GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

ALTO BETIM, BARDEZ – GOA

Academic Year 2023 - 2024

Topic – Wise Weightage

Subject : Physics **Class : XII**

Theory Component

Sr. No.	Chapter	Marks Allotted for		
		FA I	FAII	Final Board Examination
1	Electric Charges and Fields	04	----	05
2	Electrostatic Potential and Capacitance	04	----	05
3	Current Electricity	06	----	08
4	Moving Charges and Magnetism	----	05	06
5	Magnetism and Matter	----	03	04
6	Electromagnetic Induction	----	03	04
7	Alternating Current	----	04	05
8	Electromagnetic Waves	----	---	03
9	Ray Optics and Optical Instruments	06	---	08
10	Wave Optics	----	---	05
11	Dual Nature of Matter and Radiation	----	---	03
12	Atoms	----	----	04
13	Nuclei	----	----	03
14	Semiconductor Electronics : Materials, Devices and simple circuits	----	05	07
	Total	20	20	70

Theory portion

Sections are according to the Print Edition – 2020 (Reprint -2021) of NCERT books

CHAPTER ONE :- ELECTRIC CHARGES AND FIELDS		
Section		**Remarks**
1.1	Introduction	Reading
1.2	ELECTRIC CHARGE	No questions on historical importance
1.3	CONDUCTORS AND INSULATORS	
1.4	CHARGING BY INDUCTION	
1.5	BASIC PROPERTIES OF ELECTRIC CHARGE	
1.6	COULOMB'S LAW	Vector treatment not necessary
1.7	FORCES BETWEEN MULTIPLE CHARGES	
1.8	ELECTRIC FIELD	
1.9	ELECTRIC FIELD LINES	
1.10	ELECTRIC FLUX	
1.11	ELECTRIC DIPOLE	
1.12	DIPOLE IN A UNIFORM EXTERNAL FIELD	
1.13	CONTINUOUS CHARGE DISTRIBUTION	Only Qualitative treatment
1.14	GAUSS'S LAW	
1.15	APPLICATIONS OF GAUSS'S LAW	
CHAPTER TWO : - ELECTROSTATIC POTENTIAL AND CAPACITANCE		
2.1	Introduction	Only Qualitative treatment
2.2	ELECTROSTATIC POTENTIAL	
2.3	POTENTIAL DUE TO A POINT CHARGE	
2.4	POTENTIAL DUE TO AN ELECTRIC DIPOLE	Derivation not for evaluation. Concept and formulae included for evaluation.
2.5	POTENTIAL DUE TO A SYSTEM OF CHARGES	Derivation not for evaluation. Concept and formulae included for evaluation.
2.6	EQUIPOTENTIAL SURFACES	
2.7	POTENTIAL ENERGY OF A SYSTEM OF CHARGES	
2.8	POTENTIAL ENERGY IN AN EXTERNAL FIELD	

2.9	ELECTROSTATICS OF CONDUCTORS	
2.10	DIELECTRICS AND POLARISATION	
2.11	CAPACITORS AND CAPACITANCE	
2.12	THE PARALLEL PLATE CAPACITOR	
2.13	EFFECT OF DIELECTRIC ON CAPACITANCE	
2.14	COMBINATION OF CAPACITORS	
2.15	ENERGY STORED IN A CAPACITOR	
CHAPTER THREE :- CURRENT ELECTRICITY		
3.1	Introduction	Qualitative ideas only
3.2	ELECTRIC CURRENT	
3.3	ELECTRIC CURRENTS IN CONDUCTORS	
3.4	OHM'S LAW	
3.5	DRIFT OF ELECTRONS AND THE ORIGIN OF RESISTIVITY	Derivation not for evaluation. Concept and formulae included for evaluation.
3.6	LIMITATIONS OF OHM'S LAW	
3.7	RESISTIVITY OF VARIOUS MATERIALS	
3.8	TEMPERATURE DEPENDENCE OF RESISTIVITY	
3.9	ELECTRICAL ENERGY, POWER	
3.10	COMBINATION OF RESISTORS – SERIES AND PARALLEL	
3.11	CELLS, EMF, INTERNAL RESISTANCE	
3.12	CELLS IN SERIES AND IN PARALLEL	
3.13	KIRCHHOFF'S RULES	Simple applications and limited to two variable numerical problems
3.14	WHEATSTONE BRIDGE	
3.15	METER BRIDGE	
3.16	POTENTIOMETER	
CHAPTER FOUR : - MOVING CHARGES AND MAGNETISM		
4.1	INTRODUCTION	Qualitative ideas only
4.2	MAGNETIC FORCE	

