



NARENDERA®

# DAWN

## GUESS PAPER

Strictly as per New Rationalised and Reduced Syllabus issued by JKBOSE

### 12th Class SCIENCE

- |                          |                        |
|--------------------------|------------------------|
| 1. English               | 2. Physics             |
| 3. Chemistry             | 4. Biology             |
| 5. Mathematics           | 6. Physical Education  |
| 7. Environmental Science | 8. Computer Science    |
| 9. Informatic Practices  | 10. Functional English |

By  
PANEL OF EXPERTS

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# PHYSICS

Time: 3 Hours

Maximum Marks: 70

## SECTION-A

### Objective Type Questions

(1 × 10 = 10 marks)

- Q.1.** The magnitude of elementary charge is  
 (a)  $2 \times 10^{-19}\text{C}$  (b)  $1.6 \times 10^{-19}\text{C}$  (c) Zero (d) infinite
- Q.2.** If charge particle is moving perpendicular to the direction of magnetic field then magnetic force experienced by it is  
 (a) infinite (b) large but finite (c) zero (d) None of these
- Q.3.** The frequency of house hold supply of AC in India is  
 (a) 60 Hz (b) 100 Hz (c) 50 Hz (d) 30 Hz
- Q.4.** The electromagnetic waves having largest wavelength is  
 (a) X-rays (b)  $\gamma$ -rays (c) microwave (d) radio wave
- Q.5.** The velocity of light in glass of refractive index under 1.5 is  
 (a)  $5 \times 10^8 \text{ ms}^{-1}$  (b)  $2 \times 10^8 \text{ kms}^{-1}$  (c)  $2 \times 10^8 \text{ ms}^{-1}$  (d)  $2 \times 10^8 \text{ cms}^{-1}$
- Q.6.** The fringe width in Young's double slit experiment can be increased by  
 (a) decreasing wavelength  
 (b) decreasing the distance between slits  
 (c) decreasing distance between slit and screen  
 (d) increasing distance between slits
- Q.7.** The momentum in photon having frequency  $\mu$  is  
 (a)  $h/\mu c$  (b)  $hc/\mu$  (c)  $h\mu/c$  (d)  $\mu c/h$
- Q.8.** The source of energy of stars is  
 (a) chemical reaction (b) nuclear fission (c) nuclear fusion (d) None of these
- Q.9.** For pure metals conduction and valence band are  
 (a) separated by large energy gap (b) separated by small energy gap  
 (c) overlap each other (d) None of these
- Q.10.** The size of impurity atoms added to make extrinsic semiconductor should be  
 (a) smaller than semiconductor atom (b) larger than semiconductor atom  
 (c) comparable to semiconductor atom (d) can be of any size
- \* 1 kWh is equal to :  
 (a)  $3.6 \times 10^5 \text{ J}$  (b)  $3.6 \times 10^{-6} \text{ J}$  (c)  $3.6 \times 10^6 \text{ J}$  (d) 36000J
- \* Resonant frequency of LCR - resonant circuit is :-  
 (a)  $2\pi\sqrt{LC}$  (b)  $2\pi/\sqrt{LC}$  (c)  $\frac{1}{2\pi}\sqrt{LC}$  (d)  $\frac{1}{2\pi\sqrt{LC}}$
- \* The tip of a needle does not give a sharp image on a screen. This is due to:  
 (a) Polarization (b) Interference (c) Diffraction (d) Refraction



