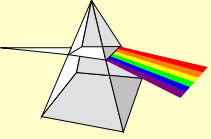


LAB #16

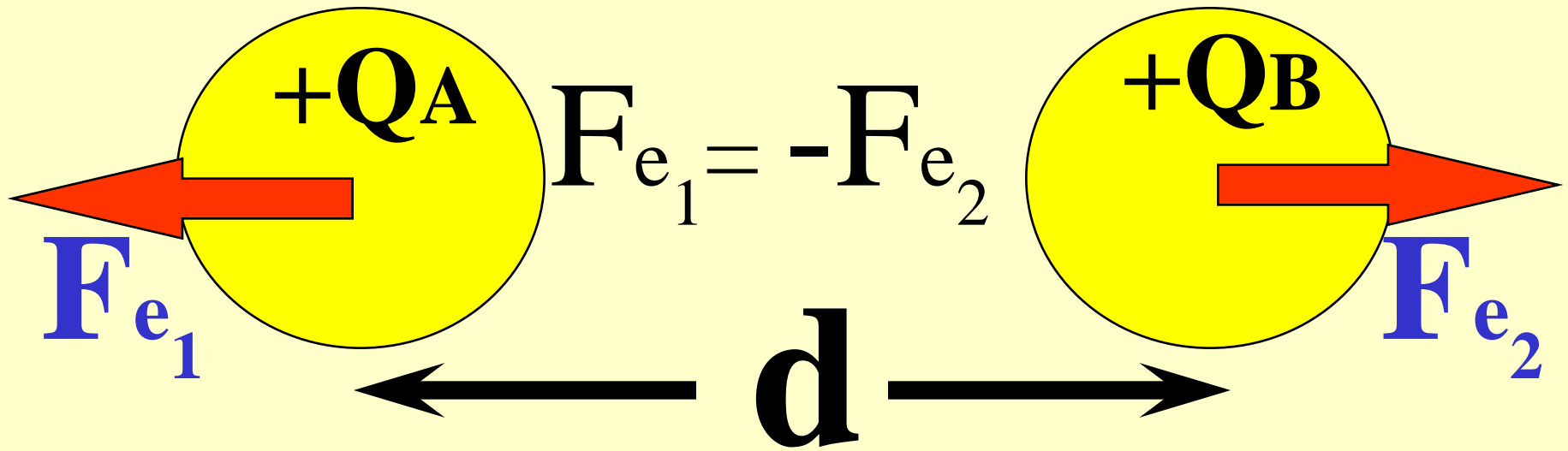
Coulomb's

Law



Coulomb's Law

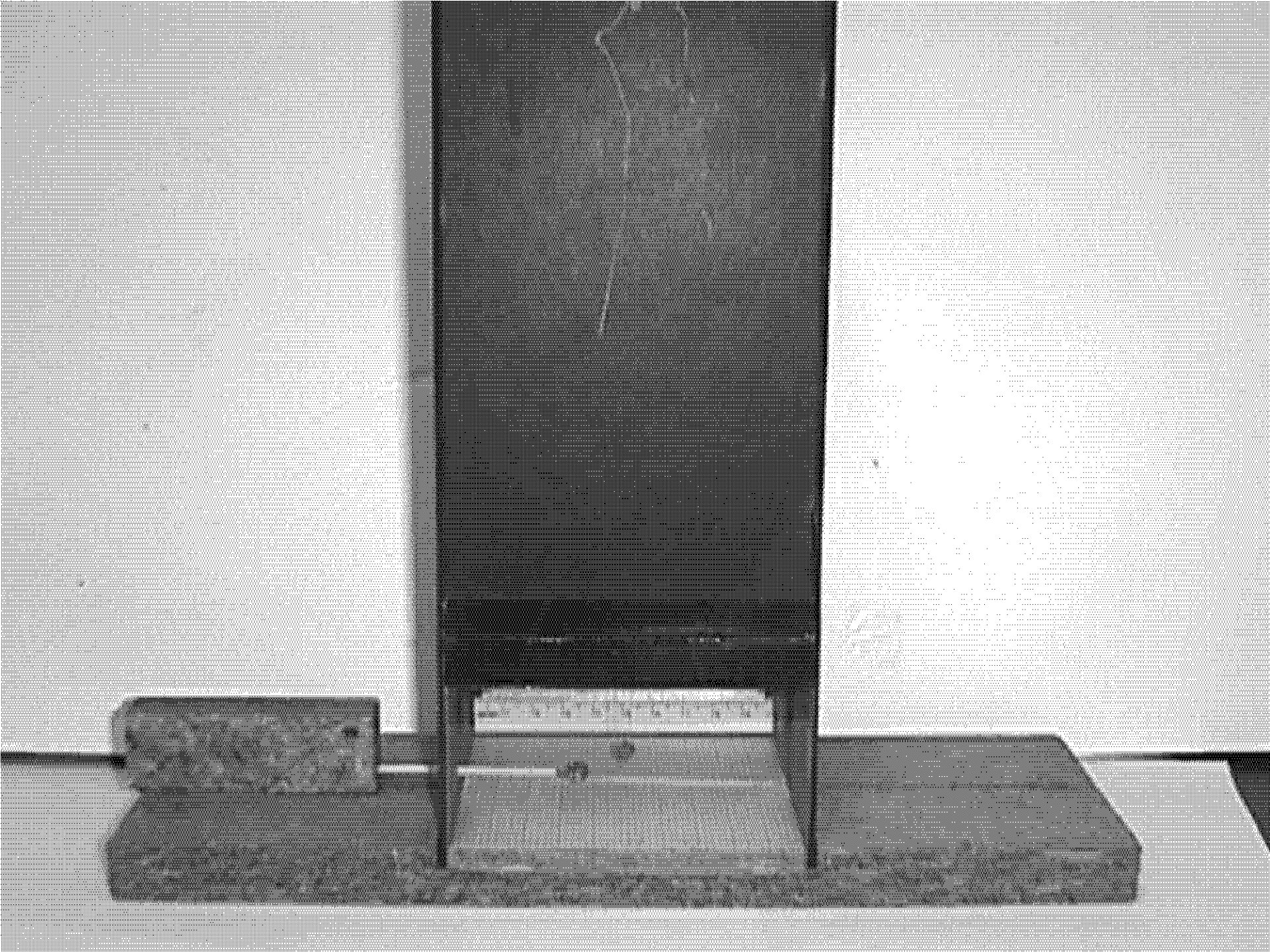
Force between Charges

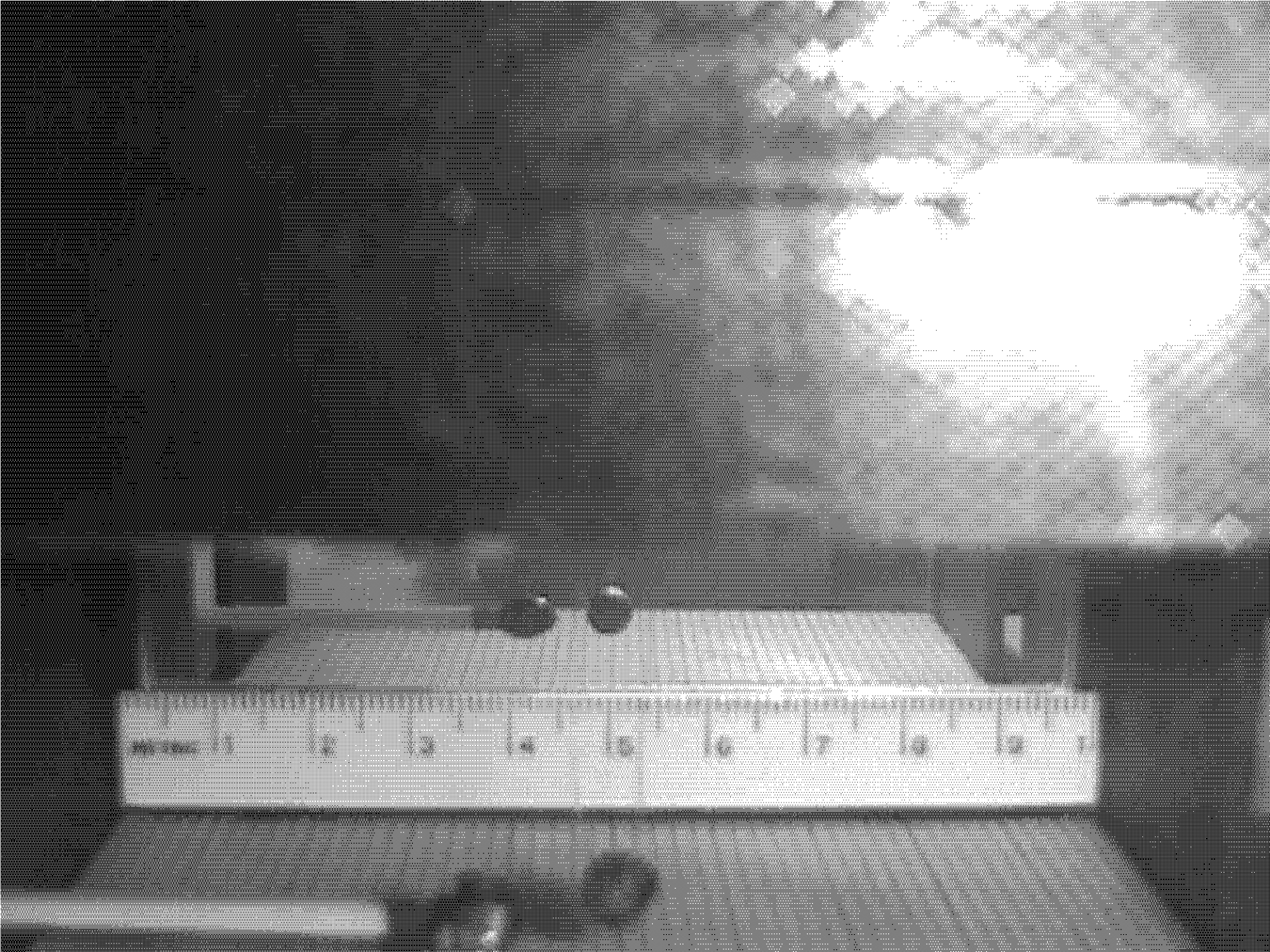


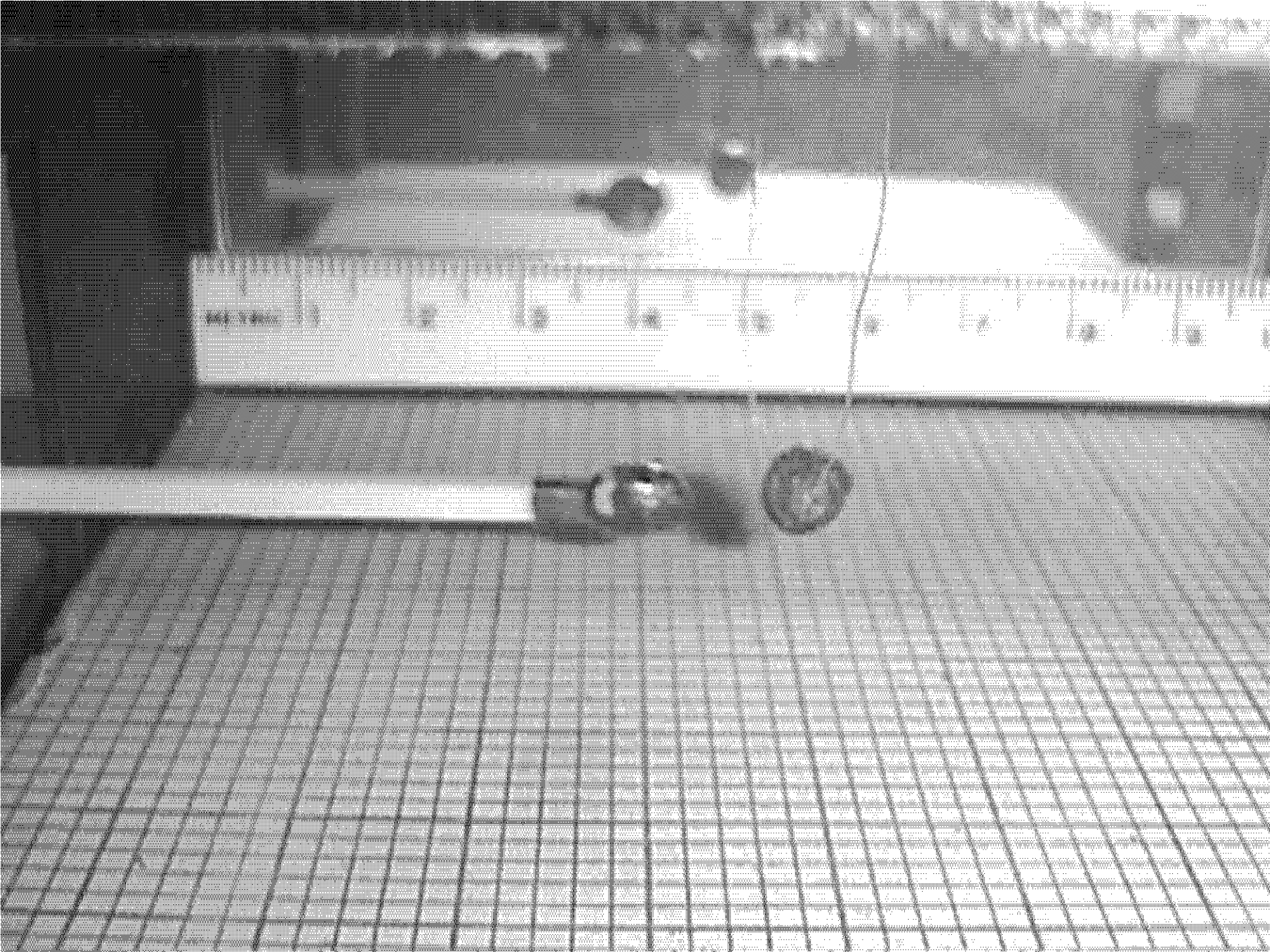
$$F_e \propto Q_A$$

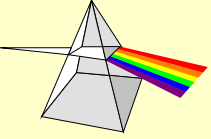
