



NANYANG GIRLS' HIGH SCHOOL

2009 Sec 4 Physics Enrichment Worksheet ()

Static Electricity

Name: _____ ()

Class: 4/ _____

Date: _____

1. Textbook: Physics Insights ('O' Level 2nd edn.)

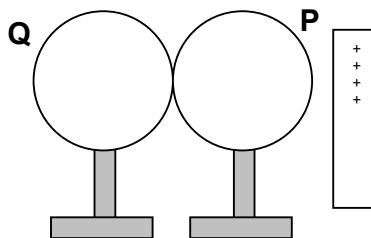
Critical Thinking (page 295)

Question 3 Tick the correct column and state your reasoning.

Ball	Positively charged	Uncharged	Negatively charged	State your reasoning
2				
3				
4				
5				
6				

Structured Questions (page 294)

Question 2



(a) Refer pages 285 and 286 on Conductors and Insulators.

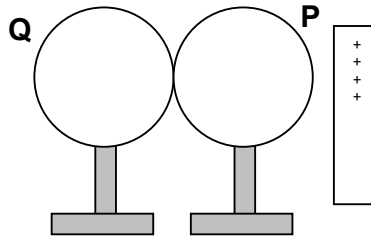
(b)

Sketch on the above diagram the distribution of charges on **P** and **Q**.

Question 2

(c) _____

(d) *Hint: consider use of earthing and use the diagram below to help with your answer.*



(e) _____

Question 3

(a) _____

(b) _____

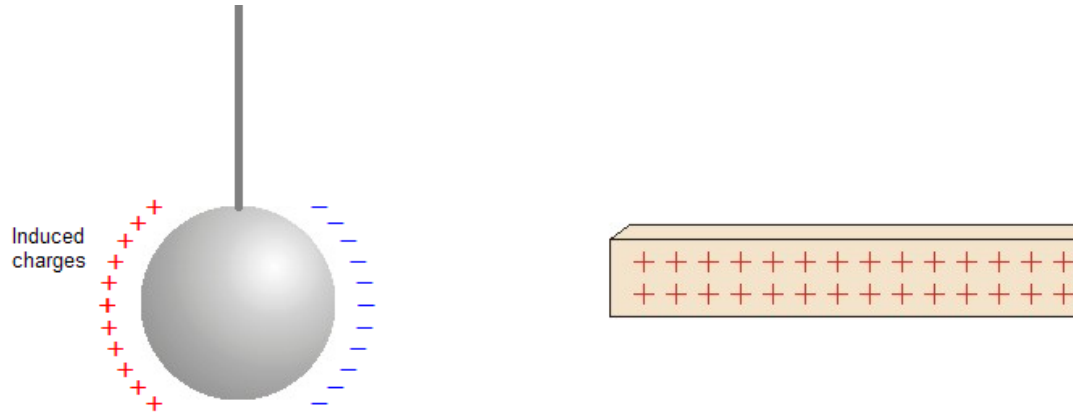
(c) _____

2. Attraction of uncharged objects

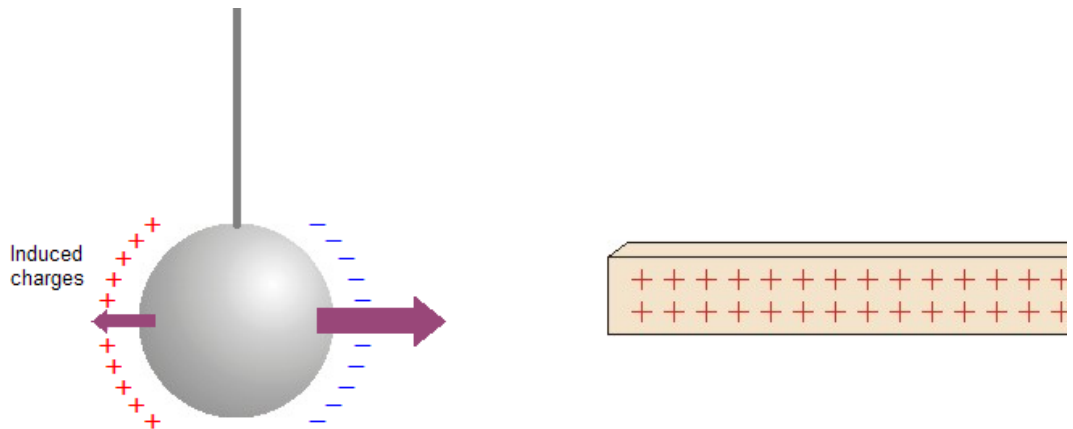
Adapted from Oxford University Press (China) Ltd / New Physics At Work Series / Simulation Program

