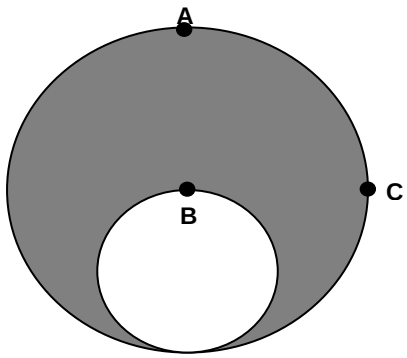
Problems of the Week 2

Always show your work to receive credit (NO WORK=NO CREDIT)

1. An insulating sphere of radius R has a cavity of radius R/2 as shown below. Assuming the sphere has uniform charge density ρ, calculate the electric field strength at points A and B.



A. $\boldsymbol{E_A = \frac{Q}{4\pi\varepsilon_o R^2}; E_B = 0}$

B. $\boldsymbol{E_A = \frac{Q}{8\pi\varepsilon_o R^2}; E_B = 0}$

C. $\boldsymbol{E_A = \frac{17Q}{72\pi\varepsilon_o R^2}; E_B = \frac{Q}{8\pi\varepsilon_o R^2}}$

D. $\boldsymbol{E_A = \frac{11Q}{36\pi\varepsilon_o R^2}; E_B = \frac{Q}{12\pi\varepsilon_o R^2}}$

E. $\boldsymbol{E_A = \frac{4Q}{9\pi\varepsilon_o R^2}; E_B = \frac{Q}{8\pi\varepsilon_o R^2}}$

Note $\boldsymbol{Q = \rho\frac{4}{3}\pi R^3}$

2. Calculate the magnitude and direction of the electric field at point C.

A. $E_C = 0.089\frac{Q}{\pi\varepsilon_o R^2}; \theta = 285^o$

B. $E_C = 0.147\frac{Q}{\pi\varepsilon_o R^2}; \theta = 324^o$

C. $E_C = 0.187\frac{Q}{\pi\varepsilon_o R^2}; \theta = 352^o$

D. $E_C = 0.228\frac{Q}{\pi\varepsilon_o R^2}; \theta = 357^o$

E. $E_C = 0.316\frac{Q}{\pi\varepsilon_o R^2}; \theta = 340^o$