

# Physics 2321. Electricity and Magnetism

## Quiz 3. Electric Flux and Gauss's Law

Name: \_\_\_\_\_

Constants:  $k = 9 \times 10^9$ ,  $\epsilon_0 = 8.85 \times 10^{-12}$

1. (1pt) A Gaussian surface should be chosen such that \_\_\_\_\_
  - (a) the E-field is perpendicular to the surface.
  - (b) the E-field is parallel to the surface, or zero.
  - (c) the E-field is parallel to, perpendicular to, or zero at the surface.
  - (d) the surface surrounds all of the charge
  - (e) the surface surrounds the point P where we want to know the field.
2. (2pt) A flat circular disk of radius 6 cm is oriented so that a uniform electric field ( $E=300$  N/C) makes an angle of  $30^\circ$  with the normal to the disk. What is the flux through the disk? (Show work.)
3. (1pt) T or F. The excess charge on a conductor is always spread uniformly on the surface.
4. (1pt) What is the E-field above an infinite, insulating sheet (or plane) with surface charge  $\sigma = -6.3\mu C m^{-2}$ ?
  - (a)  $3.6 \times 10^5$  N/C down      (b)  $3.6 \times 10^5$  N/C up      (c)  $7.1 \times 10^5$  N/C up
  - (d)  $7.1 \times 10^5$  N/C down      (e)  $1.8 \times 10^5$  N/C down
5. (1pt) What is the E-field above an infinite, conducting sheet (or plane) with surface charge  $\sigma = -6.3\mu C m^{-2}$  on each side of the plane?
  - (a)  $3.6 \times 10^5$  N/C down      (b)  $3.6 \times 10^5$  N/C up      (c)  $7.1 \times 10^5$  N/C up
  - (d)  $7.1 \times 10^5$  N/C down      (e)  $1.8 \times 10^5$  N/C down
6. (1pt) The Gaussian surface that we used to find E near an infinite line charge was \_\_\_\_\_
  - (a) a cube centered on the line
  - (b) a sphere centered on the line
  - (c) a sphere completely outside of the line
  - (d) a cylinder with its axis of symmetry parallel to the line.
  - (e) a cylinder with its axis of symmetry perpendicular to the line.
7. (1pt) What is  $\oint E \cdot dA$  for a sphere of radius 1 m centered on the origin when there is only a 2nC charge located at  $x=1.5m$ ? (Show units.)