R_1 / R_2.



72. A wire AB is carrying a steady current of 12 A and is lying on the table. Another wire CD carrying 5 A is held directly above AB at a height of 1 mm. Find the mass per unit length of the wire CD, so that it remains suspended at its position when left free. Give the direction of the current flowing in CD with respect to that in AB. **3 marks**

[Take the value of $g = 10\ ms^{-2}$]

73. Draw a labelled ray diagram of a refracting telescope. Define its magnifying power and write the expression for it.

Write two important limitations of a refracting telescope over a reflecting type telescope. **3 marks**

74. Write Einstein's photoelectric equation and point out any two characteristic properties of photons on which this equation is based.

Briefly explain the three observed features which can be explained by this equation. **3 marks**

75. (i) Why photoelectric effect cannot be explained on the basis of wave nature of light? Give reasons. **3 marks**

(ii) Write the basic features of photon picture of electromagnetic radiation on which Einstein's photoelectric equation is based.

76. A metallic rod of length l is rotated with a frequency v with one end hinged at the centre and the other end at the circumference of a circular metallic ring of radius r, about an axis passing through the centre and perpendicular to the plane of the ring. A constant uniform magnetic field B parallel to the axis is present everywhere. Using Lorentz force, explain how emf is induced between the centre and the metallic ring and hence obtain the expression for it. **3 marks**

77. Using Bohr's postulates, obtain the expression for the total energy of the electron in the stationary states of the hydrogen atom. Hence, draw the energy level diagram showing, how the line spectra corresponding to Balmer series occur due to transition between energy levels. **3 marks**

78. (i) In what way is diffraction from each slit related to the interference pattern in a double slit experiment?

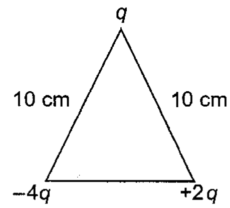
(ii) Two wavelengths of sodium light 590 nm and 596 nm are used, in turn to study the diffraction taking place at single slit of aperture 2×10^{-4} m. The distance between the slit and the screen is 1.5 m. Calculate the separation between the positions of the first maxima of the diffraction pattern obtained in the two cases. **3 marks**

79. (i) An electric dipole moment **p** is held in a uniform electric field **E**. **5 marks**

(a) Prove that no translation force acts on the dipole.

(b) Hence prove that the torque acting on the dipole is given by pE $\sin\theta$, indicating the direction along which is acts.

(ii) Calculate the work done to dissociate the system of three charges placed on the vertices of a triangle as shown. Here q = 1.6 × 10^{-10} C.



OR

(*i*) Deduce the expression for the energy density stored in a charged capacitor.

(*ii*) Show that the effective capacitance *C*, of a series combination, of three capacitors C_1, C_2 and C_3 is given by

$$C = \frac{C_1C_2C_3}{(C_1\ C_2\ + C_2C_3\ + C_3C_1)}$$

80. (*i*) What are coherent sources? Why are they necessary for observing a sustained interference pattern? **5 marks**

How are the two coherent sources obtained in the Young's double slit experiment?

(*ii*) Show that the superposition of the waves originating from the two coherent sources S_1 and S_2 having displacemnet $Y_1 = a\cos\omega t$ and $Y_2 = a\cos(\omega t + \phi)$ at a point produce a resultant intensity $I = 4a^2\cos^2\phi/2$.

Hence, write the conditions for the appearance of dark and bright fringes.

OR

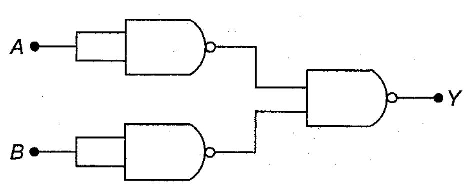
(i) In what way is diffraction from each slit related to the interference pattern in a double slit experiment?

(ii) Two students are separated by a 7 m partition wall in a room 10 m high. If both light and sound waves can bend around obstacles, how is it that the students are unable to see each other even though they can converse easily?

(iii) When a low flying aircraft passes overhead, we sometimes notice a slight shaking of the picture on our TV screen. Suggest a possible explanation.

