FIITJEE

HYDERABAD CENTRES

IMPORTANT QUESTIONS

FOR

INTERMEDIATE PUBLIC EXAMINATIONS

IN

SECOND YEAR

PHYSICS

2020 – 2021

TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD

ACADEMIC YEAR 2020-2021

70% CONTENT IN VIEW OF COVID-19 PANDEMIC

INTERMEDIATE 2nd YEAR PHYSICS SYLLABUS

CHAPTER – 1: WAVES

1.1 Introduction
1.2 Transverse and Longitudinal waves
1.3 Displacement relation in a progressive wave
1.4 Speed of a Travelling Wave
1.5 The principle of superposition of waves,
1.6 Reflection of waves
1.7 Beats

CHAPTER– 2: RAY OPTICS AND OPTICAL INSTRUMENTS

2.1 Introduction
2.3 Refraction
2.4 Total Internal Reflection
2.5 Refraction at Spherical Surfaces and by Lenses.
2.6 Refraction through a prism
2.7 Dispersion by a Prism
2.8 Some Natural phenomena due to Sunlight (except 2.8.2)
2.8.1 The Rainbow
2.9 Optical Instruments

CHAPTER – 3: WAVE OPTICS

3.1 Introduction
3.2 Huygens Principle
3.3 Refraction and Reflection of plane waves using Huygens Principle
3.4 Coherent and Incoherent Addition of waves
3.5 Interference of Light waves and Young's Experiment
3.6 Diffraction (except 3.6.3)
3.6.1 The single slit
3.6.2 Seeing the single slit diffraction pattern
3.6.3 The validity of ray optics

CHAPTER – 4: ELECTRIC CHARGES AND FIELDS

4.1 Introduction
4.2 Electric Charges
4.3 Conductors and Insulators
4.4 Charging by Induction
4.5 Basic Properties of Electric Charge
4.6 Coulomb's Law
4.7 Forces between Multiple charges
4.8 Electric Field
4.9 Electric Field Lines
4.10 Electric Flux

7.9 Force between two Parallel Currents, The Ampere(Unit)
7.10 Torque on Current Loop, Magnetic Dipole
7.11 The Moving Coil Galvanometer

CHAPTER – 8: MAGNETISM AND MATTER

8.1 Introduction
8.2 The Bar Magnet (**except 8.2.2, 8.2.3**)
8.2.1 The magnetic field lines
8.2.4 The electrostatic analog
8.3 Magnetism and Gauss' Law
8.4 The Earth's Magnetism
8.5 Magnetisation and Magnetic Intensity

CHAPTER – 9: ELECTROMAGNETIC INDUCTION

9.1 Introduction
9.2 The experiments of Faraday and Henry
9.3 Magnetic Flux
9.4 Faraday's Law of Induction
9.5 Lenz's Law and Conservation of Energy
9.6 Motional Electromotive Force
9.7 Energy consideration : A Quantitative Study
9.8 Eddy Currents
9.9 Inductance
9.10 AC Generator

CHAPTER – 10: ALTERNATING CURRENT:

10.1 Introduction
10.2 AC voltage applied to a Resistor
10.3 Representation of AC Current and Voltage by Rotating Vectors- Phasors
10.4 AC voltage applied to an Inductor
10.5 AC voltage applied to a Capacitor
10.6 AC voltage applied to a Series LCR Circuit
10.8 LC Oscillations (**Qualitative treatment only**)
10.9 Transformers

CHAPTER – 11: ELECTRO MAGNETIC WAVES

11.1 Introduction
11.3 Electro Magnetic Waves (**qualitative treatment only**)
11.4 Electromagnetic Spectrum

CHAPTER–12: DUAL NATURE OF RADIATION AND MATTER

12.1 Introduction
12.2 Electron Emission
12.3 Photoelectric Effect
12.4 Experimental Study of Photoelectric Effect
12.5 Photoelectric Effect and Wave Theory of Light
12.6 Einstein's Photoelectric Equation: Energy Quantum of Radiation
12.7 Particle Nature of Light : The Photon
12.8 Wave Nature of Matter

CHAPTER–13: ATOMS

13.1 Introduction
13.2 Alpha-particle Scattering and Rutherford's Nuclear model of Atom
13.3 Atomic Spectra
13.4 Bohr Model of the Hydrogen Atom
13.5 The Line Spectra of the Hydrogen Atom
13.6 De Broglie's Explanation of Bohr's Second Postulate of Quantization

CHAPTER–14: NUCLEI

14.1 Introduction
14.2 Atomic Masses and Composition of Nucleus
14.3 Size of the Nucleus
14.4 Mass Energy and Nuclear Binding Energy (except 14.4.2)
14.4.1 Mass- Energy
14.5 Nuclear Force
14.7 Nuclear energy