4.3	MOTION IN A MAGNETIC FIELD	
4.4	MOTION IN COMBINED ELECTRIC AND MAGNETIC FIELD	4.4.1 - Vector treatment not necessary and Flemings LH Rule can be used
4.5	MAGNETIC FIELD DUE TO A CURRENT ELEMENT, BIOT- SAVART LAW	
4.6	MAGNETIC FIELD ON THE AXIS OF A CIRCULAR CURRENT LOOP	
4.7	AMPERE'S CIRCUITAL LAW	
4.8	THE SOLENOID AND THE TOROID	Derivation not for evaluation. Concept and formulae included for evaluation.
4.9	FORCE BETWEEN TWO PARALLEL CURRENTS, THE AMPER	
4.10	TORQUE ON CURRENT LOOP, MAGNETIC DIPOLE	**4.10.2** Qualitative ideas only **4.10.3** Derivation not for evaluation. Concept and formulae included for evaluation.
4.11	THE MOVING COIL GALVANOMETER	
CHAPTER FIVE : - MAGNETISM AND MATTER		
5.1	INTRODUCTION	No questions on historical importance and Qualitative ideas only
5.2	THE BAR MAGNET	Derivation not for evaluation. Concept and formulae included for evaluation.
5.3	MAGNETISM AND GAUSS'S LAW	
5.4	THE EARTH'S MAGNETISM	
5.5	MAGNETISATION AND MAGNETIC INTENSITY	Derivation not for evaluation. Concept and formulae included for evaluation.
5.6	MAGNETIC PROPERTIES OF MATERIALS	
5.7	PERMANENT MAGNETS AND ELECTROMAGNETS	
CHAPTER SIX : - ELECTROMAGNETIC INDUCTION		
6.1	Introduction	No questions on historical importance
6.2	The Experiments of Faraday and Henry	
6.3	Magnetic Flux	
6.4	Faraday's Law of Induction	
6.5	Lenz's Law and Conservation of Energy	

6.6	Motional Electromotive Force	
6.7	Energy Consideration: A Quantitative Study	Derivation not for evaluation. Concept and formulae included for evaluation.
6.8	Eddy Currents	
6.9	Inductance (Self & Mutual)	Derivation not for evaluation. Concept and formulae included for evaluation.
6.10	AC Generator	
CHAPTER SEVEN : - ALTERNATING CURRENT		
7.1	Introduction	No questions on historical importance
7.2	AC Voltage Applied to Resistor	
7.3	Representation of AC Current and Voltage by Rotating Vectors – Phasors	
7.4	AC Voltage Applied to Inductor	
7.5	AC Voltage Applied to Capacitor	
7.6	AC Voltage Applied to a Series LCR Circuit	7.6.2 Analytical solution (excluded). 7.6.3 Sharpness for resonance (Qualitative treatment only)
7.7	Power in AC Circuit	
7.8	LC Oscillations	Qualitative treatment only
7.9	Transformers	
CHAPTER EIGHT: - ELECTROMAGNETIC WAVES		
8.1	Introduction	No questions on historical importance
8.2	Displacement Current	Qualitative ideas only.
8.3	Electromagnetic Waves	
8.4	Electromagnetic Spectrum	
CHAPTER NINE: - RAY OPTICS AND OPTICAL INSTRUMENTS		
9.1	Introduction	No questions on historical importance
9.2	Reflection of Light by Spherical Mirrors	
9.3	Refraction	
9.4	Total Internal Reflection	
9.5	Refraction at Spherical Surfaces and by Lenses	
9.6	Refraction through a Prism	
9.7	Some Natural Phenomena due to Sunlight	
9.8	Optical Instruments	Derivations not for evaluation. Understanding of the ray diagram, image formation and formulae included for evaluation.
CHAPTER TEN : - WAVE OPTICS		
10.1	Introduction	No questions on historical importance
10.2	Huygens Principle	