- \* An electron of mass 'm' and charge 'e' is moving from rest through a potential difference 'V' in vacuum. Its final velocity is :
- (a)  $\sqrt{\frac{2eV}{m}}$  (b)  $\sqrt{\frac{eV}{m}}$  (c)  $\frac{eV}{2m}$  (d)  $\frac{eV}{2m}$
- \* If we consider electrons and photons of the same wavelength then they will have the same:
- (a) Velocity (b) Angular momentum  
(c) Energy (d) Momentum
- \* Which are among the following shows particle nature of light?
- (a) Polarization (b) Photoelectric effect  
(c) Interference (d) Refraction
- \* The radius of copper nucleus is of the order of:
- (a)  $10^{-16}$  m (b)  $10^{-14}$  m (c)  $10^{-12}$  m (d)  $10^{-9}$  m
- \* Transformer works on principle of:
- (a) Conservation of charge (b) Mutual induction  
(c) Rectification (d) None of these
- \* The phase difference between current and voltage in an A.C. circuit having capacitor only is:
- (a)  $0^\circ$  (b)  $90^\circ$  (c)  $180^\circ$  (d)  $45^\circ$
- \* A person standing in front of a mirror, finds his image larger than himself. This implies that the mirror is:
- (a) Convex (b) Parabolic (c) Plane (d) Concave
- \* UHF range can propagate by means of:
- (a) Ground wave (b) Sky waves  
(c) Surface waves (d) Space waves
- \* The resistance of ideal voltmeter is:
- (a) Zero (b) Infinite (c) Very small (d) Very large
- \* Modulation is an essential feature of:
- (a) transmitter (b) receiver (c) both of them (d) None of these
- \* The electromagnetic waves used in the telecommunication are:
- (a) ultraviolet (b) infrared (c) visible (d) microwaves
- \* The reciprocal of resistance is:
- (a) Conductance (b) Specific resistance  
(c) Voltage (d) Current
- \* In electromagnetic induction, the induced e.m.f. is independent of:
- (a) Change of Flux (b) Time  
(c) Number of turns in the coil (d) Resistance of the Coil
- \* The average power dissipation in a pure capacitor in A.C. is:
- (a)  $\frac{1}{2} CV^2$  (b)  $CV^2$  (c)  $\frac{1}{2} \frac{Q^2}{C}$  (d) Zero

- \* The image formed by the objective of a compound microscope is:  
 (a) Real and enlarged (b) Real and diminished  
 (c) Virtual and large (d) Virtual and diminished
- \* The phenomenon responsible for blue colour of sky is:  
 (a) Dispersion (b) Polarisation (c) Scattering (d) Diffraction
- \* 1 volt equals:  
 (a) 1 Joule (b) 1 J/C (c) 1 C/J (d) 1 JC
- \* Resistivity of a conductor depends on its :  
 (a) Length (b) Volume  
 (c) Area of cross-section (d) Temperature
- \* The speed of electromagnetic waves in vacuum is:  
 (a)  $\sqrt{\mu_0 \epsilon_0}$  (b)  $\mu_0 \epsilon_0$  (c)  $\frac{\epsilon_0}{\mu_0}$  (d)  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$
- \* Communication channel consists of:  
 (a) Transmission line (b) Optical fibre (c) Free space (d) All of them
- \* An oscillator is nothing but an amplifier with :  
 (a) Positive feedback (b) No feedback  
 (c) Negative feedback (d) None of these
- \* De-modulation is an essential feature of a :  
 (a) Transmitter (b) Receiver (c) Medium (d) None of these
- \* 1 Volt equals:-  
 (a)  $r^2$  (b)  $r^{-1}$  (c)  $r$  (d)  $r^{-2}$
- \* Which of them is non-ohmic element?  
 (a) Diode (b) Carbon resistances  
 (c) Tungsten wire (d) Copper wire
- \* If  $W = 2\pi / T$  and  $k = 2\pi / \lambda$  then  $W/k$  is equal to :-  
 (a)  $\mu_0 \epsilon_0$  (b)  $\frac{1}{\mu_0 \epsilon_0}$  (c)  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$  (d)  $\frac{\epsilon_0}{\mu_0}$
- \* No. of electrons in 1 Coulomb of charge is:  
 (a)  $5.46 \times 10^{29}$  (b)  $6.25 \times 10^{18}$  (c)  $1.6 \times 10^{19}$  (d)  $9 \times 10^{11}$

### SECTION - B

(2 × 9 = 18 marks)

**Q.2. Answer the following questions:**

- (a) If the potential at a point due to a positive charge at a distance of 9 m is 100 volt, then what is the value of charge?
- (b) Why does the resistivity of semi-conductors and insulators decrease with the rise in temperature?



