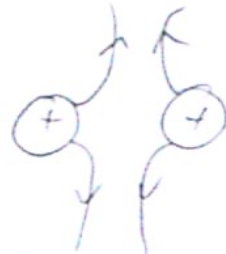


Field lines go from "+" to "-"

Do not cross

The density of the lines means the strength of the field



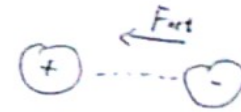
like repel

$$F = \frac{kQ_1Q_2}{r^2}$$

$$F \propto \frac{1}{r^2}$$

$$F \propto Q_1 \propto Q_2$$

$$k = 8.988 \times 10^9 \frac{Nm^2}{C^2}$$



Q: Coulomb

$$F = ma = \frac{kq_1q_2}{r^2}$$

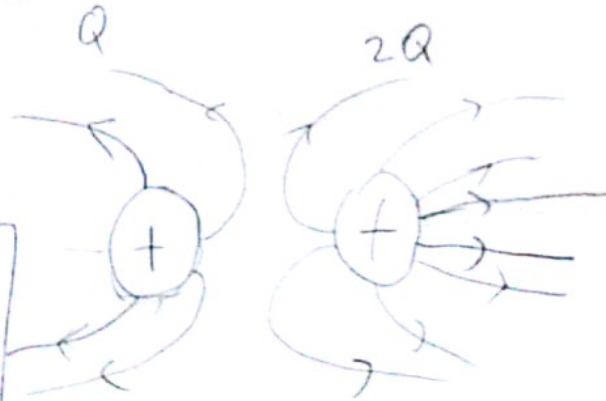
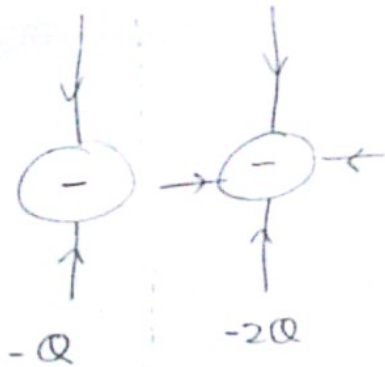
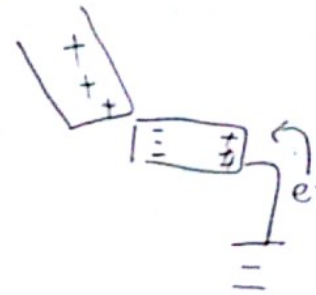
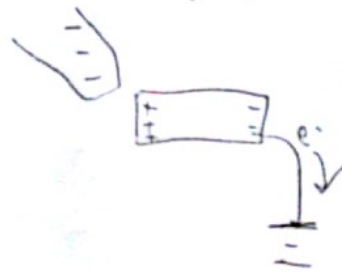
$\therefore m, k, q_1, q_2$  are constant

$$a \propto \frac{1}{r^2}$$

As  $r \rightarrow \infty, a \rightarrow 0$ .

$v_f \rightarrow$  constant

Charging by Induction



Jackie Ma

Edward Yang

### III. ELECTRICITY AND MAGNETISM

#### A. Electrostatics

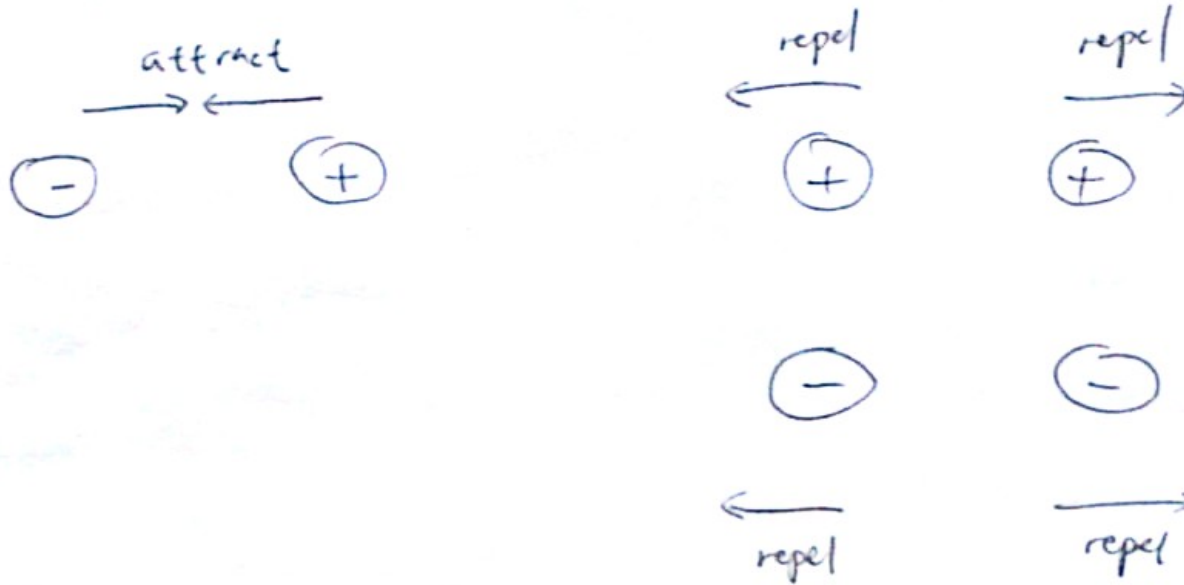
##### 1. Charge and Coulomb's Law

a) Students should understand the concept of electric charge, so they can:

(1) Describe the types of charge and the attraction and repulsion of charges.