CHAPTER–15:
SEMICONDUCTOR ELECTRONICS:MATERIALS, DEVICES AND SIMPLE CIRCUITS

15.1 Introduction
15.2 Classification of Metals, Conductors and Semiconductors (**qualitative ideas only**)
15.3 Intrinsic Semiconductor
15.4 Extrinsic Semiconductor
15.5 p – n junction
15.6 Semiconductor diode
15.7 Application of Junction Diode as a Rectifier
15.8 Special Purpose p-n Junction Diodes (except 15.8.1)
15.8.2 Optoelectronic junction devices
15.9 Junction Transistor (except 15.9.3, 15.9.4, 15.9.5)
15.9.1 Transistor structure and action
15.9.2 Basic transistor circuit configuration and transistor characteristics
15.10 Digital Electronics and Logic Gates
15.11 Integrated Circuits

CHAPTER– 16: COMMUNICATION SYSTEMS

16.1 Introduction
16.2 Elements of communication system
16.3 Basic Terminology used in Electronic Communication Systems
16.4 Bandwidth of Signals
16.5 Bandwidth of Transmission Medium
16.6 Propagation of Electromagnetic Waves
16.7 Modulation and its Necessity
16.8 Amplitude Modulation
16.9 Production of Amplitude Modulated Wave
16.10 Detection of Amplitude Modulated Wave

TELANGANA STATE BOARD OF INTERMEDIATE EDUCATION, HYDERABAD

ACADEMIC YEAR 2020-2021

30% DELETED CONTENT IN VIEW OF COVID-19 PANDEMIC

INTERMEDIATE 2nd YEAR PHYSICS SYLLABUS

CHAPTER – 1: WAVES
1.8 Doppler Effect

CHAPTER– 2: RAY OPTICS AND OPTICAL INSTRUMENTS
2.2 Reflection of light by Spherical Mirrors
2.8.2 Scattering of light

CHAPTER – 3: WAVE OPTICS
3.6.3 Resolving power of optical instruments
3.7 Polarization

CHAPTER – 4: ELECTRIC CHARGES AND FIELDS
4.15.3 Field due to a uniformly charged thin spherical shell

CHAPTER– 5: ELECTROSTATIC POTENTIAL AND CAPACITANCE
5.16 Van de Graaf generator

CHAPTER – 6: CURRENT ELECTRICITY
6.7 Resistivity of various Materials
6.10 Combination of resistors-series and parallel

CHAPTER – 7: MOVING CHARGES AND MAGNETISM
7.4 Motion in combined electric and magnetic fields

CHAPTER – 8: MAGNETISM AND MATTER
8.2.2 Bar Magnet as a equivalent solenoid
8.2.3 The dipole in a uniform magnetic field
8.6 Magnetic properties of materials
8.7 Permanent magnets and electromagnets

CHAPTER – 9: ELECTROMAGNETIC INDUCTION
No deletions

CHAPTER – 10: ALTERNATING CURRENT
10.7 Power in AC Circuit: The Power Factor

CHAPTER – 11: ELECTRO MAGNETIC WAVES
11.2 Displacement Current

CHAPTER–12: DUAL NATURE OF RADIATION AND MATTER
12.9 Davisson and Germer Experiment

CHAPTER–13: ATOMS
No deletions

CHAPTER–14: NUCLEI
14.4.2 Nuclear Binding energy
14.6 Radioactivity

CHAPTER–15: SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS
15.8.1 Zener diode
15.9.3 Transistor as a device
15.9.4 Transistor as an amplifier (CE configuration)
15.9.5 Feedback amplifier and transistor oscillator

CHAPTER– 16: COMMUNICATION SYSTEMS
No deletions

Deleted Experiments of Second Year Practical's

1. Concave mirror
2. Tangent galvanometer
3. Characteristics of transistor

TS Inter 2nd year Physics Blue Print 2021 Senior Physics

S.No	CHAPTER	2M	4M	8M	Total
1	Waves	—	—	1	8
2	Ray Optics& Optical Instruments	1	1	—	6
3	Wave optics	—	1	—	4
4	Electric Charges and Fields	—	1	—	4
5	Electro Static Potential	—	1	—	4
6	Current Electricity	—	—	1	8
7	Moving Charges and Magnetism	1	1	—	6
8	Magnetism and Matter	2	—	—	4
9	Electro Magnetic Induction	—	1	—	4
10	Alternating Current	1	—	—	2
11	Electro Magnetic Waves	1	—	—	2
12	Dual Nature and Radiation	2	—	—	4
13	Atoms	—	1	—	4
14	Nuclei	—	—	1	8
15	Semiconductor and Electronics	1	1	—	6
16	Communication System	1	—	—	2
	Total Number of Questions	**10**	**8**	**3**	**76**

PAPER PATTERN

Question Type	No. of Question given	No. of questions to be answered	Marks of each question	Total Marks
VSAQ	10	10	2	20
SAQ	12	6	4	24
LAQ	4	2	8	16
			GRAND TOTAL	60

TSBIE - MODEL PAPER

PHYSICS - II

Time: 3Hrs. **Max. Marks: 60**

SECTION – A

Answer all questions.

Each question carries 2 marks.

All are very short answer type questions. **10 × 2 = 20 Marks**

1. What is the principle of a moving coil galvanometer?
2. Define magnetic declination.
3. What happens to compass needles at the Earth's poles?
4. What type of transformer is used in a 6V bed lamp?
5. A small angled prism of 4º deviates a ray through 2.48º. Find the refractive index of the prism.
6. Give two uses of infrared rays.
7. What important fact did Millikan's experiment establish?
8. Write down Einstein's photoelectric equation.
9. What happens to the width of the depletion layer in a p-n junction diode when it is
   i) forward-biased and ii)reverse biased?
10. What is sky wave propogation?

