



PHYS 121 Quiz #1 (2232323445570033533005668678234)  
Friday, January 31

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

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

Student Number: \_\_\_\_\_

For each question, circle the best answer.

1) A point charge  $Q$  is located a short distance from a point charge  $3Q$ , and no other charges are present. If the electrical force on  $Q$  is  $F$ , what is the electrical force on  $3Q$ ?

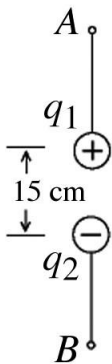
- A)  $F/3$
- B)  $F/\sqrt{3}$
- C)  $F$
- D)  $\sqrt{3}F$
- E)  $3F$

2) A positive point charge  $Q$  is fixed on a very large horizontal frictionless tabletop. A second positive point charge  $q$  is released from rest near the stationary charge and is free to move. Which statement best describes the motion of  $q$  after it is released?

- A) Its speed will be greatest just after it is released.
- B) Its acceleration is zero just after it is released.
- C) As it moves farther and farther from  $Q$ , its acceleration will keep increasing.
- D) As it moves farther and farther from  $Q$ , its speed will decrease.
- E) As it moves farther and farther from  $Q$ , its speed will keep increasing.

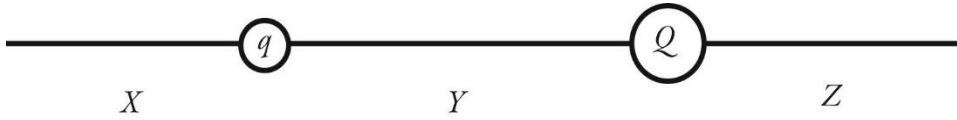
- 3) Two identical small conducting spheres are separated by 0.60 m. The spheres carry different amounts of charge and each sphere experiences an attractive electric force of 10.8N. The total charge on the two spheres is  $-24 \mu\text{C}$ . The two spheres are now connected by a slender conducting wire, which is then removed. The electric force on each sphere is closest to
- A) zero.
  - B) 3.6 N, attractive.
  - C) 5.4 N, attractive.
  - D) 3.6 N, repulsive.
  - E) 5.4 N, repulsive.

- 4) Two small insulating spheres are attached to silk threads and aligned vertically as shown in the figure. These spheres have equal masses of 40 g, and carry charges  $q_1$  and  $q_2$  of equal magnitude  $2.0 \mu\text{C}$  but opposite sign. The spheres are brought into the positions shown in the figure, with a vertical separation of 15 cm between them. Note that you cannot neglect gravity. ( $k = 1/4\pi\epsilon_0 = 8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$ ) The tension in the lower thread is closest to



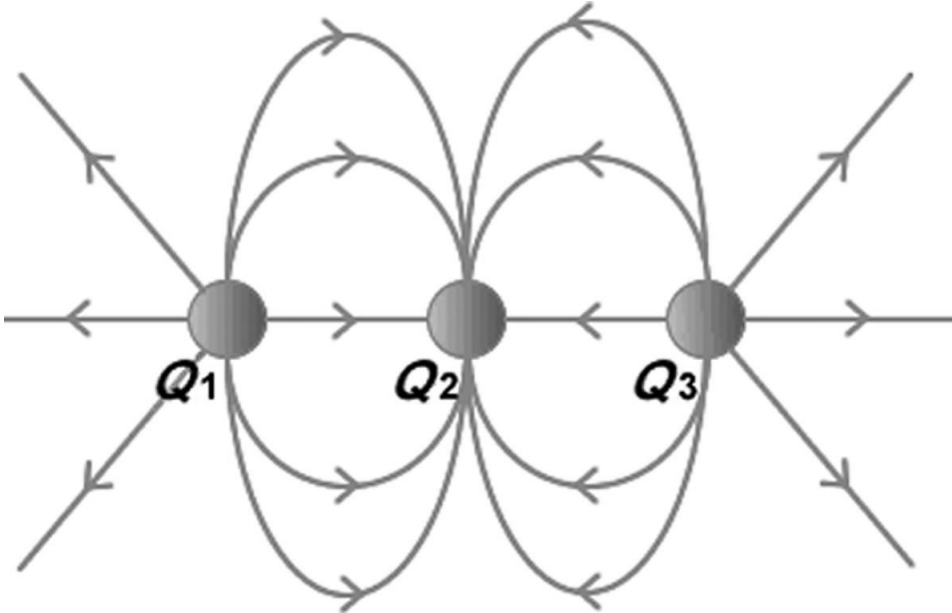
- A) 1.2 N.
- B) 1.4 N.
- C) 1.6 N.
- D) 1.8 N.
- E) 2.0 N.