A. Uncharged conducting object

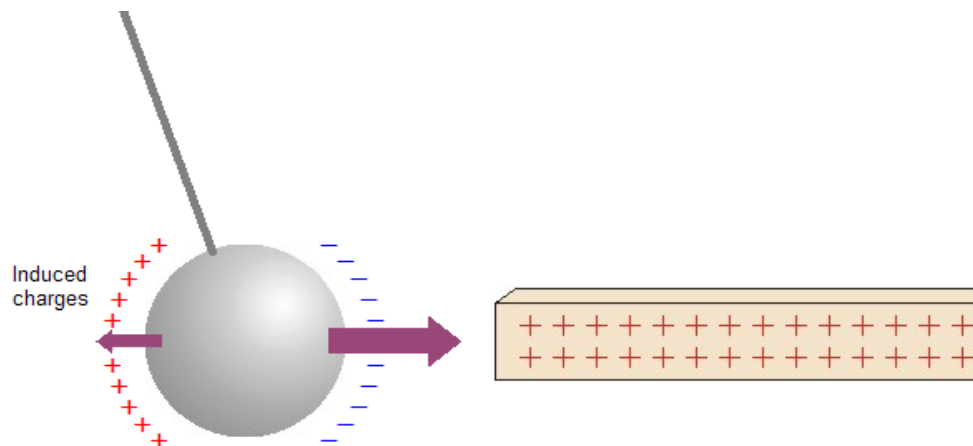
A1. A **positively charged** rod is brought near an **uncharged conducting sphere**.



Electrons on the uncharged sphere are pulled towards the +ve charged rod. The right side of the sphere becomes -ve (with surplus of electrons) and the left side +ve (with deficit of electrons).

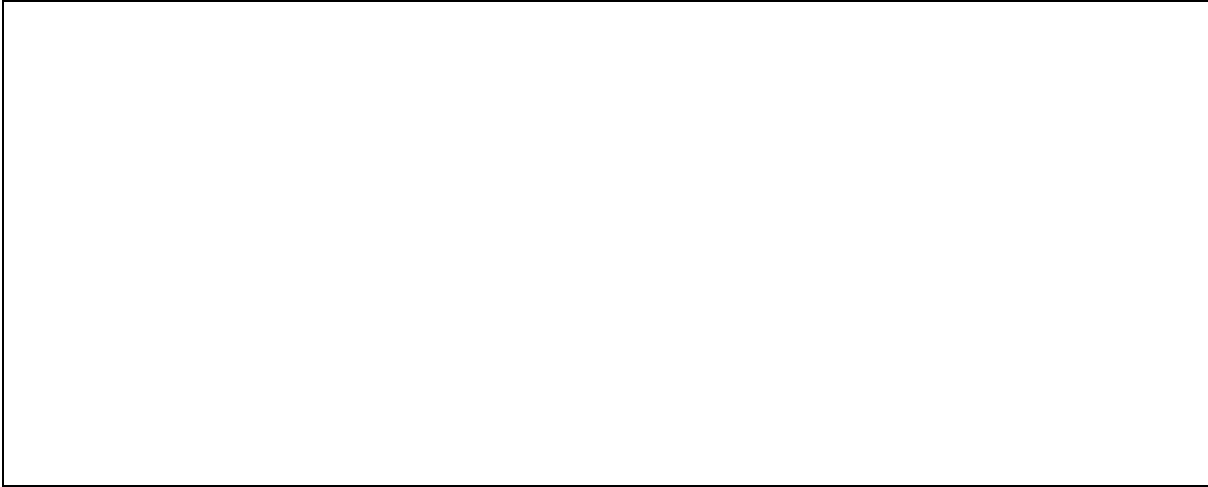


The rod attracts the right side of the sphere with a larger force and repels the left side with a smaller force (since the right side is closer).



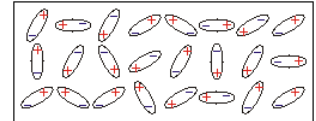
The sphere is attracted towards the rod with a net force.

