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

   ☐ zero

   ☐ pointing inward

   ☐ very large

   ☐ equal to the surface field

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

   ☐ mass

   ☐ radius

   ☐ potential

   ☐ charge

3. Capacitance is defined as:

   ☐ Q/V

   ☐ V/Q

   ☐ QV

   ☐ $Q+V$

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

   ☐ $C_0 - \kappa$

   ☐ C_0/κ

   ☐ unchanged

   ☐ κC_0

5. Excess charge on a solid conductor sits:

   ☐ spread through the volume

   ☐ entirely on the surface

   ☐ at the exact centre

   ☐ nowhere – it vanishes

6. For two spheres very far apart compared with their radii and at equal positive potential, the smaller sphere holds more charge. Neglect mutual influence.

   ☐ True ☐ False

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_____ J

8. A dielectric polarises and weakens the net field in an isolated capacitor with fixed free plate charge.

   ☐ True ☐ False

9. A fully closed conductor in electrostatic equilibrium shields an empty cavity from external static electric fields.

   ☐ True ☐ False

10. Two spheres of radii 3R and R are very far apart compared with their radii and connected by a thin wire. Neglect wire charge and mutual influence. At equal positive potential, how many times as much charge is on the bigger sphere?

    _____

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. **False**

   False. $V = kQ/R$ equal means $Q \propto R$, so the larger sphere holds more charge (although the smaller one has the stronger surface field).

7. **9 J**

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

8. **True**

   At fixed free plate charge, bound charges oppose the original plate field and reduce the net field. If voltage and gap stay fixed instead, E = V/d stays the same and extra free charge arrives.

9. **True**

   At electrostatic equilibrium, induced surface charges cancel external static fields within an empty closed cavity. A charge placed in the cavity can produce a field there.

10. **3**

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

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