A Guidebook of

APPE

APPE

Syllabus

PHY1221: Applied Electricity and Magnetism
75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 Credits, 33 Contact hours, Exam. Time: 4 hours

Electrostatics: Electric dipole; electric field due to a dipole; dipole on external electric field; Gauss's Law and its applications.

Capacitors: Parallel plate capacitors with dielectric; dielectrics and Gauss's Law; susceptibility, permeability, and dielectric constant; energy stored in an electric field.

Electric Current: Electron theory of conductivity; conductor, semiconductors and insulators; superconductors, current and current density; Kirchhoffs Law and its applications.

Electomagnetic Induction: Faraday's experiment; Faraday's law; Ampere's law, motional e.m.f.; self and mutual inductance galvanometers-moving coil, ballistic and deadbeat types.

Thermoelectricity: Thermal e.m.f; Seebeck, Peltier and Thomson Effects; laws of addition of thermal e.m.f., thermoelectric power.

DC and AC Circuits: D.C. circuits with LR, RC, and LCR in series; A.C. circuits with LR, RC, LC, and LCR in series.

Books Recommended:

1.	Leigh Page and Norman Ilsley Adams	:	**Principles of Electricity,** *D Van Nosrand Co.*
2.	David Halliday, Robert Resnick and Kenneth S. Krane	:	**Physics (Part-I & II),** *Wiley*
3.	Arthur Frederic Kip	:	**Fundamentals of Electricity and Magnetism**, *McGraw-Hill Inc.*
4.	M. S. Huq	:	**Concepts of Electricity and Magnetism,** *Students' Publications*

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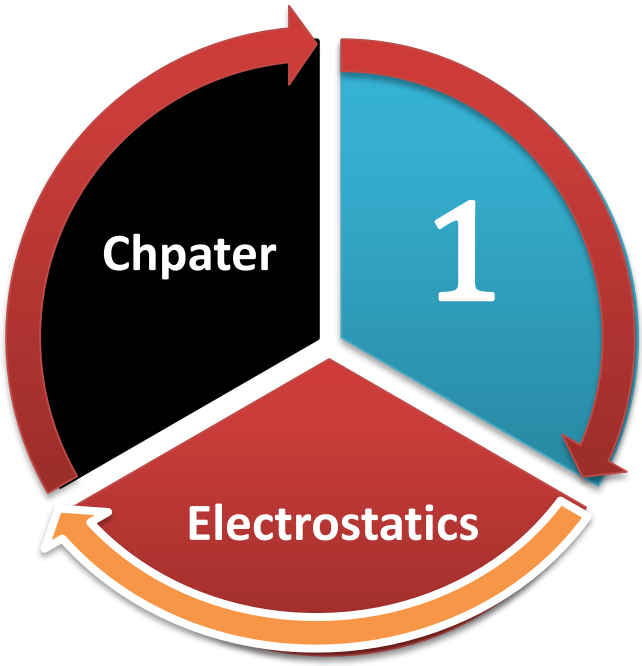
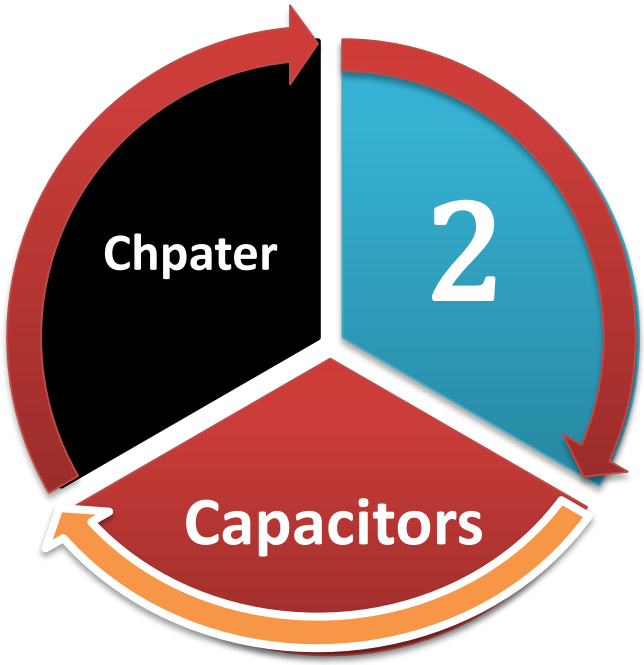