- (c) A long straight thin conductor carries a current of 40 A in South to North direction. What is the magnetic field at a point 1.0 m west of the wire?
- (d) If a compass is taken to magnetic north pole of earth. What will be the direction of the needle?
- (e) What is depletion layer. Explain.
- (f) Calculate the magnifying power of a lens of power 20 dioptre.
- (g) If the photo emissive surface has a threshold frequency of  $4.6 \times 10^{14}$  Hz, calculate the energy of photon in eV.
- (h) Express 16 mg mass into equivalent energy in electron volt.
- (i) Amorphous solids do not have sharp melting points. Why?
- \* What is the significance of direction of current?
  - \* Why induced e.m.f. is sometimes named as back e.m.f.?
  - \* Which part of electromagnetic wave is used for viewing objects through haze and fog?
  - \* How does stopping potential vary with intensity of light causing photo-electric emission?
  - \* Why connecting wires are made of copper?
  - \* What factors govern the direction of e.m.f.?
  - \* Which part of electromagnetic waves is used in operating a RADAR?
  - \* How does stopping potential 'vary with frequency of light causing photo-electric emission?
  - \* What is the order of resistivity of an insulator?
  - \* From where does the electrical energy come in a generator?
  - \* Which part of the electromagnetic spectrum is suitable for treatment of cancer tumours?
  - \* How intensity of incident light effects photoelectric current?
  - \* For which diode, the output voltage is a regulated voltage?
  - \* In homes electrical devices are connected in parallel. Why?
  - \* Is photoelectric emission possible at all frequencies?
  - \* What is the value of one atomic mass unit (amu) in term of energy?
  - \* The energy gap of silicon is 1.1 eV. What does it mean?
  - \* Under what conditions a transistor works as an open switch?
  - \* What is the basis of Kirchhoff's law?
  - \* In winch region of electromagnetic spectrum does the Balmer series of hydrogen atom lie?
  - \* How does the energy gap vary with doping in a pure semiconductor?
  - \* Will the transistor work if we interchange its emitter and collector. Give reason to justify your answer.
  - \* For what basic purpose the cells are connected in series and in parallel.
  - \* Is there any difference between light wave and matter waves?
  - \* In which region of electromagnetic spectrum does the Lyman series of hydrogen atom lie?
  - \* If a wire of Resistance "R" is stretched so that its length is doubled. Calculate the Change in resistance.
  - \* How does the angle of minimum deviation ( $\delta$  m) of a glass prism vary?
  - \* What is work function in photo electric effect?



