

10. Conductors and Capacitors

Starter Quiz · 课前小测

AP Physics C: Electricity and Magnetism

Name: _____ Score: _____

1. Inside a conductor in electrostatic equilibrium, the electric field is:

- ☐ very large
- ☐ zero
- ☐ equal to the surface field
- ☐ pointing inward

2. When two conductors are connected, charge flows until they have equal:

- ☐ charge
- ☐ potential
- ☐ radius
- ☐ mass

3. Capacitance is defined as:

- ☐ Q/V
- ☐ QV
- ☐ V/Q
- ☐ $Q + V$

4. Inserting a dielectric of constant κ changes the capacitance to:

- ☐ C_0/κ
- ☐ κC_0
- ☐ $C_0 - \kappa$
- ☐ unchanged

5. Excess charge on a solid conductor sits:

- ☐ spread through the volume
- ☐ at the exact centre
- ☐ entirely on the surface
- ☐ nowhere — it vanishes

6. At equal potential, the larger sphere holds more charge ($Q \propto R$).

- ☐ True
- ☐ False

7. A dielectric polarises and weakens the field between the plates.

- ☐ True
- ☐ False

8. A hollow conductor shields its inside from external fields (a Faraday cage).

- ☐ True
- ☐ False

9. A radius- $3R$ sphere shares charge with a radius- R sphere. The big one holds how many times the charge of the small one?

10. A 2 F capacitor is charged to 3 V. Find the stored energy (in J).

_____ J

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1. **zero**

If it were not zero, free charges would move — so at equilibrium $E = 0$ inside.

2. **potential**

Charge flows until the potentials are equal — no push remains.

3. Q/V

$C = Q/V$, charge stored per volt, in farads.

4. κC_0

$C = \kappa C_0$, and $\kappa > 1$, so capacitance rises.

5. **entirely on the surface**

With zero interior field, all excess charge must lie on the surface.

6. **True**

$V = kQ/R$ equal means $Q \propto R$ — bigger holds more.

7. **True**

Its aligned charges oppose the plates' field, weakening the net field.

8. **True**

The conductor cancels the field inside the cavity — a Faraday cage.

9. **3**

$Q \propto R$, so the $3R$ sphere holds $3\times$ the charge.

10. **9 J**

$$U = \frac{1}{2}CV^2 = \frac{1}{2}(2)(3^2) = 9 \text{ J.}$$