# Suggested problems
# Chapter 23

The quiz questions will be same or very similar to the following text-book problems.
Refer to the course website for the latest version of this document.
You are encouraged to seek the help of your instructor during his office hours.

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**1.** The square surface shown in Fig. 23-26 measures 3.2 mm on each side. It is immersed in a uniform electric field with magnitude E = 1800 N/C and with field lines at an angle of θ = 35° with a normal to the surface, as shown. Take that normal to be directed "outward," as though the surface were one face of a box. Calculate the electric flux through the surface.

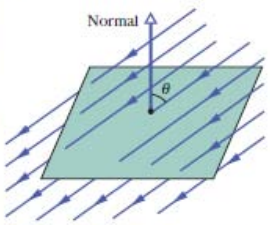

Fig. 23-26 Problem 1.

**Answer:** –0.015 N.m$^2$/C

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**12.** Figure 23-32 shows two non conducting spherical shells fixed in place. Shell 1 has uniform surface charge density $+6.0\ \mu C/m^2$ on its outer surface and radius 3.0 cm; shell 2 has uniform surface charge density $+4.0\ \mu C/m^2$ on its outer surface and radius 2.0 cm; the shell centers are separated by $L$ = 10 cm. In unit-vector notation, what is the net electric field at $x$ = 2.0 cm?

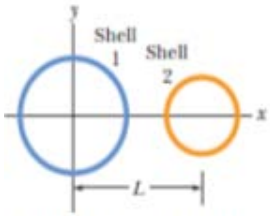

Fig. 23-32 Problem 12.

**Answer:** $-2.8\times10^4\ \hat{\imath}$ N/C

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**22.** An electron is released 9.0 cm from a very long non conducting rod with a uniform 6.0 μC/m What is the magnitude of the electron's initial acceleration?

**Answer:** $2.1\times10^{17}$ m/s$^2$

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**33.** In Fig. 23-40, two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have excess surface charge densities of opposite signs and magnitude $7.00\times10^{-22}$ C/m$^2$. In unit-vector notation, what is the electric field at points (a) to the left of the plates, (b) to the right of them, and (c) between them?

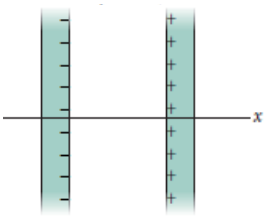

Fig. 23-40 Problem 33.

**Answer:** (a) zero ; (b) zero ; (c) $-7.91\times10^{-11}\ \hat{\imath}$ N/C

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**57.** A thin-walled metal spherical shell has radius 25.0 cm and charge $2.00\times10^{-7}$C. Find $E$ for a point (a) inside the shell, (b)just outside it, and (c) 3.00 m from the center.

**Answer:** (a) zero ; (b) $2.88\times10^4$ N/C away from the center; (c) 200 N/C away from the center

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**58.** A uniform surface charge of density 8.0 nC/m2 is distributed over the entire *xy* plane. What is the electric flux through a spherical Gaussian surface centered on the origin and having a radius of 5.0 cm?

**Answer:** 7.1 N.m$^2$/C

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**65.** Charge $Q$ is uniformly distributed in a sphere of radius $R$. (a) What fraction of the charge is contained within the radius $r = R/2.00$? (b) What is the ratio of the electric field magnitude at $r = R/2.00$ to that on the surface of the sphere?

**Answer:** (a) q/Q = 1/8 = 0.125 ; (b) $E_r/E_R$ = 1/2 = 0.5