$$F_e \propto Q_B$$

$$F_e \propto 1/d^2$$





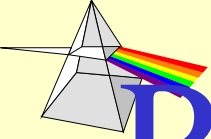




GOALS: Part 1

- To test the relationship between electrostatic **force** vs **distance**

F_e vs d



PROOF: $F_e = mg \tan \Theta$

$$\sin \Theta = X/L$$

L = PEND LENGTH

$$\Sigma F_x = 0$$

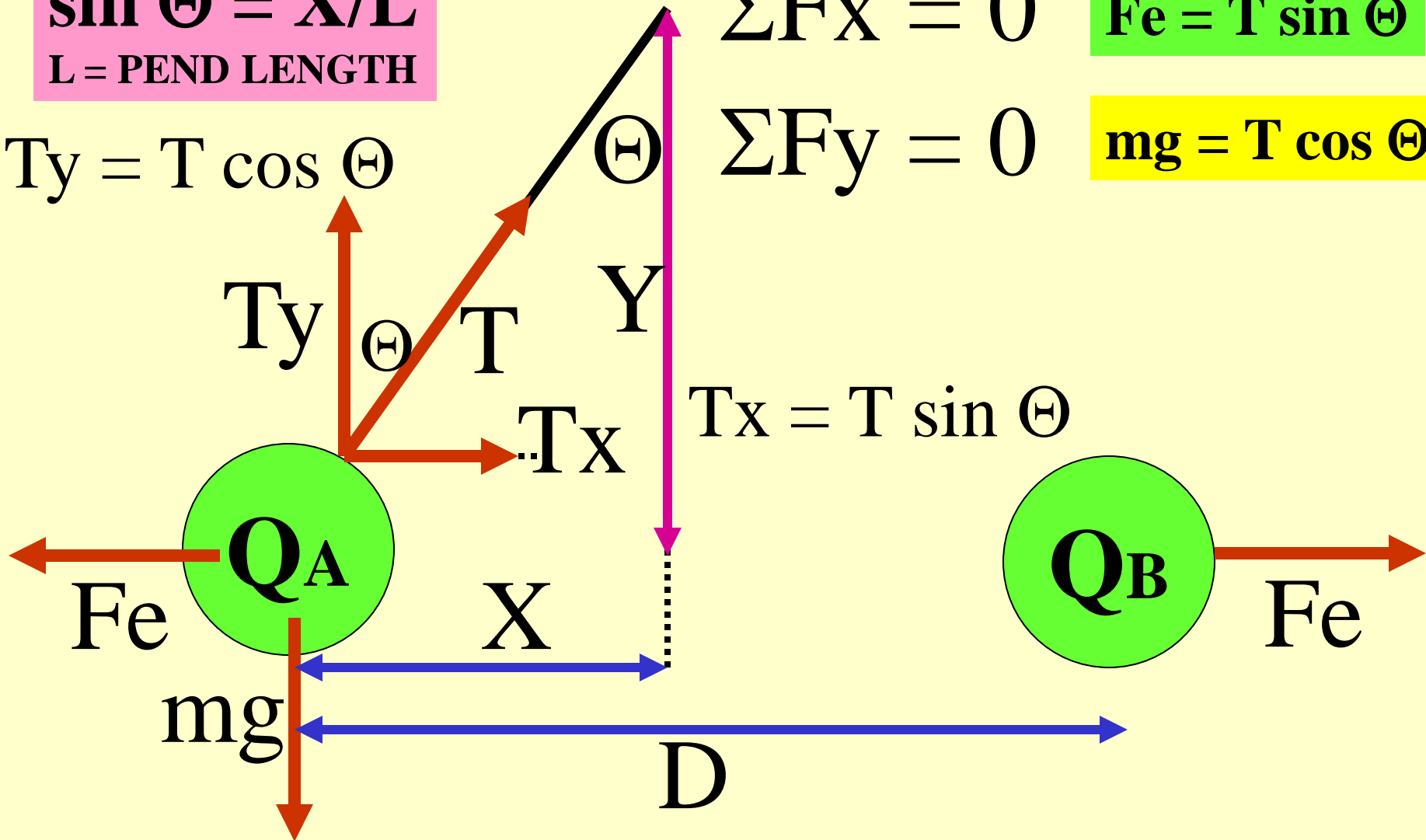
$$F_e = T \sin \Theta$$

$$\Sigma F_y = 0$$

$$mg = T \cos \Theta$$

$$T_y = T \cos \Theta$$

$$T_x = T \sin \Theta$$



PROOF: $F_e = mg \tan \Theta$

$$\Sigma F_x = 0$$

$$\Sigma F_y = 0$$

$$F_e = T \sin \Theta$$

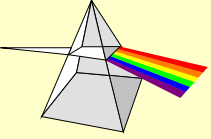
$$mg = T \cos \Theta$$

$$T = F_e / \sin \Theta$$

