JOINT INSTITUTE
交大密西根学院

Recitation Class
Week 4
(Examples)

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Electric Potential

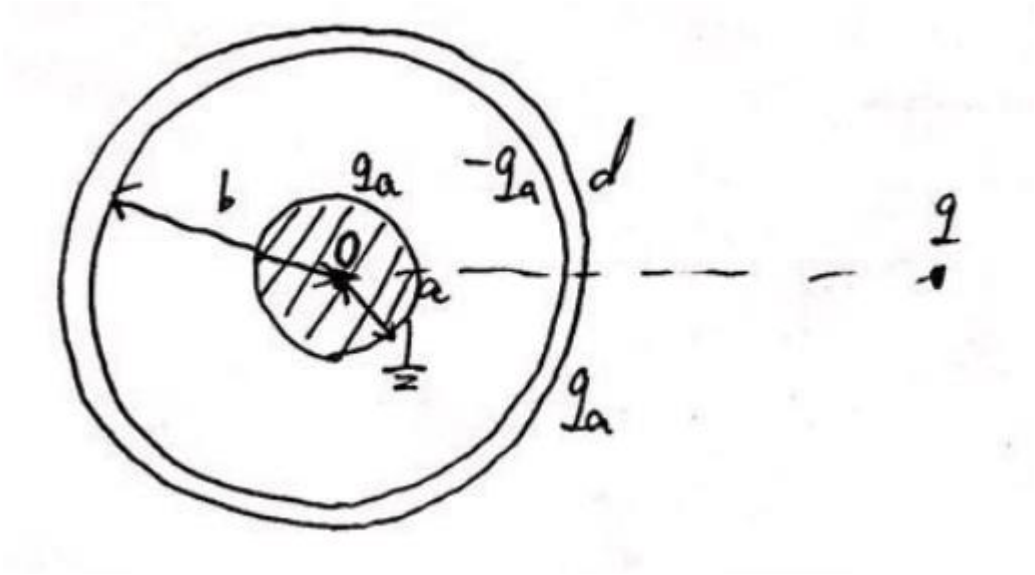
How to find electric potential

Three methods:

- By adding contributions from small charges dq regarded as point charges;
- By integrating E

* Poisson's Equation

Electric Potential



Metal spherical shell and ball (originally not charged);
The inner ball is grounded;
A charge q (q>0) is placed at distance d from the center of inner ball;

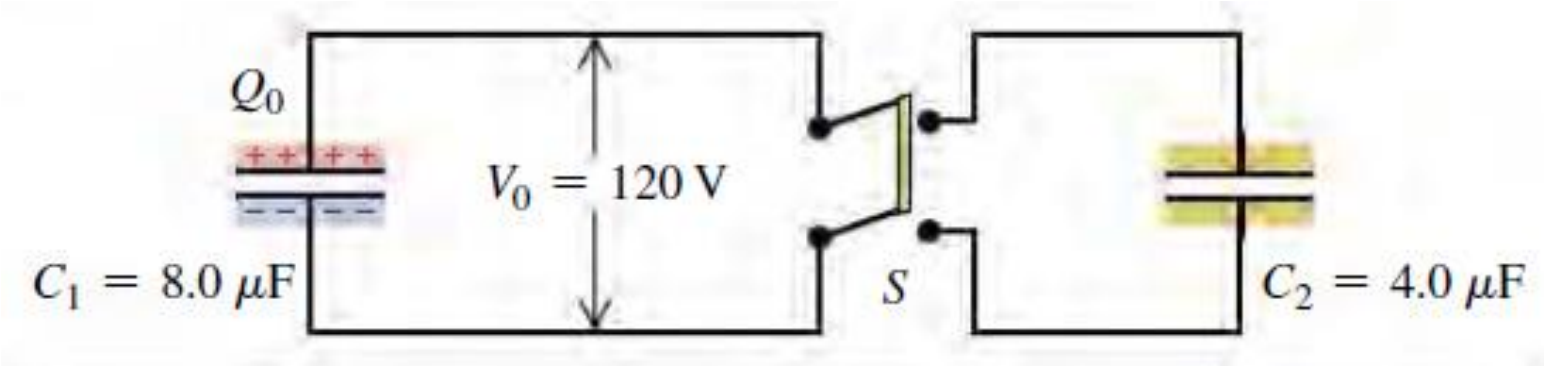
(1) Find induced charge qa
(2) Find the potential difference between inner shell and the surface of the inner ball (distance: b and a from O)