10.3	Refraction and Reflection of Plane Waves using Huygens Principle	
10.4	Coherent and Incoherent Addition of Waves	
10.5	Interference of Light Waves and Young's Experiment	
10.6	Diffraction	**10.6.1** Derivation not for evaluation. Concept and formulae included for evaluation. **10.6.2, 10.6.3 and 10.6.4 -** Qualitative treatment only
10.7	Polarisation	
CHAPTER ELEVEN : DUAL NATURE OF RADIATION AND MATTER		
11.1	Introduction	No questions on historical importance
11.2	Electron Emission	
11.3	Photoelectric Effect	11.3.1 & 11.3.2 qualitative ideas only
11.4	Experimental Study of Photoelectric Effect	
11.5	Photoelectric Effect and Wave Theory of Light	
11.6	Einstein's Photoelectric Equation: Energy Quantum of Radiation	
11.7	Particle Nature of Light: The Photon	
11.8	Wave Nature of Matter	No questions on historical importance in relation to Heisenberg's *uncertainty principle*
11.9	Davisson and Germer Experiment	
CHAPTER TWELVE : - ATOMS		
12.1	Introduction	No questions to be asked the on historical Importance
12.2	Alpha-particle Scattering and Rutherford's Nuclear Model of Atom	
12.3	Atomic Spectra	
12.4	Bohr Model of the Hydrogen Atom	
12.5	The Line Spectra of the Hydrogen Atom	
12.6	DE Broglie's Explanation of Bohr's Second Postulate of Quantisation	

CHAPTER THIRTEEN : - NUCLEI		
13.1	Introduction	Qualitative ideas only
13.2	Atomic Masses and Composition of Nucleus	No questions on historical importance of the discovery of the neutron
13.3	Size of the Nucleus	
13.4	Mass-Energy and Nuclear Binding Energy	
13.5	Nuclear Force	Qualitative ideas only
13.6	Radioactivity	
13.7	Nuclear Energy	Figure 13.5: Drawing of diagram of Nuclear reactor not for evaluation. 13.7.4 - Qualitative ideas only
CHAPTER FOURTEEN : - SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS		
14.1	Introduction	Qualitative ideas only
14.2	Classification of Metals, Conductors and Semiconductors	
14.3	Intrinsic Semiconductor	Only qualitative ideas on lattice structure shown in figure 14.3
14.4	Extrinsic Semiconductor	
14.5	p-n Junction	
14.6	Semiconductor Diode	
14.7	Application of Junction Diode as a Rectifier	
14.8	Special Purpose p-n Junction Diodes	No numericals on Zener diode as a voltage regulator
14.9	Digital Electronics and Logic Gates	

**** <u>Qualitative treatment / ideas</u> : Understanding of working principle but not going in depth of the mathematical equations***

Pattern and Design of Theory Question Paper

for the Academic Year 2023-2024

Sr.No.		
1	Time Duration	150 Minutes
2	Maximum Marks	70
3	Weightage to Objective	Knowledge : 30 % Understanding : 50 % Application : 20 %
4	Weightage to the type of Questions	LA (4 marks) X 3 = 12 SAII (3 marks) X 8 = 24 SAI (2 marks) X 10 = 20 VSA (1 marks) X 14 = 14 (7 MCQ) Total 35 questions = 70
5	Scheme of options	Options in 3 LA Type + 1 SAII Type =21%
6	Difficulty Level	Easy = 20% Average = 60% Difficult = 20 %
Additional Guidelines for paper setting		
7	Numericals	20% - 23% (14 – 16 Marks) (As far as possible avoid/ minimizethe use of Logarithmic tables)
8	Derivations	20% - 23% (14 – 16 Marks) 2 qns from LA Type + 2 qns from SAII Type (=20%) + 1 qn from SAI (total 23%)

Pattern and Design of FA I and FA II Examinations 2023-2024

1	Time Duration	60 Minutes
2	Maximum Marks	20
3	Weightage to Objective	Knowledge : 30 % Understanding : 50 % Application : 20 %
4	Difficulty Level	Easy = 20% Average = 60% Difficult = 20 %
5	Weightage to the type of Questions	SA-II (3 marks) X 02 = 06 SA-I (2 marks) X 05 = 10 VSA (1 marks) X 04 = 04 (2 MCQs)
6	Scheme of options	Option in 1 SA- II Type question
7	Numericals	20% - 25% (04 – 05 Marks) (As far as possible avoid/ minimize the use of Logarithmic tables)

Evaluation Scheme for Board Practical Examination

for the Academic Year 2023 – 24

1. Time duration : 180 minutes
2. Maximum Marks 20
3. Students would be required to perform two experiments,

   one from each section A and B 08 + 08 = 16

   Practical Record (Journal) = 02

   Viva – Voce on Experiments = 02

   Total = 20
4. External Examiner : One experiment (08) + Viva- Voce (02) = 10
5. Internal Examiner : One experiment (08) + Journal (02) = 10

PRACTICAL PORTION :

At least 12 Experiments [minimum 6 from each section] to be performed by the students during the academic year 2023 -2024.

