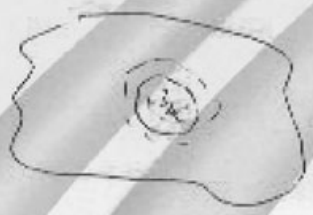
NDU
Faculty of Natural and Applied Sciences
Department of Sciences

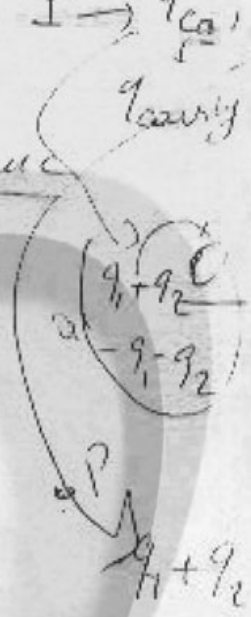
PHS212 - Electricity & Magnetism
Quiz 3 - Spring 2003
Duration: 15 min

30

Name: [redacted] ID: [redacted]

An insulated conductor of arbitrary shape carries a net positive charge of +10 μC. Inside the conductor is a hollow cavity within which is a point charge q=+3.0 μC. What is the charge on the cavity wall and on the outer surface of the conductor?





On the cavity wall

Gaussian surface very close to cavity wall

$E = 0$ (inside a conductor) ✓

$$\Phi = \oint E\,dA = 0 = \frac{\Sigma q}{\varepsilon_0} = \frac{q_{wall} + 3\mu C}{\varepsilon_0} = 0$$ ✓

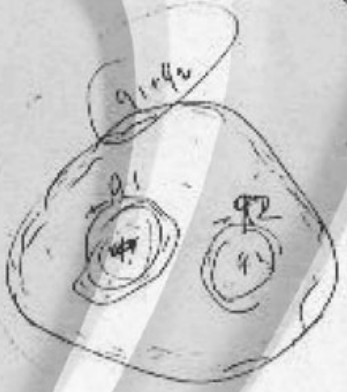
$$q_{cavity\ wall} = -3\,\mu C$$ ✓

Conservation of charge ✓

$\Sigma q = +10\,\mu C$ ✓

$Q_{outer\ surface} + Q_{inner\ surface} = 10$ ✓

$Q_{outer\ surface} = 10 - (-3) = 13\,\mu C$



$Q = 0$

q_1+q_2

P