Important Question:

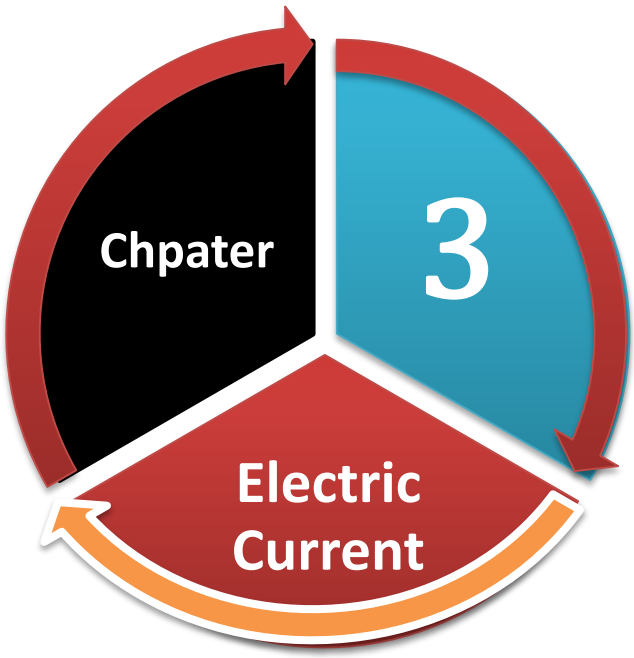
1. Define an electric dipole and its moment. **Exam-2015**
2. Drive an expression for the electric field at any point due to and electric Dipole.**Exam-2013**
3. Find the potential energy of an electric dipole placed in a uniform External electric field. **Exam-2013**
4. Find the electric field $\vec{E}$ at a point P due to a dipole at a distance r from the midpoint of the dipole. **Exam-2015**
5. A water molecule in its vapor state has an electric dipole moment $6.2\text{x}10^{-30}$ cm. What is the electric field $\vec{E}$ at a distance r of 1.1 nm from the molecule on the dipole axis? **Exam-2015**
6. State superposition principle for electric charges. **Exam-2016**
7. Derive expressions for the electric field at a point on the axial line due to an electric dipole. **Exam-2016**
8. An electric dipole of moment 2×10^{-8} cm is placed in a uniform field intensity $1.5\times 10^{5}\, NC^{-1}$ (i) What maximum torque does the field exert on the dipole? (ii) How much work is done on turning the dipole end to end? **Exam-2016**
9. State and prove Gauss's law in electrostatics. **Exam-2014**
10. Charge is distributed uniformly over the surface of a sphere. Use Gauss's law to find The electric field at the points
    i. Chasid, the sphere Exam-**2014**
    ii. On the surface of the sphere **Exam-2014**
11. State and prove Gauss's law in electrostatics. **Exam-2016**
    Charge is distributed uniformly over the surface of a sphere. Use Gauss's law to find the electric field at the points (i) Outside of the sphere (ii) On the surface of the sphere. **Exam-2016**



Important Question:

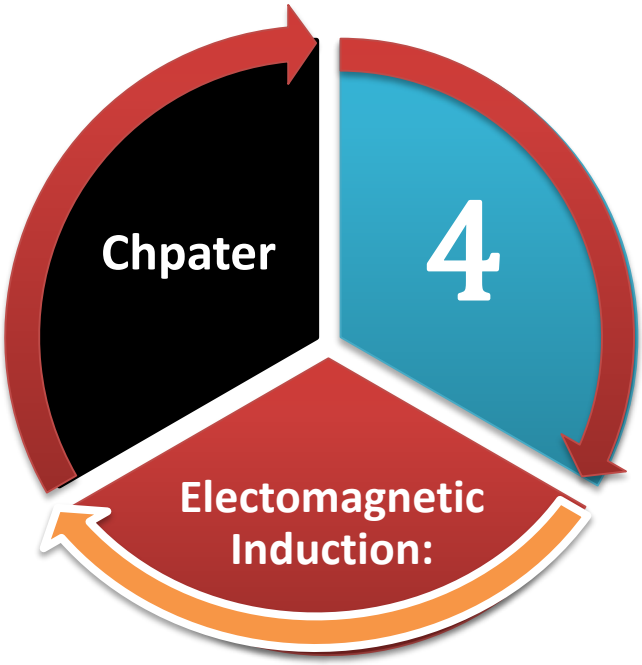
1. Define capacitor. Classify the capacitors. Write down the major uses of capacitor. **Exam-2016**
2. Derive an expression for the energy stored by a charged capacitor. **Exam-2016**
3. The parallel plates of an air-filled capacitor are 1 cm apart. What will be the area A of each plate if capacitance is to be 0.25 μF? **Exam-2016**
4. Define dielectric constant and energy density. **Exam-2013**
5. Find the expression for the capacitance of a parallel plate capacitor Without dielectric. **Exam-2013**
6. Show that D=$\in E$+ P. **Exam-2013**
7. Find expressions for the growth of charge of a capacitor through a resistor
   With constant emf. **Exam-2013**
8. In an RC circuit R=0.4× $10^{6\Omega}$ and C=2.5× 10^{6}F, in what time will the
9. Charge in the capacitor decay one fourth of its initial value? **Exam-2013**
10. Define capacitance and capacitor. **Exam-2014**
11. Deduce the relation $C = \frac{\varepsilon_0 A}{d}$ for a parallel plate capacitor, where the symbols have their usual significance. **Exam-2014**
12. The parallel plates of an air-filled capacitor are lcm apart. What must be the area A of each plate if capacitance is to be 0.25μF? **Exam-2014**
13. Derive an expression for the energy stored by a charged capacitor. **Exam-2014**
14. The capacitance of a parallel plate capacitor is 400ρF and its plate are separated by 2mm of air
15. What will be the energy when it is charged to 1500 volts? **Exam-2014**
    ii. What will be the potential difference with the same charge if the plate Separation is doubled? **Exam-2014**
16. Obtain Coulomb's law from Gauss's law. **Exam-2015**

17. A point charge of 1.8 μC is at the centre of a spherical Gaussian surface of radius 55 cm. What is the net flux through the surface? **Exam-2015**
18. Calculate the total enclosed charge q for a parallel plate capacitor with dielectric using Gauss's law. **Exam-2015**
19. A parallel plate capacitor of plate area 11.5 cm^2 and plate separation 1.24 cm. A potential difference 85.5 V is applied between the plates. The battery is then disconnected, and a dielectric slab of thickness 0.78 cm and dielectric constant 2.61 is placed between the plates. What is the capacitance with the slab in place? **Exam-2015**



Important Question:

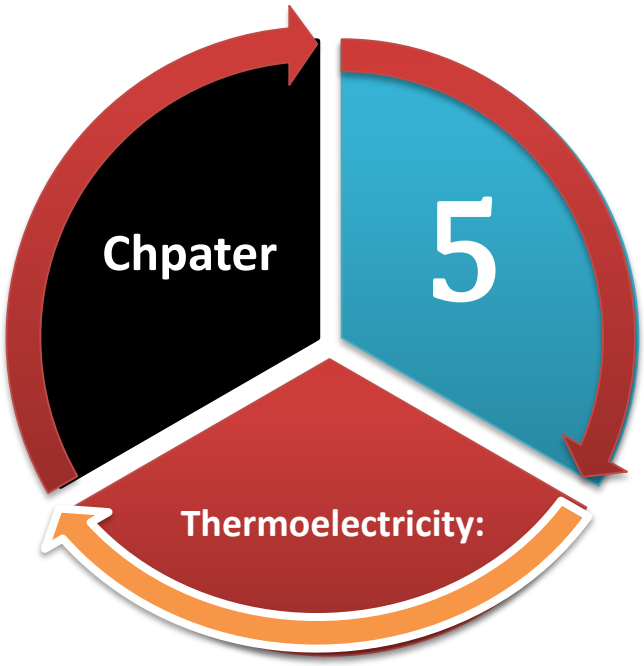
1. what is electric flux? **Exam-2015**
2. Derive an expression for the conductivity of metals based on free electron theory of conductivity. **Exam-2013**
3. A metal rod of length 25 cm has resistance $7.5\times 10^{-6}\Omega$. the diameter of rod is 0.40cm.Calculate the resistivity of the metal. **Exam-2013**
4. Define current density. Establish the relation between current density and electron drift velocity. **Exam-2013**
5. One end of an AI wire of diameter 2.5 mm is welded to one end of Cu
6. wire of diameter 1.8 mm. the composite wire carries a steady current of 1.3 A. what is the current density in ease wire? **Exam-2013**
7. State and explain Kirchhoff's law in an electrical network. **Exam-2014**
8. Deduce the condition for the balance of a Wheatstone's bridge. **Exam-2014**
9. what is the current density and drift velocity of the charge carrier? **Exam-2015**
10. Establish the relationship between the current density and drift velocity. **Exam-2015**
11. What is the drift velocity of the conduction electrons in a copper wire of diameter 0.5 mm and length 20m, when it is connected across the battery of 1.5V and internal resistance 1.25Ω.(Here $\rho = 8.96\text{x}10^{3}\ \text{kg/m}^{3}$, $n = 8.49\text{x}10^{28}\ \text{m}^{-3}$) **Exam-2015**
12. Establish the relation between current density and electron drift velocity. **Exam-2016**
13. Deduce the condition for the balance of a wheatstone's bridge. **Exam-2016**
14. Write short note about Superconductor. **Exam-2016**



Important Question:

1. State and explain Faraday's law of induction. Deduce its differential from. **Exam-2013**
2. Find the mutual inductance of two co-axial coils. **Exam-2013**
3. State and explain Faraday's law of induction. Deduce its differential form. **Exam-2015**
4. Find the mutual inductance of two co-axial coils. **Exam-2015**
5. State Ampere's law. Derive art expression for magnetizing force, B due to a current carrying long straight conductor. **Exam-2014**
6. State and prove Ampere's law. Apply it to calculate the magnetic field due to a solenoid. **Exam-2016**
7. Define self-inductance and mutual inductance. **Exam-2016**
8. Calculate the magnetizing force and flux density at a distance of 1 cm from a long straight circular conductor in air carrying a current of 100A. Draw a curve showing the variation of B from the conductor surface outwards if its diameter is 1 mm. **Exam-2014**
9. Describe a moving coil galvanometer. Explain how current can be measured with it. **Exam-2014**
10. Describe a moving coil galvanometer. Explain how current can be measured with it. **Exam-2016**
11. What are the differences between ballistic and deadbeat galvanometer? **Exam-2016**
12. Prove that the charge sensitivity of a B.G. is $2\pi/T$ times the current sensitivity. **Exam-2016**
13. What arc the differences between ballistic end deadbeat galvanometer? **Exam-2014**

