

Gauss's Law

Here are 20 multiple-choice questions (MCQs) on Gauss's Law:

Basic Concept of Gauss's Law

1. Gauss's law states that the total electric flux through a closed surface is proportional to:
 - a) The charge outside the surface
 - b) The charge enclosed within the surface
 - c) The surface area of the Gaussian surface
 - d) The electric field outside the surface(Answer: b)
 2. Mathematically, Gauss's law is expressed as:
 - a) $E \cdot dA = q/\epsilon_0$
 - b) $E \cdot dA = q\epsilon_0$
 - c) $E \cdot dA = q^2/\epsilon_0$
 - d) $E \cdot dA = q/2\epsilon_0$(Answer: a)
 3. The SI unit of electric flux is:
 - a) N/C
 - b) C/m²
 - c) N·m²/C
 - d) J/C(Answer: c)
 4. Gauss's law is useful for calculating electric fields when charge distributions have:
 - a) No symmetry
 - b) Irregular shapes
 - c) High symmetry (spherical, cylindrical, or planar)
 - d) Varying permittivity(Answer: c)
 5. Gauss's law can be applied to which of the following surfaces?
 - a) Only spherical surfaces
 - b) Only cubic surfaces
 - c) Any closed surface
 - d) Only plane surfaces(Answer: c)
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Electric Flux and Enclosed Charge

6. The net electric flux through a closed surface enclosing zero net charge is:
 - a) Zero
 - b) q/ϵ_0
 - c) Infinite

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d) Depends on the shape of the surface

(Answer: a)

7. If the charge enclosed by a Gaussian surface is doubled, the electric flux:

a) Remains the same

b) Doubles

c) Halves

d) Becomes zero

(Answer: b)

8. If a charge is placed outside a closed surface, its contribution to the electric flux is:

a) Zero

b) q/ϵ_0

c) Infinite

d) Depends on charge's distance

(Answer: a)

9. Electric flux through a spherical surface enclosing charge q is given by:

a) q/ϵ_0

b) $q\epsilon_0$

c) Zero

d) $q/4\pi\epsilon_0$

(Answer: a)

10. If a sphere encloses both positive and negative charges with equal magnitude, the total flux through the sphere is:

a) Zero

b) Positive

c) Negative

d) Infinite

(Answer: a)

Applications of Gauss's Law

11. Gauss's law is particularly useful when dealing with:

a) Irregular charge distributions

b) Charges in motion

c) Symmetric charge distributions

d) Magnetic fields

(Answer: c)

12. For a uniformly charged conducting sphere, the electric field inside the sphere is:

a) Zero

b) Maximum at the center

c) Inversely proportional to distance from center

d) Constant throughout the sphere

(Answer: a)

13. Gauss's law helps derive the electric field of:

a) Infinite charged planes

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- b) Spherical charge distributions
- c) Cylindrical charge distributions
- d) All of the above

(Answer: d)

14. If the charge enclosed within a Gaussian surface is negative, the net electric flux is:

- a) Positive
- b) Negative
- c) Zero
- d) Infinite

(Answer: b)

15. The electric field just outside a uniformly charged conductor is:

- a) Perpendicular to the surface
- b) Parallel to the surface
- c) Zero
- d) Unpredictable

(Answer: a)

Conceptual and Theoretical Questions

16. Which of the following is NOT an assumption used in Gauss's law derivations?

- a) The charge distribution is symmetric
- b) The electric field is uniform over a Gaussian surface
- c) The electric field is always zero inside a conductor
- d) The charge inside the Gaussian surface must be positive

(Answer: d)

17. The electric field due to an infinite plane of charge is:

- a) Independent of distance from the plane
- b) Directly proportional to distance from the plane
- c) Inversely proportional to distance from the plane
- d) Zero everywhere

(Answer: a)

18. Which of the following is NOT a valid Gaussian surface?

- a) Sphere
- b) Cylinder
- c) Cube
- d) Open hemisphere

(Answer: d)

19. Gauss's law is fundamentally based on:

- a) Coulomb's law
- b) Newton's laws
- c) Faraday's law
- d) Ohm's law

(Answer: a)

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20. Gauss's law in integral form applies to:

- a) Only electrostatic fields
- b) Only non-uniform fields
- c) Any electric field
- d) Only moving charges

(Answer: c)