SECTION – B

Answer any six questions.

Each question carries 4 marks.

All are short answer type questions. **6 × 4 = 24 Marks**

11. Define critical angle. Explain total internal reflection using a neat diagram.
12. Explain the formation of a rainbow.
13. Derive the expression for the intensity at a point where interference of light occurs. Arrive at the conditions for maximum and zero intensity.
14. State and explain Coulomb's inverse square law in electricity.
15. Define intensity of electric field at a point. Derive an expression for the intensity due to a point charge.
16. Derive an expression for the capacitance of a parallel plate capacitor
17. Explain the behaviour of dielectrics in an external field.
18. Derive an expression for the magnetic induction or magnetic field at the centre of a current carrying circular coil using Biot-Savart law.
19. Describe the ways in which Eddy currents are used to advantage.
20. What are the limitations of Bohr's theory of hydrogen atom?
21. Explain the different types of spectral series.
22. What is rectification? Explain the working of a full wave rectifier.

SECTION – C

Answer any two of the following.

Each question carries 8 marks.

All are long answer type questions. **$2 \times 2 = 16$ Marks**

23. How are stationary waves formed in closed pipes? Explain the various modes of vibrations and obtain relations for their frequencies. A closed organ pipe 70 cm long is sounded. If the velocity of sound is 331 m/s, what is the fundamental frequency of vibration of the air column?

24. What are beats? Obtain an expression for the beat frequency. Where and how are beats made use of? Two organ pipes of lengths 65 cm and 70 cm respectively, are sounded simultaneously. How many beats per second will be produced between the fundamental frequencies of the two pipes? (Velocity of sound = 330 m/s).

25. State Kirchhoff's law for an electrical network. Using these laws deduce the condition for balance in a Wheatstone bridge.

26. Explain the principle and working of a nuclear reactor with the help of a labeled diagram. If one microgram of $^{235}U_{92}$ is completely destroyed in an atom bomb, how much energy will be released?

LONG ANSWER QUESTIONS

WAVES

1. Explain the formation of stationary waves in stretched strings and hence deduce the laws of transverse wave in stretched strings.
2. Explain the formation of stationary waves in air column enclosed in open pipe. Derive the equations for the frequencies of the harmonics produced.
3. How are stationary waves formed in closed pipes? Explain the various modes of vibrations and obtain relations for their frequencies.

RAY OPTICS AND OPTICAL INSTRUMENTS

1. a) Define Snell's Law. Using a neat labelled diagram derive an expression for the refractive index of the material of an equilateral prism.
   b) A ray of light, after passing through a medium, meets the surface separating the medium from air at an angle of 45° and is just not refracted. What is the refractive index of the medium?
2. Draw a neat labelled diagram of a compound microscope and explain its working. Derive an expression for its magnification.
3. Obtain an expression for the combined focal length for two thin convex lenses kept in contact and hence obtain an expression for the combined power of the combination of the lenses?

WAVE OPTICS

1. Describe Young's experiment for observing interference and hence arrive at the expression for 'fringe width'.
2. Distinguish between Coherent and Incoherent addition of waves. Develop the theory of constructive and destructive interferences?
3. What is diffraction? Discuss diffraction pattern obtainable from a single slit?

ELECTRO STATIC POTENTIAL AND CAPACITANCE

1. Explain series and parallel combination of capacitors. Derive the formula for equivalent capacitance in each combination.
2. Derive an expression for the energy stored in a capacitor. What is the energy stored when the space between the plates is filled with a dielectric
3. State Gauss's law in electrostatics. Applying Gauss's law derive the expression for electric intensity due to an infinite plane sheet of charge.
4. Define electric flux. Applying Gauss's law and derive the expression for electric intensity due to an infinite long straight charged wire. (Assume that the electric field is everywhere radial and depends only on the radial distance r of the point from the wire.)
5. Define electric potential. Derive an expression for the electric potential due to an electric dipole and hence the electric potential at a point.
   (a) on the axial line of electric dipole
   (b) on the equatorial line of electric dipole

CURRENT ELECTRICITY

1. In a house three bulbs of 100 W each are lighted for 4 hours daily and six tube lights of 20 W each are lighted for 5 hours daily and a refrigerator of 400 W is worked for 10 hours daily for a month of 30 days. Calculate the electricity bill if the cost of one unit is Rs. 4.00

MOVING CHARGES AND MAGNETISM

1. Deduce an expression for the force on a current carrying conductor placed in a magnetic field. Derive an expression for the force per unit length between two parallel current-carrying conductors.
2. Obtain an expression for the torque on a current carrying loop placed in a uniform magnetic field. Describe the construction and working of a moving coil galvanometer.
3. How can a galvanometer be converted to an ammeter? Why is the parallel resistance smaller than the galvanometer resistance?
4. How can a galvanometer be converted to a voltmeter? Why is the series resistance greater than the galvanometer resistance?
5. Derive an expression for the force acting between two parallel current carrying conductors and hence define the Ampere.