A2. A **negatively charged** rod is brought near an **uncharged conducting** sphere.
Describe, with the help of a clear sketch diagram, how the sphere is attracted by the rod.

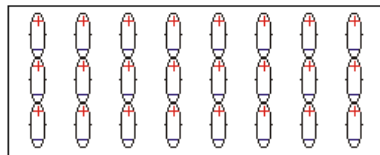


B. Uncharged non-conducting object

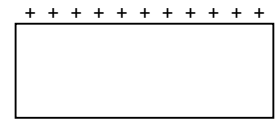
B1. A **negatively charged rod** is brought near an **uncharged non-conducting object**.



Because of the -ve charged rod, the atoms on the object are aligned with their +ve charges towards the rod and the -ve charges away from the rod.

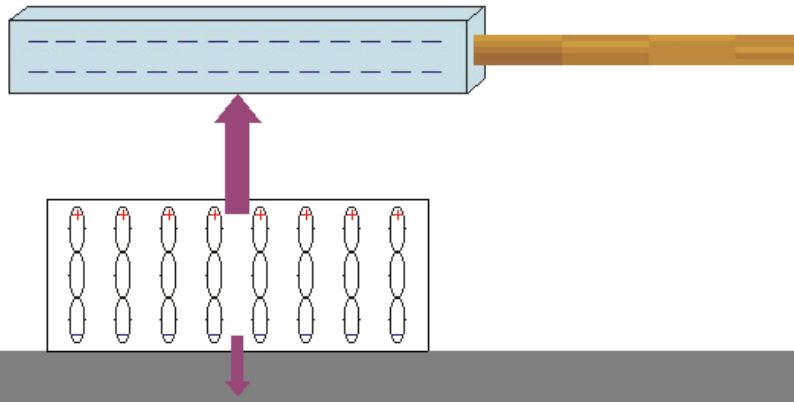


Simplify diagram to



in words: opposite charges are induced on top and bottom of the object

The rod attracts the +ve side and repels the -ve side, with attraction greater than repulsion (+ve side are closer to the rod).

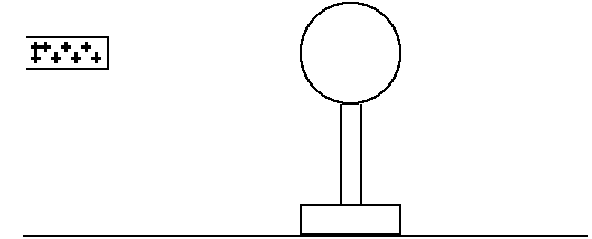
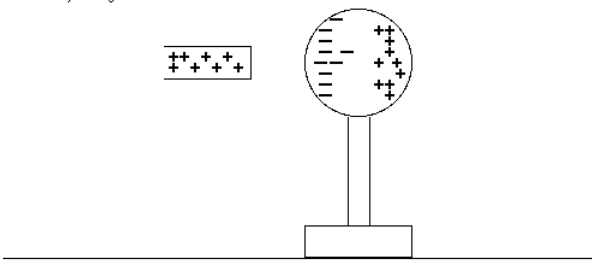
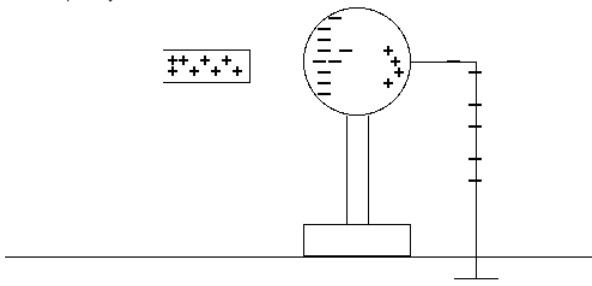
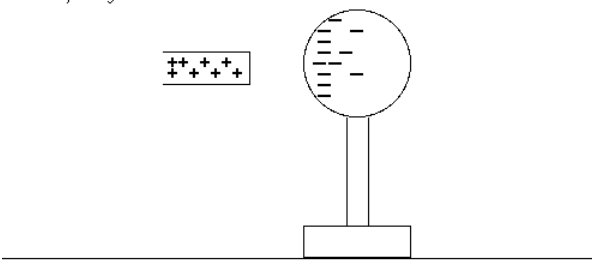
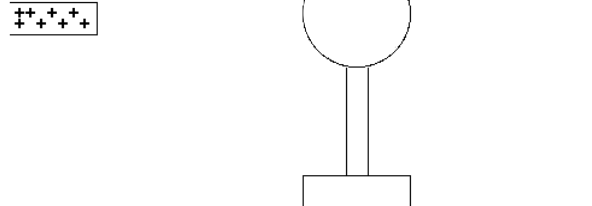


B2. A **positively charged rod** is brought near an **uncharged non-conducting object**. Describe with a clear sketch diagram how the object is attracted by the rod.