List of Experiments

SECTION–A

1. To determine resistance per cm of a wire by plotting a graph for potential difference versus current.
2. To find resistance of a given wire using metre bridge and hence to determine the specific resistance of its material.
3. To verify the laws of combination (series) of resistances using a metre bridge.

   /OR/

   To verify the laws of combination (parallel) of resistances using a metre bridge.
4. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.

5. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.

/OR/

To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.

6. To find the frequency of AC mains with a sonometer.
7. To compare the emf's of two given primary cells using potentiometer (individual cell method)

/OR/

To determine the internal resistance of given primary cell using potentiometer.

SECTION-B

1. To find the value of v for different values of u in case of a concave mirror and to find the focal length.
2. To find the focal length of a convex mirror, using a convex lens.
3. To find the focal length of a convex lens by plotting graphs between v and u or between 1/v and 1/u.
4. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
5. To determine refractive index of a glass slab using a travelling microscope.
6. To find the refractive index of a liquid using convex lens and plane mirror.
7. To find the refractive index of a liquid using a concave mirror.
8. To draw the I-V characteristic curve for a p-n junction diode in forward bias.

Activities

As a part of Innovative Test (FA III), Students to perform any 5 activities from the list provided. Students will be assessed for 10 marks.

Remaining 10 marks of the 3rd internal test can be utilized to assess students in an innovative way (as was done for the academic years 2021 -2022 and 2022 - 2023).

Activities:

1. To measure the resistance and impedance of an inductor with or without iron core.
2. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
3. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
4. To assemble the components of a given electrical circuit.
5. To study the variation in potential drop with length of a wire for a steady current.
6. To draw the diagram of a given open circuit comprising at least a battery, Resistor / rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.
7. To identify a diode, an LED, a resistor and a capacitor from a mixed collection of such items.
8. Use of multimeter to see the unidirectional flow of current in case of a diode and an LED and check whether a given electronic component (e.g., diode) is in working order.
9. To study effect of intensity of light (by varying distance of the source) on an LDR.
10. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
11. To observe diffraction of light due to a thin slit.
12. To study the nature and size of the image formed by a (i) convex lens, or (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
13. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

STD XII **SUB: PHYSICS** BLUEPRINT - MODEL PAPER **MAX Marks : 70**

	OBJECTIVE	KNOWLEDGE				UNDERSTANDING				APPLICATION				
CHAPTER No.	CHAPTER/FORM OF QUESTION (MARKS)	VSA (1)	SA I (2)	SA II (3)	LA (4)	VSA (1)	SA I (2)	SA II (3)	LA (4)	VSA (1)	SA I (2)	SA II (3)	LA (4)	TOTAL
1	Electric Charges and Fields							27			20(N)			5
2	Electrostatic Potential and Capacitance			25(D)			21							5
3	Current Electricity	2			34(D) option	13					22(N)			8
4	Moving Charges and Magnetism.				33(D) option						23(N)			6
5	Magnetism and Matter	3						29						4
6	Electromagnetic Induction							30		7(N)				4
7	Alternating Current			32(D) (Option)							24(N)			5
8	Electromagnetic Waves					4	19							3
9	Ray Optics and Optical Instruments		16(D)					26				31(N)		8
10	Wave Optics	9				12	17			5(N)				5
11	Dual Nature of Matter and Radiation					10					18(N)			3
12	Atoms					11		28						4
13	Nuclei					6	15							3
14	Semiconductor Electronics: Materials, Devices and Simple Circuits	1 8				14			35 (0ption)					7
		21				34				15				70

* **(D) : Derivation** **(N) : Numerical**

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ALTO BETIM, BARDEZ – GOA

Model Question Paper (2023 – 2024)

Subject : Physics

Time allowed: 150 minutes Max.marks: 70

Instructions:

1. All questions are compulsory.
2. This question paper has four sections.
3. Section A contains **14** questions of **one** mark each. Section B contains **10** questions of **two** marks each. Section C contains **8** questions of **three** marks each. Section D contains **3** questions of **four** marks each.
4. There is no overall choice. However, internal choices have been provided in **one** question of **three** marks and **three** questions of **four** mark weightage. You have to attempt only one of the choices in such questions.
5. Use of calculators is not permitted. However, you may ask for mathematical tables.
6. You may use the following values of physical constants wherever necessary.