MAGNETISM AND MATTER

1. Obtain Gauss's Law for magnetism and explain it.
2. Derive an expression for the magnetic field at a point on the axis of a current carrying circular loop.

ELECTROMAGNETIC INDUCTION

1. Describe the working of a AC generator with the aid of a simple diagram and necessary expressions.

ALTERNATING CURRENT

1. Obtain an expression for impedance and current in series LCR circuit. Deduce an expression for the resonating frequency of an LCR series resonating circuit?

DUAL NATURE OF RADIATION AND MATTER

1. How Einstein's photoelectric equation account for the effect of frequency of incident light on stopping potential. Explain the effect of intensity and potential on photoelectric current?

ATOMS

1. Describe Geiger-Marsden Experiment on scattering of $\alpha -$ particles. How is the size of the nucleus estimated in this experiment?
2. Discuss Bohr's theory of the spectrum of hydrogen atom.
3. State the basic postulates of Bohr's theory of atomic spectra. Hence obtain an expression for the radius of orbit and the energy of orbital electron in a hydrogen atom.

NUCLEI

1. Explain the principle and working of a nuclear reactor with the help of a labelled diagram.
2. Explain the source of stellar energy. Explain the carbon-nitrogen cycle, proton-proton cycle occurring in stars.

SEMI CONDUCTOR ELECTRONICS

1. What is rectifier? Explain the working of half wave and full wave rectifiers with diagrams.
2. Describe a transistor and explain its working.
3. Sketch a basic AND circuit with two diodes and explain its operation. Explain how doping increases the conductivity in semiconductors?
4. What is Junction diode? Explain the formation of depletion region at the junction. Explain the variation of depletion region in farward and reverse biased condition.

SHORT ANSWER QUESTIONS

WAVES

1. What are 'beats'? When do they occur? Explain their uses, if any?
2. Write an expression for progressive harmonic wave and explain the various parameters used in the expression?
3. What are standing waves? Explain how standing waves may be formed in a stretched string?
4. Explain the modes of vibration of a stretched string with examples?
5. What do you understand by 'resonance'? How would you use resonance to determine the velocity of sound in air?

RAY OPTICS AND OPTICAL INSTRUMENTS

1. Define critical angle. Explain total internal reflection using a neat diagram?
2. Explain the formation of a rainbow?
3. Explain the formation of a mirage?
4. Why does the setting sun appear red?
5. With a neat labelled diagram explain the formation of image in a simple microscope?

WAVE OPTICS

1. Derive the expression for the intensity at a point where interference of light occurs. Arrive at conditions for maximum and zero intensity.
2. Discuss the intensity of transmitted light when a Polaroid sheet is rotated between two crossed polaroids?
3. What is total internal reflection. Explain the phenomenon using Huygens principle?

ELECTRIC CHARGES AND FIELDS

1. Derive an equation for the couple acting on a electric dipole in a uniform electric field.
2. Derive an expression for the intensity of the electric field at a point on the equatorial plane of an electric dipole.
3. Derive an expression for the intensity of electric field at a point on the axial line of a dipole.
4. State and explain Coulomb's inverse square law in electricity.
5. Define intensity of electric field at a point. Derive an expression for the intensity due to a point charge.
6. State Gauss's law in electrostatics and its importance.

ELECTRO STATIC POTENTIAL AND CAPACITANCE

1. Derive an expression for the capacitance of a parallel plate capacitor.
2. Derive an expression for the electric potential due to point charge.
3. Derive expression for the potential energy of an electric dipole placed in a uniform electric field.
4. Explain behaviour of dielectrics in an electric field.
5. Derive an expression for the electrostatic potential energy of a system of two point charges and find its relation with electric potential of a charge.

CURRENT ELECTRICITY

1. State Kirchhoff's laws for electric network. Using these laws deduce the condition for balancing in a Wheatstone bridge.
2. State the working principle of potentiometer explain with the help of circuit diagram how the potentiometer is used to determine the internal resistance of the given primary cell.

3. State the working principle of potentiometer explain with the help of circuit diagram. How the emf of two primary cells are compared by using the potentiometer.
4. 'm' cells each of emf 'E' and internal resistance 'r' are connected in parallel. What is the total emf and internal resistance? Under what conditions in the current drawn from mixed groping of cells a maximum?
5. Two cells of emf 4.5 v and 6.0 v and internal resistance 6Ω and 3Ω respectively have their negative terminals joined by a wire of 18Ω and positive terminals by a wire of 12Ω resistance and third resistance wire of 24Ω connects middle points of these wires using kirchhoff's laws find the potential differences at the ends of this third resistance wire.
6. A battery of emf 10V and internal resistance 3Ω, is connected to a resistor 'R'.
   (i) If the current in the circuit is 0.5 A. Calculate the value of 'R'?
   (ii) What is the terminal voltage of the battery when the circuit is closed.