81. (i) Using the necessary circuit diagram, draw the transfer characteristics of a base-biased transistor in CE configuration. With the help of these characteristics, explain briefly how the transistor can be used as an amplifier. **5 marks**

(ii) Why are NAND gate called universal gates? Identify the logic operations carried out by the circuit given below.



OR

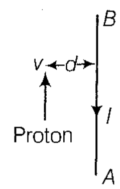
(i) Draw a circuit diagram to study the input and output characteristics of an n-p-n transistor in its common emitter configuration. Draw the typical input and output characteristics.

(ii) Explain, with the help of a circuit diagram, the working of n-p-n transistor as a common emitter amplifier.

82. (i) Derive an expression for the force between two long parallel current carrying conductors. **5 marks**

(ii) Use this expression to define SI unit of current.

(iii) A long straight wire AB carries a current I. A proton P travels with a speed v, parallel to the wire, at a distance d from it, in a direction opposite to the current as shown in the figure. What is the force experienced by the proton and what is its direction?



OR

With the help of a neat and labelled diagram, explain the underlying principle and working of a moving coil galvanometer. What is the function of

(i) uniform radial field and

(ii) soft iron core in such a device?

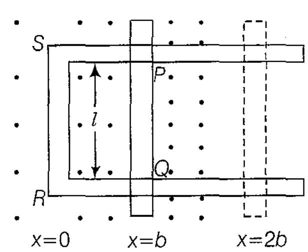
83. What is induced emf? Write Faraday's law of electromagnetic induction. Express it mathematically. **5 marks**

A conducting rod of length l, with one end pivoted, is rotated with angular speed ω in a vertical plane, normal to a uniform magnetic field B. Deduce an expression for the emf induced in this rod.

If resistance of rod is R, what is current induced in it.

OR

State Faraday's law of electromagnetic induction. Figure shows a rectangular conductor $PQRS$ in which the conductor PQ is free to move in a uniform magnetic field B perpendicular to plane of the paper. The field extends from $x = 0$ to $x = b$ and is zero for $x > b$. Assume that only the arm PQ possess resistance r. When the arm PQ is pulled outward from $x = 0$ to $x = 2b$ and is then moved backward to $x = 0$ with constant speed v, obtain the expressing for the flux and the induced emf. Sketch the variation of these quantities with distance $0 \le x \le 2b$.



84. (*i*) Use the mirror equation to show that an object placed between f and $2f$ of a concave mirror produces a real image beyond $2f$. **5 marks**

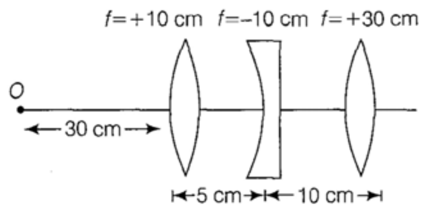
(*ii*) A beam of light consisting of two wavelength 650 nm and 520 nm, is used to obtain interference fringes in a Young's double slit experiment on a screen 1 m away. The separation between the slits is 1 mm.

(a) Find the distance of the third bright fringe on the screen from the central maximum for wavelength 650 nm.

(b) What is the least distance from the central maximum when the bright fringes due to both the wavelength coincide?

OR

(*i*) Find the position of the image formed of the object O by the lens combination given in the figure



(*ii*) Two lenses of power 10 D and –5 D are placed in contact

(a) calculate the power of lens combination.

(b) where should an object be held from the lens, so as to obtain a virtual image of magnification 2?

85. One day Chetan's mother developed a severe stomach ache all of a sudden. She was rushed to the doctor who suggested for an immediate endoscopy test and gave an estimate of expenditure for the same. Chetan immediately contacted his class teacher and shared the information with her. The class teacher arranged the money and rushed to the hospital. On realising that Chetan belonged to a below average income group family, even the doctor offered concession for the test fee. The test was conducted successfully. **5 marks**

Answer the following questions based on the above information

(i) Which principle in optics is made use of in endoscopy?

(ii) Briefly explain the values reflected in the action taken by the teacher.

(iii) In what way do you appreciate the response of the doctor on the given situations?

