

Physics 102-Rec
Quiz#6-Sect.22
Chapter 23

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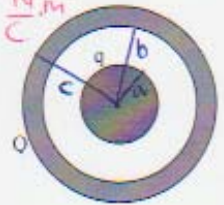
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Consider the configuration of charges shown in the figure. The sphere is non-conducting, has radius $a = 2.0$ cm and a charge $q = -20 \mu\text{C}$. The spherical shell is conducting, has an inner radius $b = 5$ cm and an outer radius $c = 6$ cm and a charge $Q = 10 \mu\text{C}$. Calculate

(a) The electric flux through a gaussian surface of radius $r = 3.0$ cm

$$\phi = \frac{q_{\text{enc}}}{\epsilon_0} = \frac{-20 \times 10^{-6}}{8.85 \times 10^{-12}} = -2.3 \times 10^6 \frac{\text{N} \cdot \text{m}^2}{\text{C}}$$

the gaussian surface contains only the charge $q = -20 \mu\text{C}$.



(b) The electric flux through a gaussian surface of radius $r = 10$ cm

$$\phi = \frac{q_{\text{enc}}}{\epsilon_0} = \frac{-20 \times 10^{-6} + 10 \times 10^{-6}}{8.85 \times 10^{-12}} = 1.1 \times 10^6 \frac{\text{N} \cdot \text{m}^2}{\text{C}}$$

(c) The charge on the inner and outer surfaces of the spherical shell, call them q_{in} and q_{out} .

$$q_{\text{in}} = 20 \mu\text{C}$$

$$q_{\text{out}} = Q - q_{\text{in}} = 10 - 20 = -10 \mu\text{C}$$