Capacitors

Concepts

- Capacitance
- Series/ Parallel connection
- Energy/ Energy density
- Permittivity
- Dielectrics

Capacitors



We connect a capacitor $C_1 = 8.0\ \mu$F to a power supply, charge it to a potential difference $V_0 = 120$ V, and disconnect the power supply (**Fig. 24.12**). Switch S is open. (a) What is the charge Q_0 on C_1? (b) What is the energy stored in C_1? (c) Capacitor $C_2 = 4.0\ \mu$F is initially uncharged. We close switch S. After charge no longer flows, what is the potential difference across each capacitor, and what is the charge on each capacitor? (d) What is the final energy of the system?

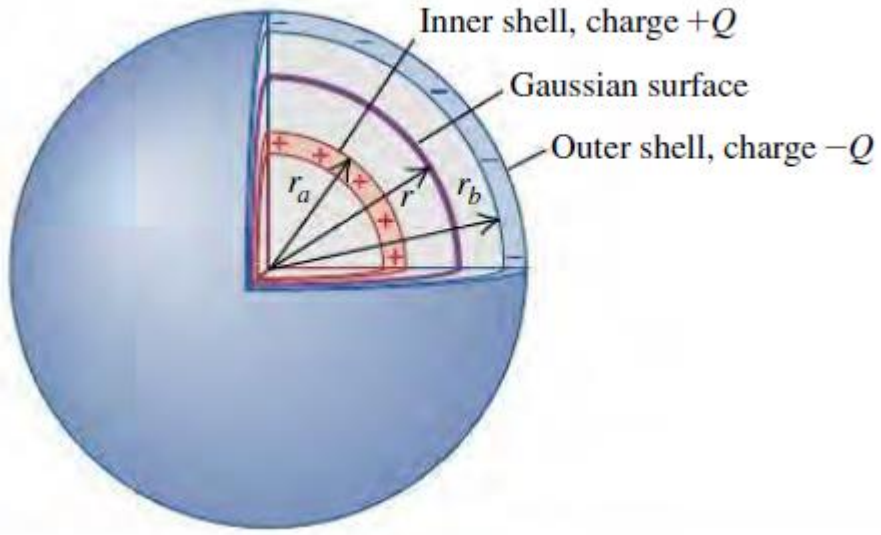
*** Where did the lost energy go?

Capacitors

The spherical capacitor described in Example 24.3 (Section 24.1) has charges $+Q$ and $-Q$ on its inner and outer conductors. Find the electric potential energy stored in the capacitor (a) by using the capacitance C found in Example 24.3 and (b) by integrating the electric-field energy density u.

$$C = 4\pi\epsilon_0 \frac{r_a r_b}{r_b - r_a}$$

24.5 A spherical capacitor.



Capacitors

24.72 •• A parallel-plate capacitor is made from two plates 12.0 cm on each side and 4.50 mm apart. Half of the space between these plates contains only air, but the other half is filled with Plexiglas® of dielectric constant 3.40 (Fig. P24.72). An 18.0-V battery is connected across the plates. (a) What is the capacitance of this combination? (*Hint:* Can you think of this capacitor as equivalent to two capacitors in parallel?) (b) How much energy is stored in the capacitor? (c) If we remove the Plexiglas® but change nothing else, how much energy will be stored in the capacitor?

Figure **P24.72**