- \* Optical effects are produced by E-vector or B-Vector in electromagnetic waves.
- \* How does an ammeter differ from a galvanometer?
- \* State the principle of production of electromagnetic waves. What is the value of velocity of these waves?
- \* Does the energy of a charged particle moving in a uniform magnetic field change? Why? Explain.
- \* How does an ammeter differ from a galvanometer?
- \* Define: (i) Power factor (ii) Wattless current.
- \* What are Radio waves? Give their two uses.
- \* Give the principle and two applications of optical fibres.
- \* Define modulation and demodulation. What is the need for Modulation?
- \* When is the force on a moving charge due to magnetic field maximum and when is minimum?
- \* Give two factors by which the current sensitivity of a moving coil galvanometer can be increased.
- \* Can an electromagnetic wave be deflected by magnetic or electric field? Explain.
- \* Write the conditions for total internal reflection to take place.
- \* Distinguish between reactance and impedance of an A.C. circuit.
- \* The near point of a person is at 40 cm from the eye. Find the power of the lens he should use while reading at 25 cm.
- \* Define half-life of a radioactive substance and derive an expression for it.
- \* Explain mutual induction. Define co-efficient of mutual induction.
- \* Explain the need of modulation in communication system.
- \* Explain Self-Induction. Define co-efficient of self-induction.
- \* An object is placed 10 cm in front of a concave mirror of radius of curvature 15 cm. Find the nature; position and magnification of the image.
- \* Draw a curve between mass number and average binding energy.
- \* Calculate the radius (r) of the loop when a charged particle is projected perpendicular to a Magnetic field Intensity (B)?
- \* Calculate the wavelength of radiation emitted when transition occurs from first-excitation state to ground state.
- \* Write two properties of materials suitable for making: (a) A permanent Magnet (b) An electromagnet.
- \* A capacitor behaves as perfect conductor for high frequency A.C. Explain why?
- \* Give two points of difference between nuclear fission and nuclear fusion.
- \* State laws of photoelectric emission.
- \* How many electrons pass through a wire in 2 minutes if current passing through the wire is 300 mA?
- \* Write four characteristics of electromagnetic waves.
- \* Explain the term stopping potential and threshold frequency.
- \* Define binding energy. Sketch the graph between binding energy per nucleon and mass number.



- \* Define half-life and average life of a radioactive substance.
- \* List the properties of Paramagnetic substances.
- \* What are elements of earth's magnetic field? Name them.
- \* Define photo-electric effect and threshold work function.
- \* Calculate the energy associated in eV with a photon of wavelength 4000Å.
- \* State Faraday's laws of electromagnetic induction.
- \* Explain mass defect.
- \* Distinguish between self inductance and mutual inductance.
- \* What is doping? Why is it done?
- \* Define peak and rms value of alternating current.
- \* Define power of a lens. Find focal length of a lens of power +5 dioptre.
- \* What are Para and Diamagnetic substances? Give one example of each.

### SECTION - C

(3 × 9 = 27 marks)

**Q.3. Answer the following questions:**

- (i) State Coulomb's law of electrostatic forces between two charges.
  - (ii) Calculate the resistivity of the material of a wire 1.0 m long with diameter 0.5 mm and having resistance of  $2.0 \Omega$ .
  - (iii) Using Biot-Savart's law, calculate the magnetic field at the Centre of a circular coil.
  - (iv) A magnet is dropped in a very long aluminium tube. Even in the absence of air resistance it acquires a constant terminal velocity. Why?
  - (v) Ordinary ammeter and voltmeter are used to measure D.C. but not A.C. But the hot wire ammeter and voltmeter can be used to measure the current and voltage for both D.C. and A.C. Why?
  - (vi) Using Huygens principal, draw a diagram to show propagation of a wave front originating from a monochromatic point source.
  - (vii) Derive Einstein's photoelectric equation.
  - (viii) Describe Rutherford's atomic model.
  - (ix) Give the difference between Intrinsic and Extrinsic Semiconductors.
- \* Derive relation between current and drift velocity.
  - \* State and explain principle of superposition of charges.
  - \* Calculate the torque experienced by an electric dipole placed in a uniform electric field.
  - \* Explain how the internal resistance of a primary cell can be determined using a potentiometer?
  - \* An electron enters a magnetic field of 5 T intensity with a velocity of  $5 \times 10^6 \text{ ms}^{-1}$  at an angle of  $30^\circ$  with the field. Find the magnitude of the force acting on the electron.
  - \* In Young's interference experiment, the ratio of intensity at the maxima and minima in the interference pattern is 25 : 9. What will be the ratio of amplitude of two waves?
  - \* What do you mean by dual nature of matter waves?