MOVING CHARGES AND MAGNETISM

1. State and explain Biot-Savart law.
2. State and explain Ampere's law.
3. Derive an expression for the magnetic induction at the centre of a current carrying circular coil using Biot-Savart law?
4. What are the basic components of cyclotron? Mention its uses?
5. Find the magnetic induction intensity B due to a long current carrying conductor?
6. Obtain an expression for the magnetic dipole moment of a current loop?
7. Derive an expression for the magnetic dipole moment of a revolving electron?
8. Derive an expression for the magnetic field at a point on the axis of a current carrying circular coil using Biot-Savart law?

MAGNETISM AND MATTER

1. Derive an expression for the axial field of a solenoid of radius "r", containing "n" turns per unit length and carrying current "i".
2. If B is the magnetic field produced at the centre of a circular coil of one turn of length L carrying current I then what is the magnetic field at the centre of the same coil which is made into 10 turns?

ELECTROMAGNETIC INDUCTION

1. Obtain an expression for the emf induced across a conductor which is moved in a uniform magnetic field which is perpendicular to the plane of motion.
2. Obtain an expression for the mutual inductance of two long co-axial solenoids.
3. Obtain an expression for the magnetic energy stored in a solenoid in terms of the magnetic field, area and length of the solenoid.
4. Describe the ways in which Eddy currents are used to advantage.

ALTERNATING CURRENT

1. State the principle on which a transformer works. Describe the working of a transformer with necessary theory.
2. Obtain an expression for the current through an inductor when an a.c. emf is applied?
3. Obtain an expression for the current in a capacitor when an a.c. emf is applied?

ELECTROMAGNETIC WAVES

1. What is the Greenhouse effect and its contribution towards the surface temperature of earth?
2. What does an electromagnetic wave consists of? On what factors does it velocity in vacuum depends?

DUAL NATURE OF RADIATION AND MATTER

1. What is the effect of (i) intensity of light (ii) potential on photoelectric current?
2. Describe an experiment to study the effect of frequency of incident radiation on "Stopping potential"?
3. Summarise the photon picture of electromagnetic radiation.
4. What is the debroglie wavelength of a ball of mass 0.12 kg moving with a speed of $20ms^{-1}$? What can we infer from this result?

ATOMS

1. What is impact parameter and angle of scattering? How are they related to each other?
2. Explain the distance of closest approach and impact parameter.
3. What are the limitations of Bohr's theory of hydrogen atom?
4. Explain the different types of spectral series.
5. Describe Rutherford atom model. What are the draw backs of this model.
6. Derive an expression for potential and kinetic energy of an electron in any orbit of a hydrogen atom according to Bohr's atomic model.
7. State the basic postulates of Bohr's theory of atomic spectra.

NUCLEI

1. Write a short note on the discovery of neutron.
2. Distinguish between nuclear fission and nuclear fusion.
3. What are the properties of a neutron?
4. What are nuclear forces? Write their properties.
5. What is nuclear fission? Give an example to isslustrate it.
6. What is nuclear fusion? Write the conditions for nuclear fusion to occur.

SEMICONDUCTORS

1. Describe how a semi conductor diode is used as a half wave rectifier.
2. What is rectification? Explain the working of a full wave rectifier.
3. What are n-type and p-type semiconductors? How is a semiconductor junction formed?
4. What is a photodiode? Explain its working with a circuit diagram and draw its I-V characteristics.
5. Explain the working of LED and what are its advantages over conventional incandescent flow power lamps.
6. Explain the working of a solar cell and draw its I-V characteristics.
7. Define NAND and NOR gates. Give their truth tables.
8. Explain the operation of a NOT gate and give its truth table.
9. Explain the different transistor configurations with diagrams.
10. Distinguish between half-wave and full-wave rectifiers.
11. Discuss the behaviour of p-n junction. How does a potential barrier develop at the junction?
12. Draw and explain the current-voltage (I-V) characteristic curves of a junction diode in forward and reverse bias.
13. Explain hole conduction in Intrinsic Semiconductors?

VERY SHORT ANSWER QUESTIONS

1. WAVES

1. Distinguish between transverse and longitudinal waves.
2. What are the parameters used to describe a progressive harmonic wave?
3. Using dimensional analysis obtain an expression for the speed of sound waves in a medium.
4. What is the principle of superposition of waves?
5. What is a stationary or standing wave?
6. What do you understand by the terms 'node' and 'antinode'?
7. The air column in a long tube, closed at one end , is set in vibration. What harmonics are possible in the vibrating air column?
8. If the air column in a the, open at both ends, is set in vibration ; what harmonics are possible?
9. Under what conditions will a wave be reflected?

2. RAY OPTICS AND OPTICAL INSTRUMENTS

1. What is optical density and how is it different from mass density?
2. Define 'power' of a convex lens. What is its unit?
3. A small angled prism of 4° deviates a ray through 2.48°. Find the refractive index of the prism.
4. What is myopia/ How can it be corrected?
5. What is hypermetropia? How can it be corrected?

3. WAVE OPTICS

1. What is Fresnel distance?

4. ELECTRIC CHARGES AND FIELDS

1. Repulsion is the sure test of charging than attraction. Why?
2. How many electrons constitute $1C$ of charge?
3. What happens to the weight of a body when it is charged positively?
4. What happens to the force between two charges if the distance between them is (a) halved (b) doubled?
5. The electric lines of force do not intersect. Why?
6. Write the expression for electric intensity due to an infinite long charged wire at a distance radial distance r from the wire.
7. Write the expression for electric intensity due to an infinite plane sheet of charge.
8. What is meant by "charge is quantised "?
9. When is the electric plugs negative and when is it positive?