86. (i) Using Biot-Savart's law, derive the expression for the magnetic field in the vector form at a point on the axis of a circular current loop. **5 marks**

(ii) What does a toroid consist of? Find out the expression for the magnetic field inside a toroid for N turns of the coil having the average radius r and carrying a current I. Show that the magnetic field in the open space inside and exterior to the toroid is zero.

OR

(i) Draw a schematic sketch of a cyclotron. Explain clearly the role of crossed electric and magnetic field in accelerating the charge. Hence derive the expression for the kinetic energy acquired by the particles.

(ii) An α-particle and a proton are released from the centre of the cyclotron and made to accelerate.

(a) Can both be accelerated at the same cyclotron frequency? Give reason to justify your answer.

(b) When they are accelerated in turn, which of the two will have higher velocity at the exit slit of the dees?

87. (i) Define electric dipole moment. Is it a scalar or a vector? Derive the expression for the electric field of a dipole at a point on the equatorial plane of the dipole. **5 marks**

(ii) Draw the equipotential surfaces due to an electric dipole. Locate the points where the potential due to the dipole is zero.

OR

Using Gauss' law, deduce the expression for the electric field due to a uniformly charged spherical conducting shell of radius R at a point

(i) outside and (ii) inside the shell.

Plot a graph showing variation of electric field as a function of $r > R$ and $r < R$ (r being the distance from the centre of the shell).

88. Using Bohr's postulates, derive the expression for the frequency of radiation emitted when electron in hydrogen atom undergoes transition from higher energy state quantum number (n_i) to the lower state (n_f). **5 marks**

When electron in hydrogen atom jumps from energy state $n_i = 4$ to $n_f = 3, 2, 1$. Identify the spectral series to which the emission lines belong.

89. While travelling back to his residence in the car, Dr. Pathak was caught up in a thunderstorm. It became very dark. He stopped driving the car and waited for thunderstorm to stop. Suddenly, he noticed a child walking alone on the road. He asked the boy to come inside the car till the thunderstorm stopped. Dr. Pathak dropped the boy at his residence. The boy insisted that Dr. Pathak should meet his parents. The parents expressed their gratitude to Dr. Pathak for his concern for safety of the child. **5 marks**

Answer the following questions based on the above information.

(i) Why is it safer to sit inside a car during a thunderstorm?

(ii) Which two values a\re displayed by Dr. Pathak in his action?

(iii) Which values are reflected in parents' response to Dr. Pathak?

(iv) Give an example of similar action on your part in the past from everyday life.

90. (i) Draw a ray diagram showing the image formation by a compound microscope. Hence, obtain the expression for total magnification when the image is formed at infinity. **5 marks**

(ii) Distinguish between myopia and hypermetropia. Show diagrammatically, how these defects can be corrected?

OR

(i) State Huygen's principle. Using this principle, draw a diagram to show how a plane wavefront incident at the interference of the two media gets refracted when it propagates from a rarer to a denser medium. Hence, verify Snell's law of refraction.

(ii) Is the frequency of reflected and refracted light same as the frequency of incident light?

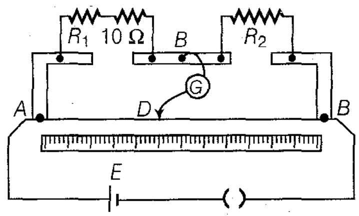
91. (i) State the working principle of a potentiometer. With the help of the circuit diagram, explain how a potentiometer is used to compare the emf's of two primary cells. Obtain the required expression used for comparing the emf's.

(ii) Write two possible causes for one sided deflection in a potentiometer experiment. **5 marks**

OR

(i) State Kirchhoff's rules for an electric network. Using Kirchhoff's rules, obtain the balance condition in terms of the resistances of four arms of Wheatstone bridge.

(ii) In the metre bridge experimental set up shown in the figure, the null point D is obtained at a distance of 40 cm from end A of the metre bridge wire.



If a resistance of $10\,\Omega$ is connected in series with R_1, null point is obtained at AD = 60 cm. Calculate the values of R_1 and R_2.

92. **(i)** Derive the expression for the torque on a rectangular current carrying loop suspended in a uniform magnetic field. **5 marks**

(ii) A proton and a deuteron having equal momentum enter in a region of a uniform magnetic field at right angle to the direction of the field. Depict their trajectories in the field.