3. Charging of conducting objects

Adapted from induction_anim.gif

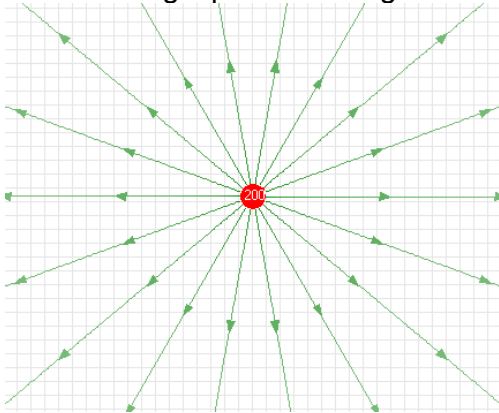
Stages in the charging process	Description
<p style="text-align: center;">Insulated sphere</p> <p>Positively charged rod</p> 	
<p style="text-align: center;">Insulated sphere</p> <p>Positively charged rod</p> 	
<p style="text-align: center;">Insulated sphere</p> <p>Positively charged rod</p> 	
<p style="text-align: center;">Insulated sphere</p> <p>Positively charged rod</p> 	
<p style="text-align: center;">Insulated sphere</p> <p>Positively charged rod</p> 	<p><i>[Draw the charges on the sphere]</i></p>

4. Electric field patterns

Created using Electric field.exe 2.01 from <http://www.physics-software.com/software.html>

Draw the corresponding electric field pattern

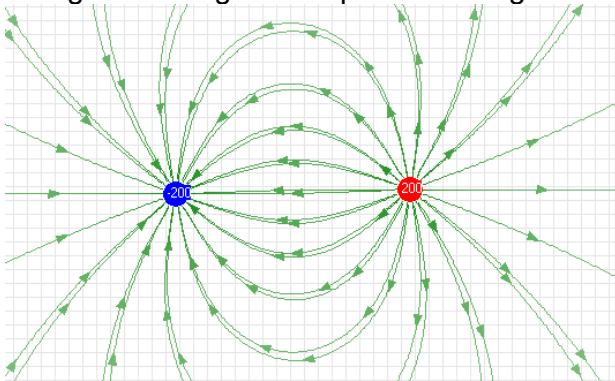
A single positive charge



A single negative charge



A negative charge and a positive charge

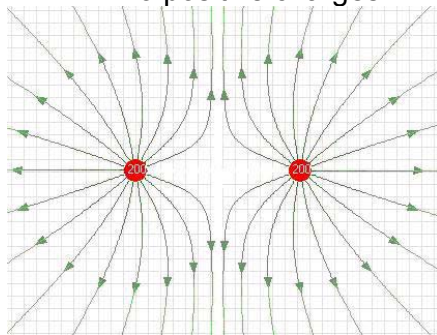


A positive charge and a negative charge



Note: Ignore one of the "double" lines which are very close together!

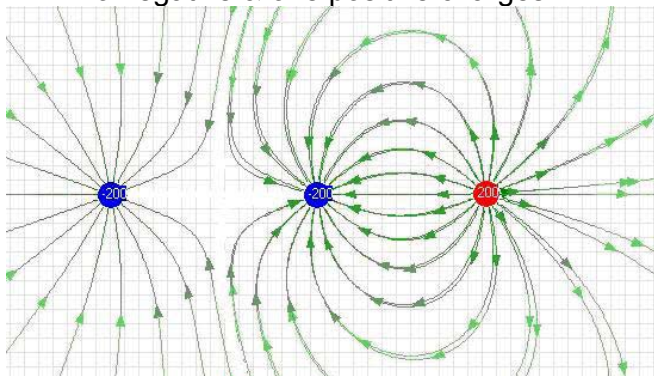
Two positive charges



Two negative charges



Two negative & one positive charges



Two positive & one negative charges