5) The figure shows two unequal point charges,  $q$  and  $Q$ , of opposite sign. Charge  $Q$  has greater magnitude than charge  $q$ . In which of the regions  $X$ ,  $Y$ ,  $Z$  will there be a point at which the net electric field due to these two charges is zero?



- A) only regions  $X$  and  $Z$
- B) only region  $X$
- C) only region  $Y$
- D) only region  $Z$
- E) all three regions

6) The figure shows three electric charges labeled  $Q_1$ ,  $Q_2$ ,  $Q_3$ , and some electric field lines in the region surrounding the charges. What are the signs of the three charges?

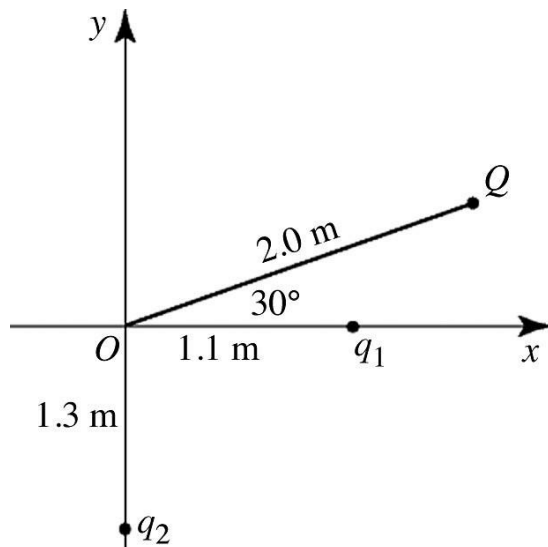


- A)  $Q_1$  is positive,  $Q_2$  is negative,  $Q_3$  is positive.
- B)  $Q_1$  is negative,  $Q_2$  is positive,  $Q_3$  is negative.
- C)  $Q_1$  is positive,  $Q_2$  is positive,  $Q_3$  is negative.
- D) All three charges are negative.
- E) All three charges are positive.

7) Two large, flat, horizontally oriented plates are parallel to each other, a distance  $d$  apart. Half way between the two plates the electric field has magnitude  $E$ . If the separation of the plates is reduced to  $d/2$  what is the magnitude of the electric field half way between the plates?

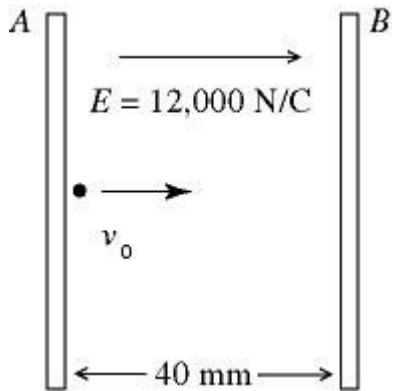
- A)  $4E$
- B)  $2E$
- C)  $E$
- D)  $0$
- E)  $E/2$

8) A point charge  $Q = -500 \text{ nC}$  and two unknown point charges,  $q_1$  and  $q_2$ , are placed as shown in the figure. The electric field at the origin  $O$ , due to charges  $Q$ ,  $q_1$  and  $q_2$ , is equal to zero. The charge  $q_1$  is closest to



- A)  $130 \text{ nC}$ .
- B)  $76 \text{ nC}$ .
- C)  $150 \text{ nC}$ .
- D)  $-76 \text{ nC}$ .
- E)  $-130 \text{ nC}$ .

9) A pair of charged conducting plates produces a uniform field of 12,000 N/C, directed to the right, between the plates. The separation of the plates is 40 mm. An electron is projected from plate A, directly toward plate B, with an initial velocity of  $v_0 = 1.0 \times 10^7$  m/s, as shown in the figure. ( $e = 1.60 \times 10^{-19}$  C,  $\epsilon_0 = 8.85 \times 10^{-12}$  C<sup>2</sup>/N · m<sup>2</sup>,  $m_e = 9.11 \times 10^{-31}$  kg) The distance of closest approach of the electron to plate B is nearest to



- A) 16 mm.
- B) 18 mm.
- C) 20 mm.
- D) 22 mm.
- E) 24 mm.

10) If the electric flux through a closed surface is zero, the electric field at points on that surface must be zero.

- A) True
- B) False