5. ELECTRO STATIC POTENTIAL AND CAPACITANCE

1. Can there be electric intensity at a point with zero electric potential? Give an example
2. What are meant by equipotential surfaces?
3. Three capacitors of capacitances $1\mu F, 2\mu F$ and $3\mu F$ are connected in parallel
   a) What is the ratio of charges?
   b) What is the ratio of potential differences?
4. Three capacitors of capacitances $1\mu F, 2\mu F$ and $3\mu F$ are connected in series
   a) What is the ratio of charges?
   b) What is the ratio of potential differences?
5. What happens to the capacitance of a parallel plate capacitor if the area of its plates is doubled?

6. CURRENT ELECTRICITY

1. State Ohm' law and write its mathematical form.
2. Define temperature coefficient of resistance.
3. Define mean free path of electron in a conductor.

7. MOVING CHARGES AND MAGNETISM

1. What is the importance of Oersted's experiment?
2. State Ampere's law and Biot-Savart law.
3. What is the force on a conductor of length L carrying a current $"i"$ placed in a magnetic field of induction B? When does it become maximum?
4. What is the force on a charged particle of charge "q" moving with a velocity "v" in a uniform magnetic field of induction B? When does it become maximum?
5. How do you convert a moving coil galvanometer into an ammeter?
6. How do you convert a moving coil galvanometer into a voltmeter?
7. Distinguish between ammeter and voltmeter.
8. A current carrying circular loop lies on a smooth horizontal plane. Can a uniform magnetic field be set up in such a manner that the loop turns about the vertical axis?

8. MAGNETISM AND MATTER

1. What happens to compass needles at the Earth's poles?
2. Define magnetic declination.
3. Define magnetic inclination or angle of dip.
4. What are the units of magnetic moment , magnetic induction and magnetic field.
5. What is the magnetic moment associated with a solenoid.

9. ELECTROMAGNETIC INDUCTION

1. What did the experiments of Faraday and Henry show?
2. Define magnetic flux.
3. State Faraday's law of electromagnetic induction.
4. State Lenz's law.
5. What are Eddy currents?
6. What do you understand by 'self inductance'?

10. ALTERNATING CURRENT

1. A transformer converts 200V ac into 2000V ac. Calculate the number of turns in the secondary if the primary has 10 turns.
2. What type of transformer is used in a 6V bed lamp?
3. What is the phenomenon involved in the working of a transformer?
4. What is transformer ratio?
5. Write the expression for the reactance of (i) an inductor and (ii) a capacitor.

11. ELECTROMAGNETIC WAVES

1. Give any one use of infrared rays.
2. What is the principle of production of electromagnetic waves?
3. What are the applications of microwaves?
4. Microwaves are used in Radars, why?

12. DUAL NATURE OF RADIATION AND MATTER

1. What important fact did Millikan's experiment establish?
2. What is "photoelectric effect "?
3. Write down deBroglie's relation and explain the terms there in.
4. State Heisenberg's Uncertainity Principle.

14. NUCLEI

1. What is a.m.u.? What s its equivalent energy?
2. What will be the ratio of the radii of two nuclei of mass numbers A_1 and A_2 ?
3. A nucleus contains no electrons but can emit them. How?
4. Neutrons are the best projectiles to produce nuclear reactions. Why?
5. What are delayed neutrons?
6. What are thermal neutrons? What is their importance?
7. What is the role of controlling rods in a nuclear reactor?
8. What is a chain reaction?
9. What are isotopes and isobars.

15. SEMICONDUCTOR ELECTRONICS : MATERIALS, DEVICES AND SIMPLE CIRCUITS

1. What is an n-type semiconductor? What are the majority and minority charge carriers in it?
2. What is a p-type semiconductor? What are the majority and minority charge carriers in it?
3. What is a p-n junction diode? Define depletion layer.
4. Draw the circuit symbols for p-n-p and n-p-n transistors.
5. Define amplifier and amplification factor.
6. In which bias can a Zener diode be used as voltage regulator?
7. Which gates are called universal gates?

16. COMMUNICATION SYSTEMS

1. What is "World Wide Web" (WWW)?
2. Define modulation. Why is it necessary?
3. Mention the basic methods of modulation.
4. Which type of communication is employed in Mobile Phones?

FIITJEE
HYDERABAD CENTRES

Total No. of Questions - 26
Total No. of Printed Pages - 2

Reg. No.

Part - III
PHYSICS, Paper II
I.P.E BOARD MODEL PAPER-I
(English Version)

Time : 3 Hours **Max. Marks : 60**

SECTION – A

Answer all questions.
Each question carries 2 marks.
All are very short answer type questions. **10 × 2 = 20 Marks**

1. Define temperature coefficient of resistance.
2. What is myopia? How can it be corrected?
3. Mention the basic methods of modulation.
4. Draw the circuit symbols for p-n-p and n-p-n transistors.
5. What are "beats"?
5. What is Fresnel distance?
6. A current carrying circular loop is placed in a uniform external magnetic field. If the loop is free to turn. What is its orientation when it achieves stable equilibrium?
8. Three capacitors of capacitances $1\mu F$, $2\mu F$ and $3\mu F$ are connected in series
   a) What is the ratio of charges?
   b) What is the ratio of potential differences?
9. Give two uses of infrared rays.
10. What is the phase difference between AC emf and current in the following: Pure resistor, pure inductor and pure capacitor?

