# Homework #3, 4B

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1 Question 1

Figure 22-22 shows three arrangements of electric field lines. In each arrangement, a proton is released from rest at point A and is then accelerated through point B by the electric field. Points A and B have equal separations in the three arrangements. Rank the arrangements according to the linear momentum of the proton at point B, greatest first.

(a)   (b)   (c)
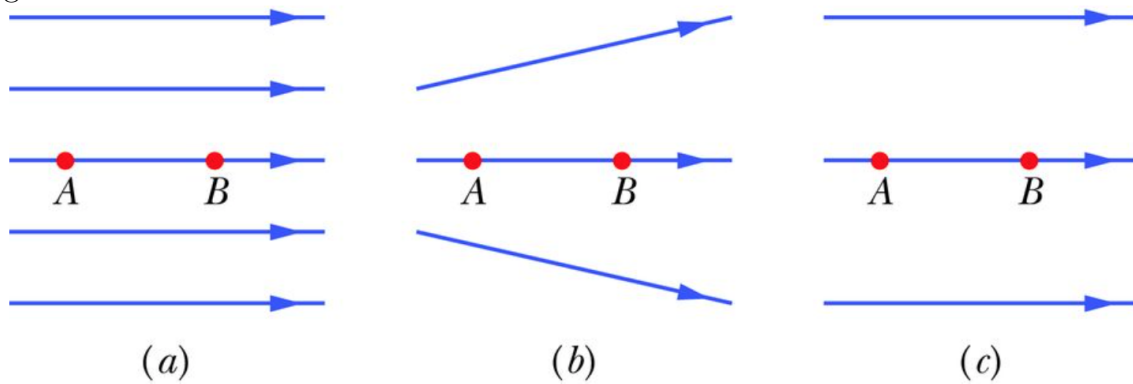
Solution

2 Question 6

In Fig. 22-27, two identical circular nonconducting rings are centered on the same line with their planes perpendicular to the line. Each ring has charge that is uniformly distributed along its circumference. The rings each produce electric fields at points along the line.
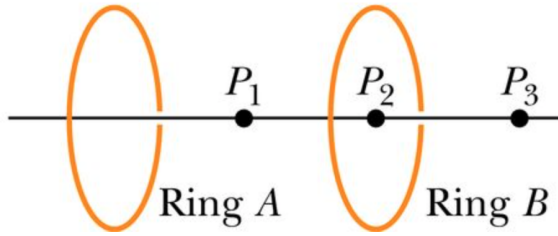
For three situations, the charges on rings A and B are, respectively, (1) q_0 and q_0, (2) $-q_0$ and $-q_0$, and (3) $-q_0$ and q_0. Rank the situations according to the magnitude of the net electric field at (a) point P_1 midway between the rings, (b) point P_2 at the center of ring B, and (c) point P_3 to the right of ring B, greatest first.

Solution

3   Question 9

Figure 22-28 shows two disks and a flat ring, each with the same uniform charge Q. Rank the objects according to the magnitude of the electric field they create at points P (which are at the same vertical heights), greatest first.
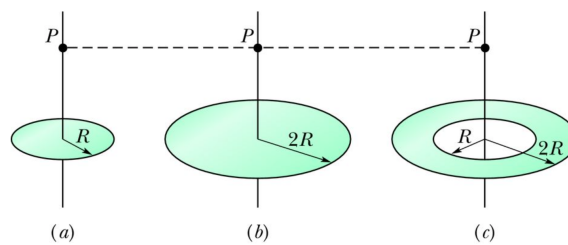

Figure 22-28 Question 9.

Solution

4 Question 13

Figure 22-32 shows three rods, each with the same charge Q spread uniformly along its length. Rods a (of length L) and b (of length $\frac{L}{2}$) are straight, and points P are aligned with their midpoints. Rod c (of length $\frac{L}{2}$) forms a complete circle about point P. Rank the rods according to the magnitude of the electric field they create at points P, greatest first.
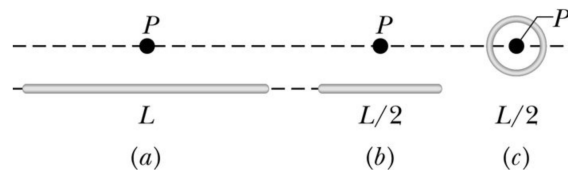

Figure 22-32 Question 13.

Solution

5 Problem 24

A thin nonconducting rod with a uniform distribution
of positive charge Q is bent into a complete circle of
radius R (Fig. 22-48). The central perpendicular
axis through the ring is a z axis, with the origin at
the center of the ring. What is the magnitude of the
electric field due to the rod at (a) z = 0 and (b) z =
inf? (c) In terms of R, at what positive value of z is
that magnitude maximum? (d) If R = 2.00 cm and
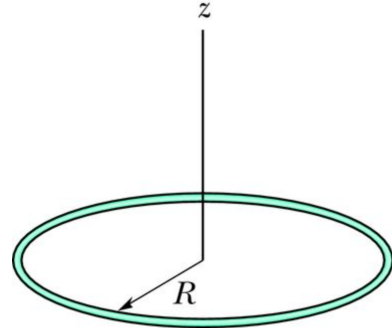Q = 4.00 C, what is the maximum magnitude?

Figure 22-48 Problem 24.

Solution

6 Problem 26

Fig. 22-50, a thin glass rod forms a semi-circle of radius $r = 5.00$cm. Charge is uniformly distributed along the rod, with $+q = 4.50$pC in the upper half and $-q = -4.50$pC in the lower half. What are the (a) magnitude and (b) direction (relative to the positive direction of the x axis) of the electric field E at P, the center of the semicircle?
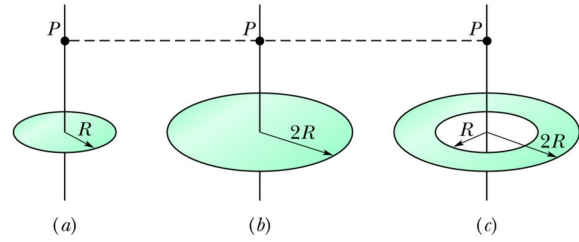

(a)   (b)   (c)

Figure 22-28 Question 9.

Solution