- \* Distinguish between isotopes and isobars. Give examples.
- \* Explain ground wave propagation of radio waves.
- \* Explain the variation of resistance with temperature in a (i) metallic conductor and (ii) semiconductors.
- \* Explain the terms (i) quantization of charge (ii) conservation of charge.
- \* Derive an expression for electric field intensity at a point on equatorial line of a dipole.
- \* Calculate electric field intensity at a point on the axial line of a dipole.
- \* Show that the electric field at any point is equal to the negative of the potential gradient at that point.
- \* How many electrons pass through a wire in 2 minutes, if the current passing through the wire is 0.3 ampere?
- \* What is the drift velocity of electrons in a copper conductor having cross-sectional area of  $5 \times 10^{-6} \text{ m}^2$  if the current is 10 A? Assume that there are  $8 \times 10^{28}$  electrons/ $\text{m}^3$ .
- \* What is Wheatstone Bridge? Apply Kirchhoff's laws to Wheatstone bridge to derive the condition for balancing the bridge.
- \* Derive an expression for magnetic field at a point well inside a solenoid carrying current.
- \* State and explain Faraday's law of electromagnetic induction.
- \* What is the momentum of electron if its de-Broglie wavelength is 2A?
- \* Derive an expression for energy stored in a capacitor.
- \* A wire of resistance 5 ohms stretched to twice of its original length. What will be its (i) new resistivity (ii) new resistance?
- \* A voltage of 30 V is applied across a colour coded carbon resistor with first, second and third rings of blue, black and yellow colours. What is the current (assuming the resistor)?
- \* Define electrical capacitance of a conductor. On what factors does it depend? Give its unit.
- \* In a potentiometer, a cell of e.m.f. 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shift to 63.0 cm, what is the emf of the second cell?
- \* Three identical cells each of e.m.f. 2V and unknown internal resistance are connected in parallel. This combination is connected to a 5 ohm resistor. If the terminal voltage across the cell is 1.5 volt. What is the internal resistance of each cell?
- \* How will you use potentiometer for comparing the e.m.f.'s of two given cells?
- \* What is Kirchhoff's 2nd Law? Write down the sign convention for currents and e.m.f.'s
- \* Derive Principle of wheat stone bridge using Kirchhoff's law.
- \* State Biot-savart law & express this law in the vector form.
- \* Two identical circular coils P&Q each of radius R, carrying 1A&A respectively, are placed concentrically and perpendicular to each other lying in XY & YZ planes. Find the Magnitude and direction of net magnetic field at centre of coils.
- \* Derive the expression for capacitance of a parallel plate capacitor.
- \* A monochromatic light of wave length 589 nm is incident from air on water surface. If for water is 1.33, find the wavelength, frequency and speed of the refracted light.



- \* Write down laws of refraction.
- \* Draw the circuit diagram of a Full wave rectifier and state how its works.
- \* Derive Einstein's Photoelectric Equation. How it explains the features which were not explained by wave-theory.
- \* Derive Mirror Formula for a concave Mirror.
- \* Differentiate between ground wave propagation and sky Wave propagation and
- \* Calculate the potential energy in case of dipole having magnitude of each charge as  $3 \times 10^{-6}$  C. The charges are separated at a distance of 2000 A.
- \* State and explain Faraday's laws of electromagnetic induction.
- \* What is space wave propagation? Give two examples of communication system which use space wave mode.
- \* A capacitor of capacitance  $20 \mu F$  is charged to a potential of 500V. Calculate the charge and energy stored in a capacitor.
- \* Establish the relation between drift velocity of electrons and electric current.
- \* What are magnetic lines of force? Why two such lines do not cross each other?
- \* Calculate the speed of light in a medium whose critical angle is  $45^\circ$ .
- \* Explain with the help of a circuit diagram how a zener diode can be used as voltage regulator?
- \* Two positive charges which are 0.1 m apart repel each other with a force of 18 N. If the sum of the charges be  $9 \mu C$ , calculate their individual value.
- \* The ratio of amplitude of two waves producing interference pattern is 1 : 4. find  $I_{\max}$  to  $I_{\min}$  and fringe visibility.
- \* An object is placed 5 cm in front a concave mirror of radius of curvature 15 cm. Find the position, nature and magnification of the image.
- \* Explain the formation of energy bands in solids.
- \* What capacity is required to store an energy of 1000 joule at a potential difference of 10000 volt?
- \* Describe a method to find the internal resistance of a cell using potentiometer.
- \* Name the various known electromagnetic radiations. State the range of their frequencies.
- \* In Young's double slit experiment, a screen is placed 1.5 m away from slits which are 0.03 cm apart. The distance between the central bright fringe and fourth bright fringe is 1 cm. Calculate the wavelength of light used
- \* Discuss the variation of resistance with temperature in metallic conductor.
- \* Calculate the angle of minimum deviation for an equilateral triangular prism of refractive index.  $\sqrt{3}$
- \* An infinite line Charge produces a field of  $9 \times 10^4$  N/C at a distance of 20 cm. Calculate the linear charge density.
- \* A 600 PF Capacitor is charged by a 200 V supply. It is then disconnected from the supply and is connected to another uncharged 600 PF capacitor. How much domestic energy is lost in the process?