SECTION – B

Answer any six questions.
Each question carries 4 marks.
All are short answer type questions. **6 × 4 = 24 Marks**

11. Derive an expression for the capacitance of a parallel plate capacitor?
12. State Kirchoff's law for an electrical net work. Using these laws deduce the condition for balance in a Wheatstone bridge.
13. Derive an expression for the magnetic induction at the centre of a current carrying circular coil using Biot-Savart law.
14. What is the position of the object for a simple microsope? What is the maximum magnification of a simple microscope for a realistic focal length?

15. Explain the formation of a rainbow.
16. Derive the equation for the couple acting on a electric dipole in a uniform electric field.
17. Derive an expression for the axial field of a solenoid of radius 'r' containing 'n' turns per unit length and carrying current 'i'.
18. Describe the ways in which Eddy currents are used to advantage.
19. What are 'beats'? When do they occur? Explain their use, if any.
20. Derive the expression for the intensity at a point where interference of light occurs. Arrive at the conditions for maximum and zero intensity.

21. What is deBroglie wavelength of a ball of mass 0.12 kg moving with a speed of $20ms^{-1}$? What can we infer from this result?
22. What is rectification? Explain the working of a full wave rectifier.

SECTION – C

Answer any two of the following.

Each question carries 8 marks.

All are long answer type questions. **$2 \times 2 = 16$ Marks**

23. Explain the formation of stationary waves in stretched strings and hence deduce the laws of transverse waves in stretched strings.

    A stretched wire of length 0.6m is observed to vibrate with a frequency of 30 Hz in the fundamental mode. If the string has a linear mass of 0.05 kg/m find (a) the velocity of propagation of transverse waves in the string (b) the tension in the string?
24. Deduce an expression for the force on a current carrying conductor placed in a magnetic field. Derive expression for the force per unit
25. Explain the source of stellar energy. Explain the carbon-nitrogen cycle and proton-proton cycle occurring in stars.

    If one microgram of $^{235}U_{92}$ is completely destroyed in an atom bomb. How much energy will be released.
26. Draw a circuit diagram showing how a potentiometer may be used to find internal resistance of a cell and establish a formula for it.

FIITJEE
HYDERABAD CENTRES

Total No. of Questions - 26 **Reg. No.**

Total No. of Printed Pages - 2

Part - III
PHYSICS, Paper II
I.P.E BOARD MODEL PAPER-II
(English Version)

Time : 3 Hours **Max. Marks : 60**

SECTION – A

Answer all questions.

Each question carries 2 marks.

All are very short answer type questions. **$10 \times 2 = 20$ Marks**

1. The sequence of bands marked on a carbon resistor are: Red, Red, Red, Silver. What is its resistance and tolerance?
2. Distinguish between ammeter and voltmeter.
3. The focal length of concave lens is 30cm. Where should an object be placed so that its image is $\frac{1}{10}$ of its size.
4. Mention the various parts of the ionosphere.
5. Which gates are called universal gates?
6. What is transformer ratio?
7. The dielectric strength of air is $3 \times 10^6 \, V/m$ at certain pressure. A parallel plate capacitor with air in between the plates has a plate separation of 1 cm can you charge the capacitor to $3 \times 10^6 V$?
8. What is the ratio of speed of infrared rays and ultraviolet rays in vacuum?
9. What is the important fact did Millikan's experiment establish?
10. Neutrons cannot produce ionization. Why?

SECTION – B

Answer any six questions.

Each question carries 4 marks.

All are short answer type questions. **$6 \times 4 = 24$ Marks**

11. Derive an expression for the potential energy of an electric dipole placed in a uniform electric field.
12. Draw a circuit diagram showing how a potentiometer may be used to find internal resistance of a cell and establish a formula for it.
13. Draw a neat labelled diagram of a compound microscope and explain its working. Derive an expression for its magnification.

14. Does the principle of conservation of energy hold for interference and diffraction phenomena? Explain briefly.
15. State Gauss's law in electrostatics and explain its importance.
16. If B is the magnetic field produced at the centre of a circular coil of one turn of length L carrying current I then what is the magnetic field at the centre of the same coil which is made into 10 turns?
17. Obtain an expression for the emf induced across a conductor which is moved in a uniform magnetic field which is perpendicular to the plane of motion.
18. Distinguish between excitation potential and ionization potential.
19. Define NAND and NOR gates. Give their truth tables.
20. What are nuclear forces? Write their properties.
21. What is Greenhouse effect and its contribution towards the surface temperature of earth?
22. Obtain an expression for the emf induced across a conductor which is moved in a uniform magnetic field which is perpendicular to the plane of motion.

SECTION – C

Answer any two of the following.

Each question carries 8 marks.