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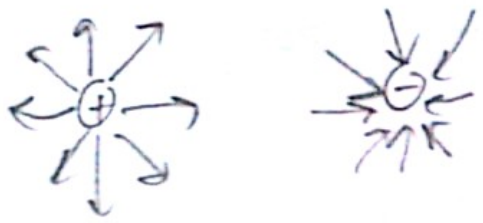
III. ELECTRICITY AND MAGNETISM

A. Electrostatics

1. Charge and Coulomb's Law

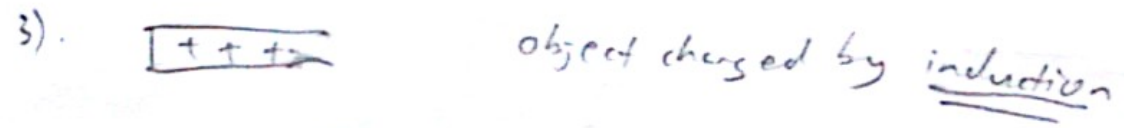
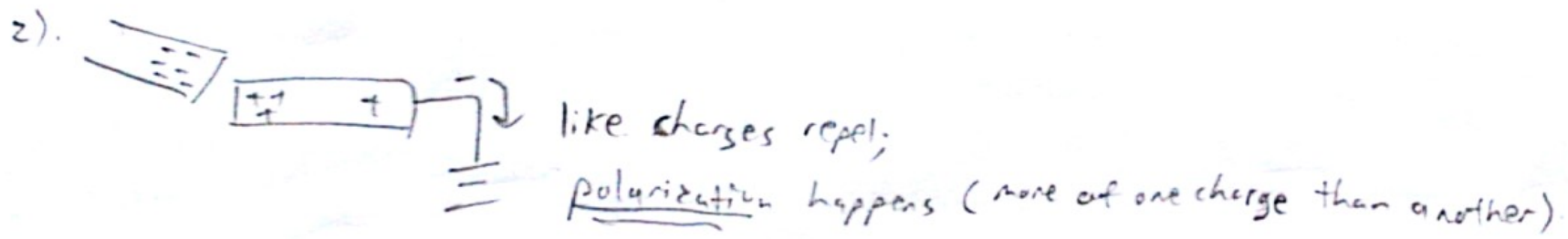
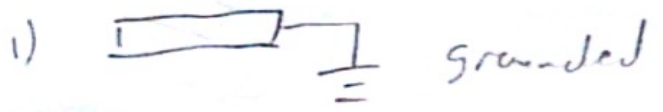
- a) Students should understand the concept of electric charge, so they can:
- (2) Describe polarization and induced charges.

Section 4



like charges repel  
 opposite charges attract

Induction



### III. ELECTRICITY AND MAGNETISM

#### A. Electrostatics

##### 1. Charge and Coulomb's Law

b) Students should understand Coulomb's Law and the principle of superposition, so they can:

(1) Calculate the magnitude and direction of the force on a positive or negative charge due to other specified point charges.

$$F = \frac{kq_1q_2}{r^2}$$

$k = 9 \times 10^9 \text{ (N}\cdot\text{m}^2/\text{C}^2)$ , constant

$q_1, q_2$  = charge of charge (C)

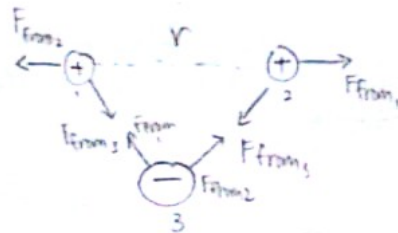
$r$  : distance between charges (m)

direction: opposite charges attract

like charges repel

multiple directions:  $\tan \theta = \frac{F_y}{F_x}$

superposition:  $F$  is vector, adds up or subtracts down



and add / subtract

### III. ELECTRICITY AND MAGNETISM

#### A. Electrostatics

##### 1. Charge and Coulomb's Law

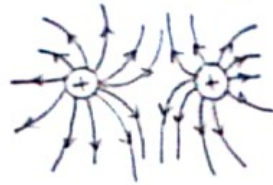
b) Students should understand Coulomb's Law and the principle of superposition, so they can:

(2) Analyze the motion of a particle of specified charge and mass under the influence of an electrostatic force.

charge

positive + negative attracts

+ + or - - repel

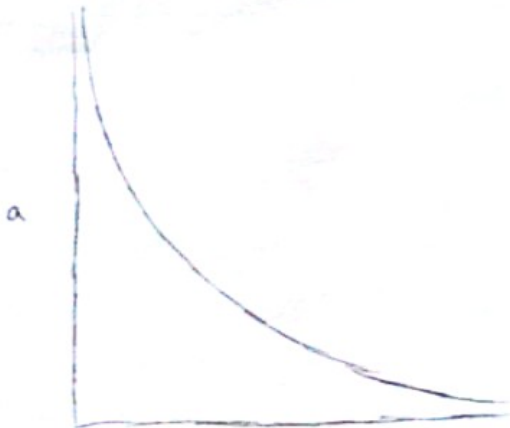


Coulomb's law

$$F = k \frac{Q_1 Q_2}{r^2}$$

gives the magnitude of the electric force that either object exerts on the other.

$$k = 8.988 \times 10^9$$



$$a \propto \frac{1}{r^2}$$

velocity approaches a constant, acceleration approaches 0