- \* A Potential difference of 3V as applied across a conductor of resistance 1.5 calculate the number of electrons flowing through it in one second. Charge of electron  $e = 1.6 \times 10^{-19}$  C.
- \* A wire of resistance one ohm is stretched to double its length. What is the new resistance?
- \* The angle of minimum deviation for prism of angle is .
- \* Calculate the velocity of the material of prism, if the velocity of light in vacuum is  $3 \times 10^8$  m/sec
- \* Calculate the radius of the smallest orbit of Hydrogen atom.
- \* Ground wave propagation is not suitable for high frequency. Discuss.
- \* Define electric potential and deduce an expression for it due to a point charge at a distance  $r$  from it.
- \* In a potentiometer, a cell of e.m.f. 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm, what is the e.m.f. of the second cell?
- \* Derive the relation  $R = \frac{ml}{ne^2 A \tau}$ . Where symbols have their usual meanings.
- \* Velocity of light in glass is  $2 \times 10^8$  m/s and air  $3 \times 10^8$  m/s. If the ray passes through glass to air, calculate the value of critical angle.
- \* Define half-life of a radioactive sample. Deduce an expression for it.
- \* Explain principle of Potentiometer. How can a potentiometer be made more sensitive?
- \* What is radioactive decay law? Derive an expression for it in a Mathematical form.

### SECTION-D

(5 × 3 = 15 marks)

**Q.4. Answer the following questions:**

- (i) State and prove Gauss's theorem for electrostatic. How Coulomb's law and derived from it.

Or

Define Ohm's law and derived the relation  $J = \sigma E$ .

- (ii) Explain Ampere's Circuit law and derive an expression for magnetic field due to current in a toroid.

Or

State Faraday's laws of electromagnetic induction and explain the methods of producing induced e.m.f.

- (iii) What is fringe width? Derive the relationship for fringe width in Young's double slit experiment.

Or

Derive Lens Maker's formula for convex lens.