All are long answer type questions. **$2 \times 2 = 16$ Marks**

23. Explain the formation of stationary waves in an air column enclosed in open pipe. Derive the equations for the frequencies of harmonics produced.

    Two organ pipes of length 65 cm and 70 cm respectively are sounded simultaneously. How many beats per second will be produced between the fundamental frequencies of the two pipes? (Velocity of sound = 330 m/s).
24. Describe the construction and working of a moving coil galvanometer. Obtain the relation between current and deflection of the coil.

    The resistance of M.C.G. is 5Ω. The maximum current it can measure is 0.015A. How would you convert it into voltmeter to measure 1.5 volts?
25. State Bohr's Postulates. Derive the expression for the radius of the first orbit in a Hydrogen atom.

    Radius of the first orbit of a Hydrogen atom is 5.3×10^{-11}m. What are the radii of the n_2 and n_3 orbits?
26. Explain the principle and working of a nuclear reactor with the help of a labelled diagram.

NOTE: After learning all the above questions, students are advised to go through remaining VSAQ's in Text Book.

PHYSICS DELETED QUESTIONS 2020-2021

WAVES

SAQ

1. What is 'Doppler effect'? Give illustrative examples?

LAQ

2. What is Doppler effect? Obtain an expression for the apparent frequency of sound heard when the source is in motion with respect to an observer at rest.
3. What is Doppler's shift? Obtain an expression for the apparent frequency of sound heard when the observer is in motion with respect to a source at rest?

VSAQ

4. What is 'Doppler effect'? Give an example.

RAY OPTICS

SAQ

1. Explain the Cartesian sign convention for mirrors?
2. Define focal length of a concave mirror. Prove that the radius of curvature of a concave mirror is double its focal length?

LAQ

3. (a) Using a neat labelled diagram derive the mirror equation. Define linear magnification?
   (b) An object is placed at 5 cm. from a convex lens of focal length 15 cm. What is the position and nature of the image?

VSAQ

4. What are the laws of reflection through curved mirrors?
5. A concave mirror produces an image of a long vertical pin, placed 40 cm from the mirror, at the position of the object. Find the focal length of the mirror.

WAVE OPTICS

SAQ

1. Explain Doppler effect in light. Distinguish between red shift and blue shift?
2. Discuss the intensity of transmitted light when a Polaroid sheet is rotated between two crossed polaroids?
3. How do you determine the resolving power of your eye?
4. Explain polarisation of light by reflection and arrive at Brewster's law from it.

LAQ

5. What is resolving power of optical instruments? Derive the condition under which images are resolved?

VSAQ

6. What is Malus' law.
7. Explain Brewster's law.

ELECTROSTATICS

LAQ

1. Applying Gauss's law derive the expression for electric intensity due to a charged conducting spherical shell at
   (i) a point outside the shell
   (ii) a point on the surface of the shell and
   (iii) a point inside the shell

CURRENT ELECTRICITY

SAQ

1. Derive an expression for the effective resistance when three resistors are connected in (i) series (ii) parallel.
2. Three resistors each of resistance 10 ohm are connected in turn to obtain
   (i) minimum resistance (ii) maximum resistance
   Compute:
   (a) the effective resistance in each case
   (b) the ratio of minimum to maximum resistance so obtained
3. Three identical resistors are connected in parallel and the total resistance of the circuit is $\frac{R}{3}$. Find the value of each resistance.

VSAQ

4. Define resistivity or specific resistance.
5. Why is manganin used for making standard resistors?
6. Write the colour code of a carbon resistor of resistance 23 kilo ohms.
7. Why are household appliances connected in parallel?

MOVING CHARGES AND MAGNETISM

SAQ

1. Explain how crossed E and B fields serve as a velocity selector?

MAGNETISM AND MATTER

SAQ

1. How do you distinguish Dia, Para and Ferromagnetisms in matter?
2. Define retentivity and coercivity. Draw the hysteresis curve for soft iron and steel. What do you infer from these curves?

VSAQ

3. What do you understand by the 'magnetization' of a sample?
4. Magnetic lines form continuous closed loops. Why?

ALTERNATING CURRENT

VSAQ

1. Define power factor. On which factors does power factor depend?

ATOMS

LAQ

1. Describe the Davisson and Germer experiment, what did this experiment conclusively prove?

NUCLEI

SAQ

1. Define half period and decay constant for a radioactive substance. Deduce the relation between them.
2. Define average life of a radioactive substance. Obtain the relation between decay constant and average life.
3. Explain α - decay and β - decay.

LAQ

4. What is radioactivity? State the law of radioactive decay. Show that radioactive decay is exponential in nature.

5. Define mass defect and binding energy. How does binding energy per nucleon vary with mass number? What is its significance?

VSAQ

6. Define Becquerel and Curie.

SEMICONDUCTORS

SAQ

1. Explain how transistor can be used as a switch?
2. Distinguish between zener breakdown and avalanche breakdown.
3. Explain how transistor can be used as an oscillator?

LAQ

4. What is Zener diode? Explain how it is used as voltage regulator?

VSAQ

5. What is Zener voltage (V_Z) and how will a Zener diode be connected in circuits generally?