

TERMS

Be able to define or discuss the following terms with their SI units, if any.

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|------------------------------|------------------------------|
| 1. charge stored Q | 7. free charges |
| 2. capacitance C | 8. bound charges |
| 3. capacitor | 9. polarization |
| 4. dielectric | 10. permittivity ϵ |
| 5. dielectric strength E_m | 11. parallel-plate capacitor |
| 6. dielectric constant K | 12. energy density u |

EQUATIONS

Understand the meaning and know the SI units of all the symbols in these equations—and be able to use the equations to solve problems.

- Eq. (24.1)
- $V_{ab} = Ed$ (parallel-plate capacitor)
- Eq. (24.9)
- Eq. (24.17)
- Eq. (24.19)
- Eq. (24.20)
- Eq. (24.23)

SKILLS

Use the material in these sections to be able to:

- realize that ϵ is exactly ϵ_0 and K is exactly 1 in vacuum.
- realize that ϵ is slightly greater than ϵ_0 and K is slightly greater than 1 in air.
- give the microscopic cause of the bound charge on a dielectric's surface.
- give the macroscopic effects of the free charge on the capacitor plates and of the bound charge on the dielectric's surface.
- take our previous results for E and V_{ab} in vacuum and simply replace ϵ_0 with either ϵ or $K\epsilon_0$ for a dielectric that keeps the symmetry. For example, in one such case, $E = \sigma/\epsilon_0$ becomes either $E = \sigma/\epsilon$ (in terms of the permittivity ϵ of the dielectric) or $E = \sigma/K\epsilon_0$ (in terms of the dielectric constant K of the dielectric).

On page 800, caption above the photo: Wall studs are usually wood, which has a different dielectric constant than air or insulation, thus changing the capacitance Page 802, top: In “EVALUATE”: Change V to *vol* twice so that potential and volume aren't mixed up. On page 806, in “Test Your Understanding ...”, the assumption is that the dielectric is so large that the spherical symmetry is maintained. On the middle of page 807, change “maximum field that a” to “maximum electric field magnitude that a ...”.

Mahatma Gandhi warned of the destructive Seven Blunders of the World (that cause violence):

- Wealth without work.
- Pleasure without conscience.
- Knowledge without character.
- Commerce without morality.
- Science without humanity.
- Religion without sacrifice.
- Politics without principle.

Can you think of others? His grandson, Arun Gandhi, added:

- Rights without responsibilities.