

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

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Consider the configuration of charges shown in the figure. The sphere is non-conducting, has radius $a = 5.0$ cm and a charge $q = -20$ μC . The spherical shell is conducting, has an inner radius $b = 7$ cm and an outer radius $c = 9$ cm and a charge $Q = 20$ μC . Calculate

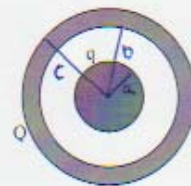
(a) The electric field at $r = 2.0$ cm from the center of the sphere.

Inside the sphere

$$E = \frac{kq}{a^3} r$$

$$= \frac{9 \times 10^9 \times 20 \times 10^{-6}}{(0.05)^3} \times 0.02 = 2.88 \times 10^7 \text{ N/C}$$

radially inward.



(b) The electric field at $r = 8.0$ cm from the center of the sphere.

Inside the conducting shell

$$E = 0$$

(c) The electric field at $r = 12$ cm from the center of the sphere.

$$E = \frac{k(q+Q)}{r^2} = \frac{9 \times 10^9 (-20 \times 10^{-6} + 20 \times 10^{-6})}{(0.12)^2} = 0$$

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

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

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

$$\Rightarrow q_{out} = 0$$