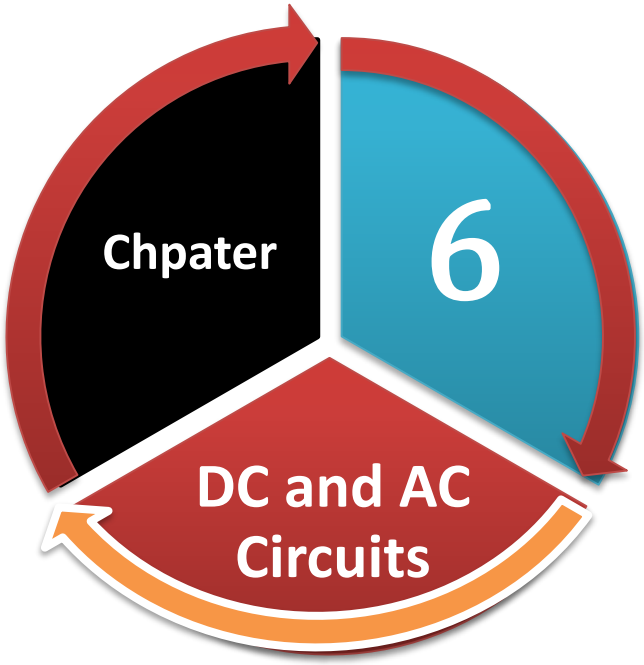
14. In a ballistic galvanometer 2μA. gives a steady deflection of 1 division. The time of free oscillation is 8s and damping is negligible. What quantity of electricity is measured by a kick of 1 division? **Exam-2014**
15. A series circuit containing an inductor L and a resistor R is connected to a battery. Obtain the expression for the rate of decay of current. **Exam-2014**
16. An e.m.f 10v is applied to a circuit having a resistance of 10Ω and an inductance of 0.5H. Find the time required by the currant to attain 63.2% of its final value. What is the time constant of the circuit? **Exam-2014**



Important Quesiton

1. Write down the laws of intermediate metal and intermediate temperature. **Exam-2013**
2. Describe Thomson effect. **Exam-2013**
3. What do you mean by thermal EMF? **Exam-2015**
4. What is Thomson effect? **Exam-2015**
5. Find an expression of the thermo-electric power. **Exam-2015**
6. Find expression for the growth and decay of charges of a capacitor through resistor with constant EMF. **Exam-2015**
7. An alternation EMF is applied to a circuit consisting an inductor, capacitor and resistor in series. Obtain the expression for the current and impedance. **Exam-2015**
8. A circuit consists of a non-inductive resistance of 50Ω, an inductance of 0.3Hz and resistance of 2Ω and capacitor of 40μF in series and is supplied with 200 volts at 50Hz. Find the impedance and the current in the circuit. **Exam-2015**
9. Briefly describe about Seedbeck and Peltier effects. **Exam-2016**
10. Write down the laws of addition of thermal electromotive forces

11. Write short note
    a) Seebeck effect **Exam-2013**
    b) Peltier effect **Exam-2013**
    c) Reactance **Exam-2013**
    d) Resonance **Exam-2013**



Important Question

1. Define reactance and impedance of an AC circuit. **Exam-2014**
2. Analyze a series LCR circuit and explain the phenomenon of resonance. **Exam-2014**
3. Find the resonance frequency of an LCR series circuit for L=10mH, C=0.02μF and r=20Ω **Exam-2014**
4. What is the time constant in an RC circuit? Show that the time constant has the unit of time. **Exam-2015**
5. In an RC circuit R = $0.4x10^6$ ohm and C = $2.5x10^6$ F, in what time will the charge in the capacitor decay one fourth of its value? **Exam-2015**
6. A series circuit containing an inductor L and a resistor R is connected to a battery. Obtain the expression for the rate of decay of current **Exam-2016**
7. An e.m.f 10V is applied to a circuit having a resistance of 10Ω and in inductance of 0.5H. Find the time required by the current to attain 63.2% of its final value. What is the time constant of the circuit? **Exam-2016**