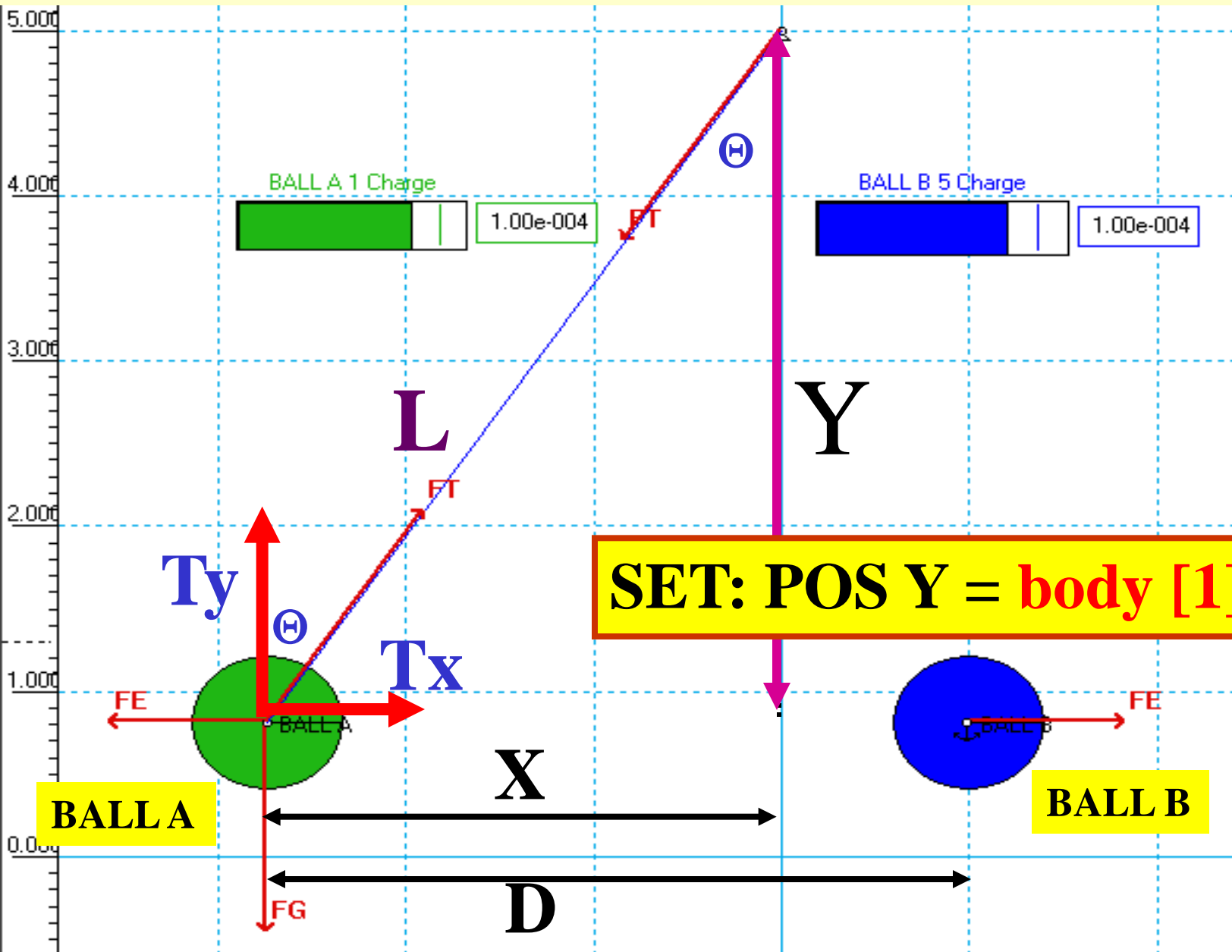
$$T = mg / \cos \Theta$$

$$F_e / \sin \Theta = mg / \cos \Theta$$

$$F_e = mg \tan \Theta$$



PART 1: Fe vs D



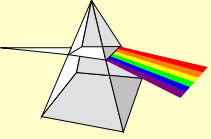
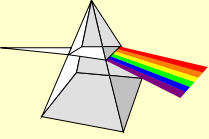


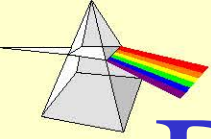
TABLE OF CONSTANTS: PART 1

CONSTANTS:		
$Q_a =$	1.00E-04	C
$Q_b =$	1.00E-04	C
$M_a =$	1	kg
$L =$	5	m



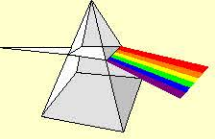
PROCEDURE: PART 1

<u>PROCEDURES:</u>	
1	CONSTRUCT SIMULATIONS TO SPECIFICATIONS ABOVE
2	FOR EACH TRIAL, SET THE INITIAL POS x OF BALL B AND RUN
3	RECORD x , y AND d VALUES, REPEAT FOR 8-10 TRIALS