$h = 6.63 \times 10^{-34}$ J s

$\pi = 3.14$

$e = 1.6 \times 10^{-19}$ C

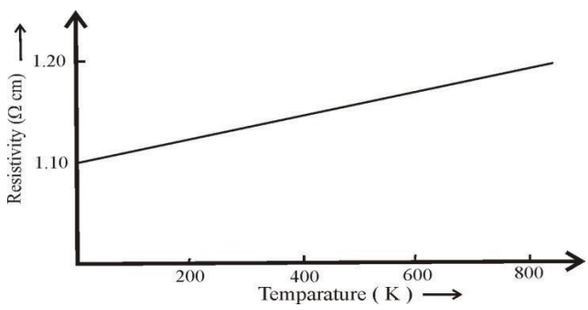
$C = 3 \times 10^{8}$ m s^{-1}

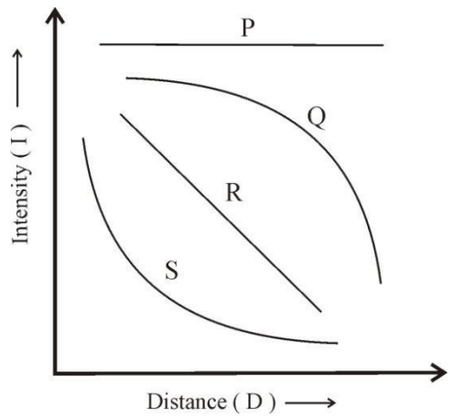
$\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 $N^{-1}m^{-2}$

$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^{9}$ N m^2 C^{-2}

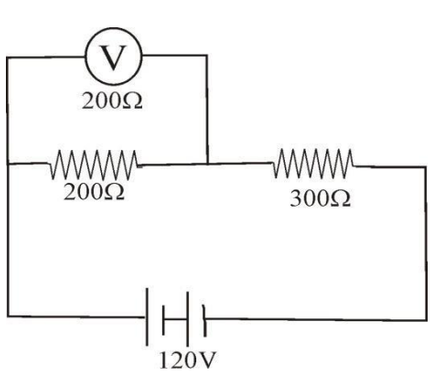
$\mu_0 = 4\pi \times 10^{-7}$ Tm A^{-1}

$m_e = 9.1 \times 10^{-31}$ kg

	Section A	
	Directions for Q1 – Q7 **Select and write the most appropriate options from those given below each question.**	
1	In a semiconductor the energy gap between conduction band and valence band is….. * infinity * greater than 3eV * less than 3eV * zero	1
2	The graph shows the variation of resistivity of the material as a function of temperature. The given material may be  * Germanium. * wood . * Copper. * Nichrome.	1
3	One wb m^{-2} is same as a_____. * Tesla * Henry * Watt * Dyne	1
4	If λ_v, λ_x and λ_m represent the wavelength of visible light , X-ray , and microwaves respectively then * $\lambda_m > \lambda_x > \lambda_v$ * $\lambda_v > \lambda_m > \lambda_x$ * $\lambda_m > \lambda_v > \lambda_x$ * $\lambda_v > \lambda_x > \lambda_m$	1
5	Two coherent sources of different intensities send waves that interfere. The ratio of maximum to minimum intensity in the interference pattern is 25:1. The intensity ratio of the sources is * 25 :1 * 5 :1 * 9: 4 * 3:2	1