- \* How is the field directed if the sheet is (i) positively charged (ii) negatively charged?
- \* Define capacitance of a capacitor. Derive an expression for the capacitance of a parallel plate capacitor.
- \* Explain principle of capacitor.
- \* Derive an expression for average power of an a.c. circuit. How will you differentiate between average power, and virtual power?
- \* Describe briefly the theory of a transformer. Explain copper loss, iron loss and hysteresis loss in it.
- \* Stating the assumptions made and convention of signs used, derive the Lens Maker's formula for a thin lens.
- \* What is an electric dipole? Deduce an expression for torque on an electric dipole placed in a uniform field. Hence define dipole moment.
- \* Give the principle, construction and working of a moving coil galvanometer.
- \* State Huygen's principle. Verify Snell's law of refraction using it.
- \* Describe an astronomical telescope. Derive an expression for its magnifying power when final image is formed at infinity.
- \* Define a wave front? Use Huygen's principle to verify laws of refraction.
- \* Using Gauss's law derive an expression for electric field intensity due to a solid sphere. Draw graph of  $E$  versus  $r$ .
- \* Discuss interference theory. Determine positions of dark and bright spots and derive expression for fringe width.
- \* Draw a labelled diagram of A.C generator. Obtain the expression for the e.m.f induced. What is parallel plate capacitor? Derive an expression for the energy stored in a capacitor.
- \* Derive an expression for the torque experienced by an electric dipole placed in a uniform electric field. What is the net force acting on this electric dipole?
- \* Describe briefly the principle, construction and working of Van-de-Graaff electrostatic generator.
- \* Derive an expression for the force acting on a current carrying conductor placed in a uniform magnetic field. When the force is: (i) Maximum (ii) Minimum.
- \* What is meant by conservation of charge? State and explain superposition principle.
- \* Name and state the theorem which relates the enclosed charge inside a closed surface with the electric flux through it. Use the theorem to obtain the electric field due to a Spherical Shell.
- \* Discuss the properties of dia, para and ferromagnetic materials.
- \* Give the principle, construction and working of moving coil galvanometer.
- \* Discuss the properties of dia, para and ferromagnetic materials.
- \* What is Ampere's circuital law? Derive an expression for magnetic field induction due to current in a toroid.
- \* Find an expression for magnetic force on a current carrying conductor in a uniform magnetic field. When is this force minimum and maximum?
- \* Define magnetic dipole moment. Derive an expression for magnetic field intensity due to a magnetic dipole at a point perpendicular to its axis.



- \* State the principle of superposition of charges. Derive an expression for the force on a charge " $q$ " due to discrete position of  $n$ -charges in terms of their position vectors.
- \* Define capacitance of a capacitor. Give its unit. Derive an expression for the capacitance of a parallel plate capacitor in which a dielectric medium of dielectric constant  $K$  fills the space between the plates.
- \* Derive an expression for the electric field at a point on the equatorial line of electric dipole.
- \* Explain the concept of electrostatic potential. Derive an expression for potential at a point due to an electric dipole.
- \* Discuss the construction, working and theory of cyclotron. State its limitations.
- \* Derive an expression for the force per unit length between two long straight parallel conductors carrying current in the same direction and hence define the unit of current.
- \* State and explain Amperes circuital law and find the magnetic field at a point inside the solenoid carrying current.
- \* What are the elements of Earth's magnetic field? Explain them briefly.
- \* What is meant by total internal reflection? State its conditions.
- \* Describe the principle, construction and working of a transformer.
- \* What is Self-induction? Define self-inductance and calculate it for a long solenoid of length  $l$ .
- \* Explain phenomenon of mutual induction. Define Co-efficient of mutual induction. What are its units.
- \* State Lenz's Law of Electromagnetic Induction. Show that it is in accordance with law of Conservation of Energy.
- \* What is meant by root mean square value of alternating current? Derive an expression for r.m.s. value of alternating current.
- \* State Huygen's principle and prove the laws of reflection on its basis.
- \* Deduce the conditions of maxima and minima in Young's Double Slit experiment.
- \* Name the device which converts mechanical energy into alternating electrical energy. Give its principle, construction and theory with the help of diagram.
- \* Define Total Internal Reflection. State its conditions. How do optical fibres transmit light without absorption?
- \* What is diffraction of light? Describe diffraction of light at a single Slit
- \* What is lens maker's formula? Derive lens maker's formula for a convex lens?
- \* What do you understand by fringe width? Derive an expression for fringe width in the interference pattern.
- \* Describe a compound microscope and find the expression for its magnifying power.
- \* What is a Transistor? Explain the use of  $n$ - $p$ - $n$  transistor as an amplifier in common emitter configuration.