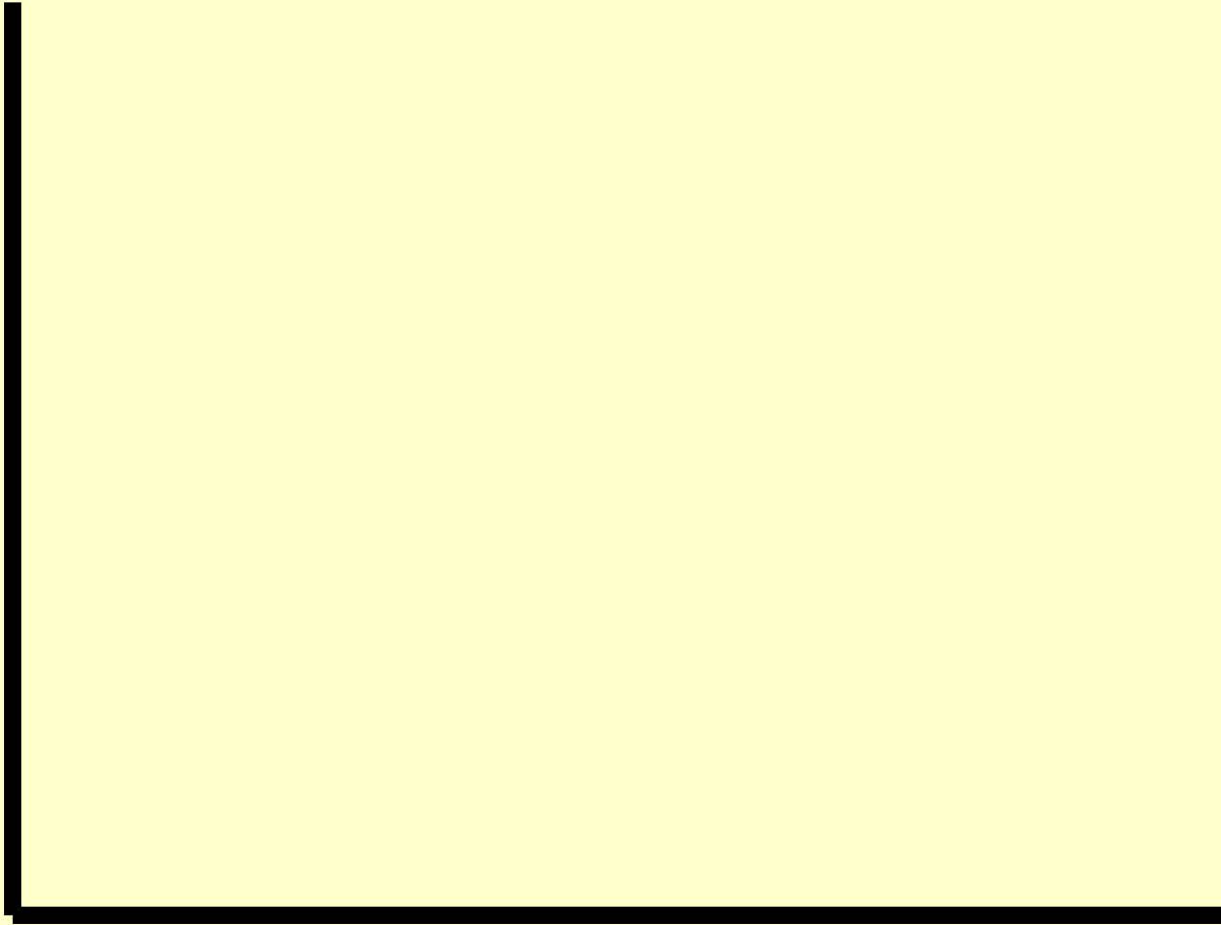
DATA TABLE: PART 1

SAMPLE DATA TABLE: PART 1							
TRIAL	Xo BALL B	D (m)	1/D ²	X (m)	Y (m)	tan Θ (X/Y)	Fe (N)
1	1						
2	2						
3	3						
4	4						
5	5						
6	6						
7	7						
8	8						

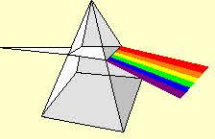


GRAPH #1

FORCE (N)



DISTANCE (m)

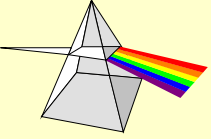


GRAPH #2

FORCE (N)



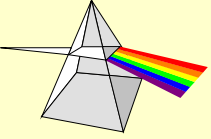
$1/D^2$ ($1/m^2$)