6	If m_n, m_p, and m_e are the masses of neutron, proton, and electron respectively then the mass defect of the nucleus of mass M, atomic number Z and mass number A is given by * $[Zm_n +(A-Z)m_p] – M$ * $[Zm_p +(A-Z)m_n] – M$ * $[Zm_p +(A-Z)m_e] – M$ * $[Zm_p +(A-Z)m_n] + M$	1
7	A 50 mH coil carries a current of 2A. The energy stored in the coil is * 100 J * 0.1 J * 0.05 J * 50 J	1
Directions for Q 8 – Q 14 Answer the following		
8	Why are NAND and NOR gates called universal logic gates?	1
9	What is Doppler effect of light?	1
10	A point source of light is used in an experiment on photoelectric effect. Which one of the following curves best represents the variation of photocurrent (I) with distance (D) of the source from the emitter? 	1
11	If a_0 is the Bohr's radius then what will be the radius of second orbit of the hydrogen atom?	1
12	A plane wavefront AB passing through a transparent object emerges as shown in the figure. (Arrows represent the direction of propagation of the wavefronts). Identify the object. 	1
13	If the temperature of a conductor is increased, what will be the effect on the product of conductivity and resistivity of the conductor? Give a reason for your answer.	1
14	Why is an n-type semiconductor electrically neutral even though majority charge carriers in it are electrons?	1

Section B

15	In a nuclear reactor how does the moderator increase the multiplication factor (K) while the control rods decrease it?	2
16	If two thin lenses of focal length f_1 and f_2 are in contact, derive an equation for effective focal length of their combination.	2
17	What is the effect on the fringe width of the interference pattern in Young's double slit experiment if (i) The screen is moved away from the plane of the slits? (ii) The source is replaced by another source of higher frequency?	2
18	The threshold frequency for a metal is f_0. When a light of frequency $2f_0$ is incident on the metal plate, the maximum velocity of electrons emitted is v_1. When the frequency of the incident radiation is increased to $5f_0$, the maximum velocity of electrons emitted is v_2. Find the ratio of v_1 and v_2.	2
19	Name the part of the electromagnetic spectrum which i) is used in T.V communication. ii) maintains the warmth of the Earth`s atmosphere.	2
20	An infinite line charge produces a field of 9×10^4 NC^{-1} at a distance of 2 cm. Calculate the charge density.	2
21	Why is an induced electric field developed inside a dielectric material, when it is placed in an external electric field? How does this electric field differ from the induced electric field produced in a conductor, when it is placed in an external electric field?	2
22	A voltmeter of resistance 200 Ω is connected across a 200 Ω resistor as shown in the figure. Find the voltage shown by the voltmeter. 	2
23	A charge of 2 μC is moving undeviated in crossed electric and magnetic fields. When the electric field is switched off, the charge experiences a magnetic force of 5 newton. What is the strength of the electric field?	2
24	A 100 Ω resistor is connected to an ac supply of peak voltage 311 V. What is the net power consumed over a full cycle?	2

Section C

25 Derive an expression for the capacitance of a parallel plate capacitor with air as the intervening medium between the plates. **3**

What will be the effect on the capacitance of a parallel plate capacitor, if air is replaced by a dielectric medium of dielectric constant K.

26 Some practical applications of total internal reflection are mirage, total reflecting prism and optical fibre. **3**

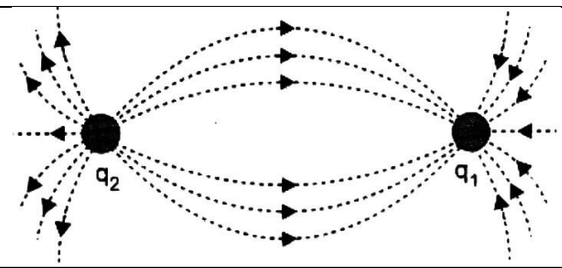
i) T_1 is the temperature of the air near the ground and T_2 is the temperature of the air at a higher level. For the phenomenon of mirage to occur, which of the two temperatures should have a larger value?

ii) In a total reflecting prism designed to bend light coming from an object by 90^0 or 180^0, what is the effect on size of the image?

iii) If μ_1 is the refractive index of the core and μ_2 is the refractive index of the cladding of an optical fibre, what is the relation between μ_1 and μ_2?

27 **3**

The figure shows electric field lines due to an electric dipole.



i) Write down the polarities of q_1 and q_2.

ii) An electric dipole is placed inside a uniform electric field.

a) Why is the net force on the dipole zero?

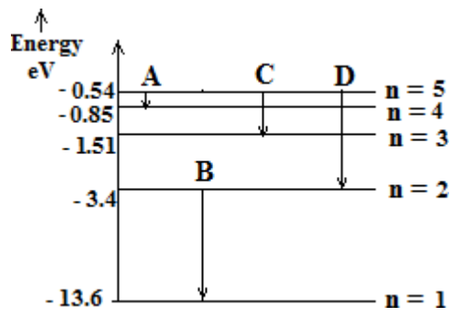
b) With respect to the electric field, in which orientation of the dipole will the torque be maximum?

