

## 1. Details of unit revision and its structure

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|----------------|---|
| Subject Name   | Physics   |
| Course Name    | Physics 03 (Physics Part – 1, Class XII)  |
| Title          | Revision Unit-01_Study Guide  |
| Pre-requisites | Study of all Electric charges and fields and Electrostatic potential and Capacitance  |
| Objectives     | After going through this study guide, the learners will be able to: <ul style="list-style-type: none"> <li>• How to consolidate the unit?</li> <li>• How to prepare notes?</li> </ul> |
| Keywords       | Electric Charges and Fields, Electrostatic Potential and Capacitance  |

## 2. Development Team

| Role                            | Name  | Affiliation  |
|---------------------------------|---|--|
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Study Guide Unit 1 Physics 03 2019

## INTRODUCTION

The idea of revision modules is to help the student assimilate the concepts learnt in the unit. This is required for clarity as well as examination or test purpose.

The rationale being if the learner understands the reasons for study of a concept, its application will be easier. In order to move from rote learning to fun learning, the team has designed the revision week under the following scheme:

**Study guide-** This will provide, how to consolidate the unit? How to prepare notes?

How to check if the entire syllabus has been covered? Check out the formulae, derivations, graphs required to complete the unit, any special features for which the learners should be ready for evaluation.

**Activities that you can do:** Suggestions for activities that may be done at home, in order to understand a phenomenon or a method

**Problems for tests:** These will be problems which students may use for understanding as well as for getting ready for tests and examinations. These include questions asked by various boards. Solving these will enhance the confidence.

## STUDY GUIDE

- **Chapter–1: Electric Charges and Fields**
- **Chapter 2: Electrostatic Potential and Capacitance**

**1. Read the syllabus carefully (this will familiarize you with the new words you will learn). Please take time to read it peacefully.**

### Chapter–1: Electric Charges and Fields

Electric Charges; Conservation of charge, Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electric field; electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

## Chapter 2: Electrostatic Potential and Capacitance

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

### 2. Now make a list of all the concepts

**This list for the unit should be as follows:**

1. Electric Charges
2. Conservation of charge
3. Coulomb's law-force between two point charges
4. forces between multiple charges
5. Superposition principle
6. Continuous charge distribution
7. Electric field
8. Electric field due to a point charge
9. Electric field lines
10. Electric dipole
11. Electric field due to a dipole
12. Torque on a dipole in uniform electric field
13. Electric flux
14. Statement of Gauss's theorem
15. Applications of Gauss's theorem to find
  - a) Field due to infinitely long straight wire
  - b) Uniformly charged infinite plane sheet and
  - c) Uniformly charged thin spherical shell (field inside and outside)
16. Electric potential
17. Potential difference
18. Electric potential due to
  - a) a point charge
  - b) a dipole and
  - c) system of charges
19. Equipotential surfaces
20. Electrical potential energy of a system of two point charges

21. Electrical potential energy of electric dipole in an electrostatic field
22. Conductors and insulators
23. Free charges and bound charges inside a conductor.
24. Dielectrics
25. Electric polarization,
26. Capacitors and Capacitance,
27. Combination of capacitors in
  - a) series
  - b) parallel
  - c) series and parallel
28. Capacitance of a parallel plate capacitor
  - a) with dielectric medium between the plates
  - b) without dielectric medium between the plates,
29. Energy stored in a capacitor

**3. Prepare a list of formulae**

**E.g.** - Electric flux through an area element  $\Delta S$  is:  $\Delta\phi = E \cdot \Delta S = E\Delta S \cos\theta$

- Electrostatic potential due to a point charge:  $V(r) = \frac{Q}{4\pi\epsilon_0 r}$

Now make the list of other formulae by yourself

**4. Read the module, say the module 1; watch the video, read the NCERT book.**

**You may use a help book also.**

**5. Now tell yourself what you have learnt, mark it on the check list if you have understood. Please be truthful. Teach yourself or your friend, this always helps**

**6. Make a definition list**

**E.g. electric charge, electric field, electric flux ...**

**7. Make a derivation list**

Derivation list Electrostatics

1. Electric field due to a system of charges
2. Electric flux emerging from an area at different angles to the field lines max and min flux
3. Electric field due to an electric dipole at a point on the axis of the dipole
4. Electric field due to an electric dipole at a point on the equatorial plane perpendicular to the axis of the dipole, at the center of the dipole axis
5. Application of Gauss's law to find the field due to an infinitely long straight uniformly charged wire
6. Application of Gauss's law to find the field due to a uniformly charged infinite plane sheet

7. Application of Gauss's law to find the field due to a uniformly charged thin spherical shell
8. Electrostatic potential at a point due to a charge
9. Electrostatic potential due to an electric dipole
10. Potential due to a system of charges
11. Electric field is in the direction in which the potential decreases steepest
12. Magnitude of electric field is given by the change in the magnitude of potential per unit displacement perpendicular to the equipotential surface at the point
13. Potential energy of a system of charges
14. Potential energy in an external electric field
15. Potential energy of a system of two charges in an external field
16. Potential energy of a dipole in an external field
17. Factors effecting the capacitance of a parallel plate capacitor
18. Effect of dielectric on capacitance
19. Effective capacitance of capacitors connected in series and parallel or a combination
20. Energy stored in capacitor, in terms of C, Q and V

**8. Make a list of graphs - all equations can be graphed; you will get a straight line if the equation can be placed as  $y = mx + c$**

**9. Now make your notes yourself, not by copying from the book or help book.**

**10. Revisit your notes and you will see that you need to change the words as you probably understand it better.**

**11. Now try the suggested problems.**