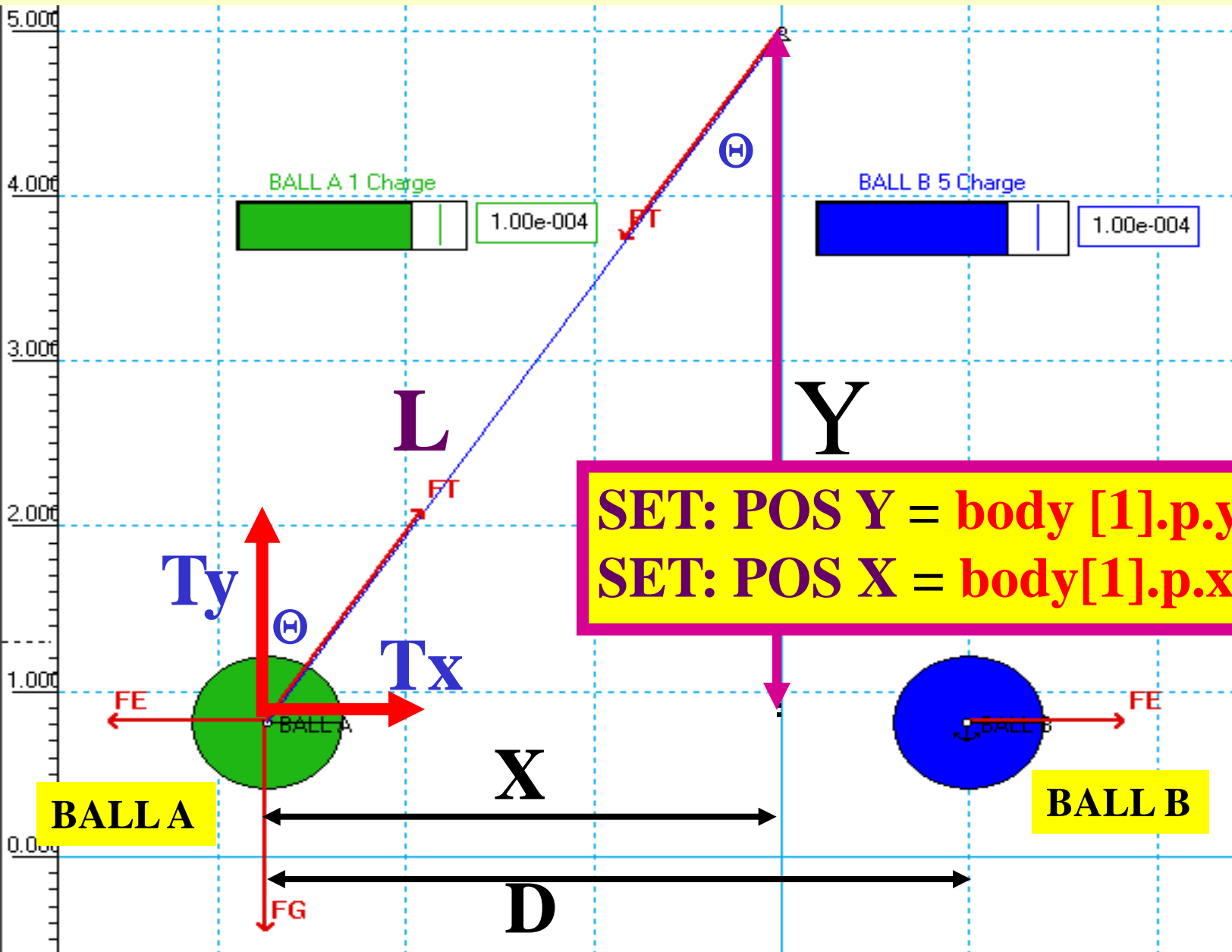
GOALS: Part 2

- To test the relationship between electrostatic **force** vs **charge**

F_e vs Q



PART 2: Fe vs Q



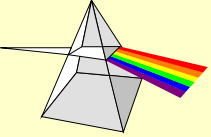
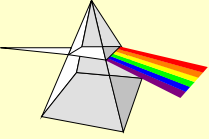


TABLE OF CONSTANTS

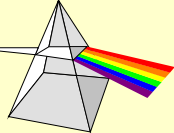
PART 2

CONSTANTS:		
Qa	1.00E-04	C
D	4.00	m
Ma	10	kg
L	5	m



PROCEDURE: PART 2

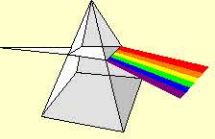
<u>PROCEDURES:</u>	
1	CONSTRUCT SIMULATIONS TO SPECIFICATIONS GIVEN
2	FOR EACH TRIAL, SET THE INITIAL CHARGE OF BALL B AND RUN
3	RECORD X, Y AND D VALUES, REPEAT FOR 8-10 TRIALS