28 The figure shows the transitions A, B, C and D of electrons between different energy levels in a Hydrogen atom. **3**

i) Name the series to which the spectral line corresponding to the transition C belongs.

ii) Name the part of the electromagnetic spectrum to which the spectral line corresponding to transition D belongs.

iii) The spectral line corresponding to which transition has the lowest wavelength?

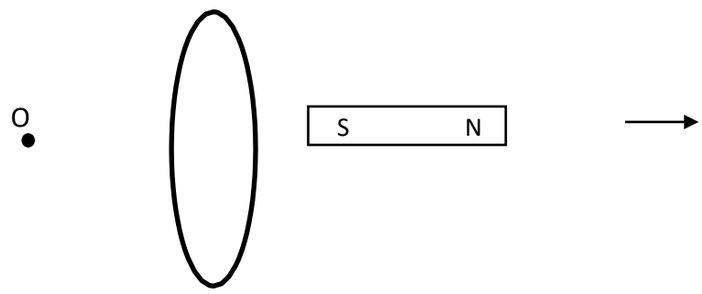
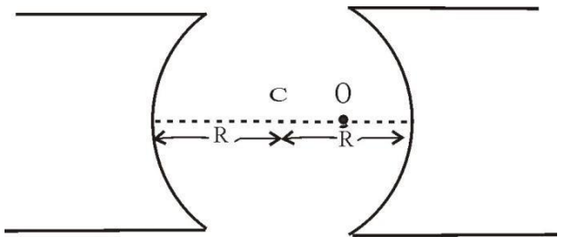


29 **3**

i) The magnetic field inside a current carrying solenoid is B. What will be the effect on this field if the solenoid is filled with a material of zero magnetization?

ii) What will be the angle of dip at a place where the magnitudes of the horizontal and the vertical components of the magnetic field are equal?

iii) Why does a magnetic compass needle orient in any random direction, when placed at a magnetic pole of the earth?

30	The figure shows a bar magnet kept along the axis of a circular coil whose plane is perpendicular to the plane of the paper.  (i) Will there be an induced current produced in the coil when the magnet is at rest? Why? (ii) If the magnet is moving away from the coil as shown by the arrow, what is the direction of the induced current produced in the coil, with respect to an observer at 'O'? Give reason for your answer.	3
31	Two concave glass refracting surfaces each with radius of curvature R = 35 cm and refractive index $\mu = 1.5$ are placed facing each other in air. A point object O is placed at a distance of R/2 from one of the surfaces. Find the separation between the two images of the object, produced by the refracting surfaces.  	3
32	Obtain an expression for the instantaneous current when an ideal capacitor is connected across an alternating voltage source. Draw the phasor diagram. **/OR/** Obtain the relationship between the number of turns and the voltages in the primary and secondary coils of a transformer. Suggest one method to minimize the flux leakage between the coils.	3 3
	Section D	
33	Derive an expression for the magnetic field due to a circular coil carrying current, at a point along its axis. Draw the necessary diagram. **/OR/** Show that the force per unit length between two parallel current carrying wires is inversely proportional to the distance between them. Draw the necessary diagram.	4 4
34	Derive an expression for the effective emf of two cells, when combined in series. Draw the necessary circuit diagram. Write the expression for the emf and internal resistance, when the polarity of one of the cells is reversed? **/OR/** Derive the balancing condition for Wheatstone Bridge. Draw the necessary circuit diagram. Write the formula for the balancing condition when applied to a metre Bridge.	4 4

35	A p-n junction is connected in reverse bias. i) Why does the width of the depletion region increase with the increase in applied voltage? ii) Why does the reverse current suddenly increase at the breakdown voltage? iii) Why is the dynamic resistance below breakdown voltage very large while that above the breakdown voltage negligible?	4
	/OR/	4
	Answer the following questions based on the p-n junction used as optoelectronic junction devices. a) Why is a photodiode operated under reverse bias, while a light emitting diode under forward bias? b) Why should the light energy illuminating a photodiode be greater than the forbidden energy gap? c) Why should the metallic grid on top of a solar cell occupy a very small surface area?	