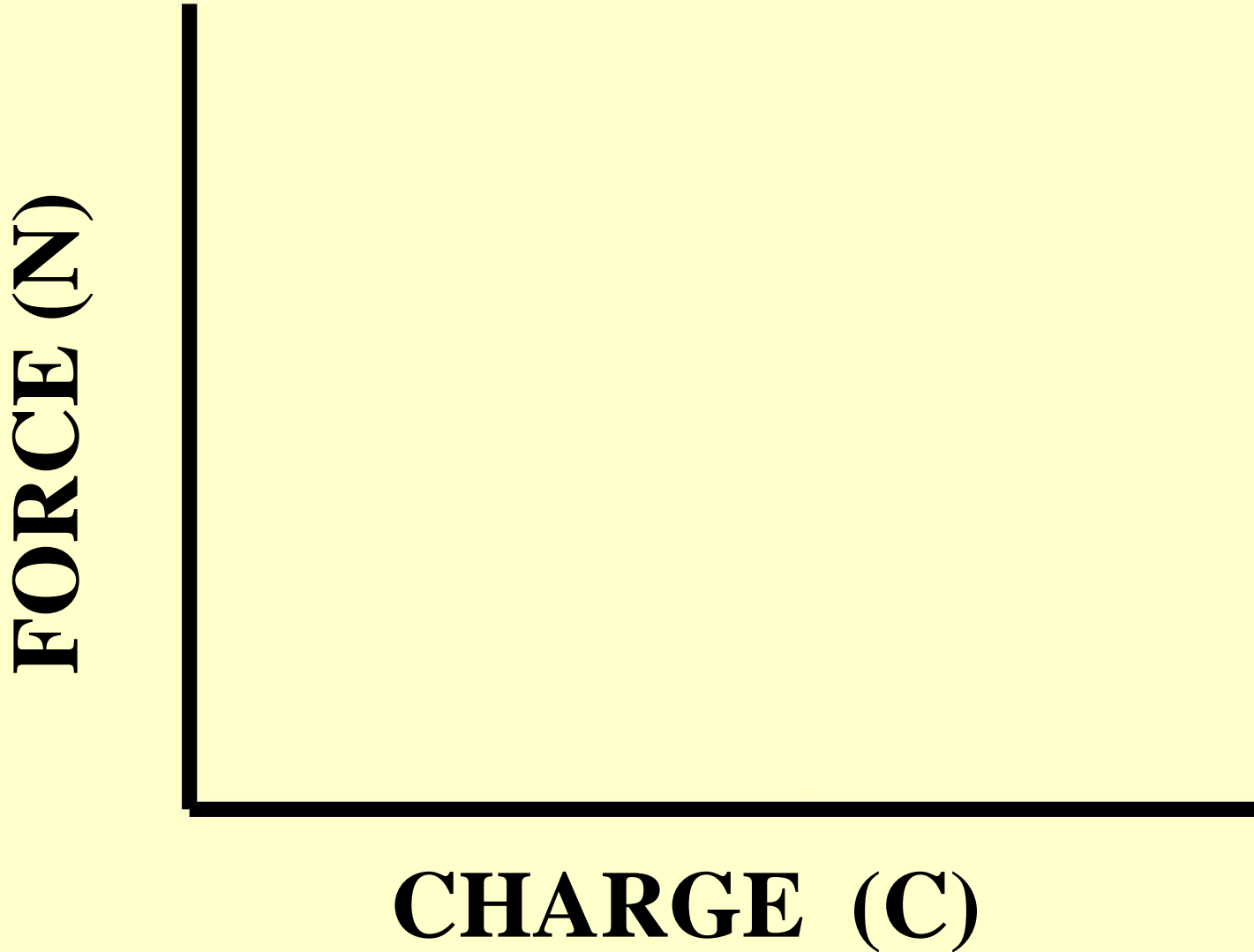
DATA TABLE: PART 2

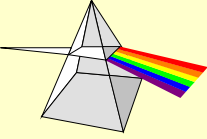
SAMPLE DATA TABLE: PART 1

TRIAL	Q BALL B	D (m)	X (m)	Y (m)	$\tan \theta (X/Y)$	Fe (N)
1	1.00E-04	4				
2	2.00E-04	4				
3	3.00E-04	4				
4	4.00E-04	4				
5	5.00E-04	4				
6	6.00E-04	4				
7	7.00E-04	4				
8	8.00E-04	4				



GRAPH #3





WRITE-UP

- **ABSTRACT:**
 - BACKGROUND
 - METHOD
- **IP SCREEN DUMP WITH VECTORS ADDED**
 - SHOW PROOF OF: $F_e = mg \tan \theta$
- **DATA TABLES**
- **GRAPHS**
 - TRENDLINES
 - SLOPE ANALYSIS FOR LINEAR GRAPHS
- **CONCLUSION**