

Physics 3204
Assignment 1: Electrostatics

Name: _____

- 1 What causes an object to obtain a positive charge?
A gain of electrons B gain of protons
C loss of electrons D loss of protons

- 2 When a glass rod is rubbed with silk, why does the rod takes on a positive charge?
A electrons flow out of the glass to the ground.
B electrons move from the glass to the silk.
C protons move from the glass to the silk.
D protons move from the silk to the glass.

- 3 A balloon becomes charged when it is rubbed on one's hair. Why does the balloon attract to a neutral wall?
A The balloon induces a charge separation in the wall.
B The polar molecules of the wall charges a redistribution of charges.
C The wall becomes charged.
D Rubbing the balloon results in a charge separation in the balloon.

- 4 What movement is induced if a positively charged rod is brought near but does not touch a neutral object?
A negative charges in the object move away from the rod.
B negative charges in the object move toward the rod.
C positive charges in the object move away from the rod.
D positive charges in the object move toward the rod

- 5 Why does a positively charged pith ball P attract a neutral pith ball?
A exchange of charge from the neutral to the positive object.
B exchange of charge from the positive to the neutral object.
C redistribution of charge in the neutral object.
D redistribution of charge in the positive object.

- 6 Three rods, X, Y, and Z are charged by friction. Rod X attracts rod Y, but repels rod Z. What are the signs of the charges on each of these rods?

	rod X	rod Y	rod Z
A	negative	negative	negative
B	negative	negative	positive
C	negative	positive	negative
D	negative	positive	positive

- 7 Which operation will place a residual negative charge on a piece of copper pipe?
A Hold the rod in your hand and allow it to touch a negatively charged piece of plastic.
B Hold the rod in your hand close to, but not touching, a positively charged piece of glass.
C Place the rod on a piece of wood and touch it with a negatively charged piece of cat fur.
D Place the rod on a piece of wood and rub it vigorously with a neutral piece of cat fur.

- 8 Two pith balls, A and B, are brought near one another and found to attract. When a positively charged rod is brought near ball B, the ball is repelled. What can be concluded about ball A?
A It can only be negatively charged.
B It can only be positively charged.
C It may be negative or neutral.
D It may be positive or neutral.

- 9 What is an electroscope used for?
A change the direction of electric current.
B detect the presence of electric charge.
C measure the potential difference between two points.
D regulate the flow of electric current.

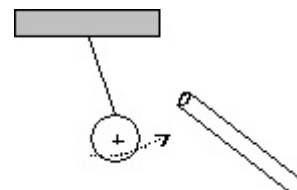
- 10 A glass rod is rubbed with silk and a paraffin wax rod is rubbed with fur. Use the electrostatic series table shown at the right to determine what happens when the two rods are suspended approximately 1.0 cm apart.

- A Nothing will happen.
- B The rods will attract.
- C The rods will attract and repel. On one side the rods will repel and on the other they will attract.
- D The rods will repel.

ELECTROSTATIC SERIES	
Hold On to Electrons Tightly	Gold Sulfur Brass Copper Ebonite Paraffin Wax Silk Lead
Hold on to Electrons Loosely	Fur Wool Glass

- 11 A rod is brought near a positively charged Styrofoam ball. If the ball is attracted to the rod, which conclusion is best?

- A The rod is positively charged.
- B The rod is neutral.
- C The rod is either negatively charged or neutral.
- D The rod is negatively charged.

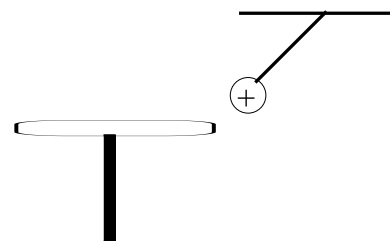


- 12 When a negatively charged rod approaches, but does not touch a neutral electroscope, the leaves separate. What is the charge on the leaves?

- A negative
- B neutral
- C positive
- D not known

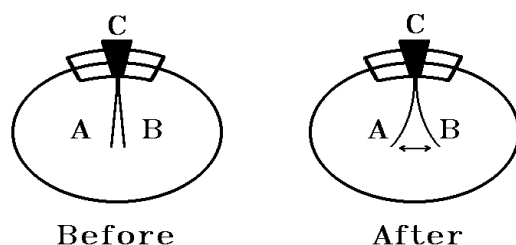
- 13 A positively charged pith ball is suspended by an insulating thread. A neutral conducting rod on an insulating stand is brought toward the pith ball as shown. What will happen if the pith ball touches the rod?

- A The net charge on the rod will be zero, but the near end will become negative and the far end positive.
- B The net charge on the rod will be zero, but the near end will become positive and the far end negative.
- C The rod will become negatively charged.
- D The rod will become positively charged.



- 14 The diagram below shows an electroscope with a metal knob C on top. The two metal leaves, A and B, move apart as shown when a positively charged rod is brought near but does not touch the knob C. The charge on leaves A and B after they separate is

- A negative
- B positive
- C neutral
- D not known from the information

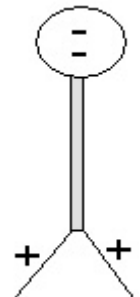


- 15 What will happen when a negatively charged rod approaches a grounded electroscope?

- A Electrons will flow from the ground to the knob
- B Electrons will flow from the knob to the ground
- C Protons will flow from the ground to the knob
- D Protons will flow from the knob to the ground

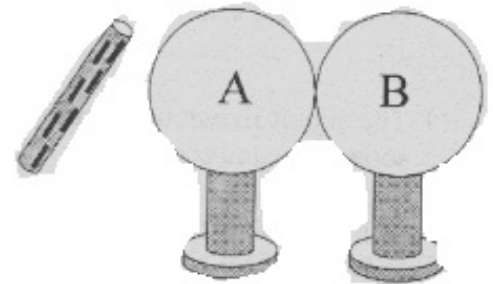
- 16 A negatively charged rod is brought close to, but not touching, an electroscope that already had an unknown residual charge. If the leaves on the electroscope fall closer together as the rod approaches it, which of the following is true?
- A The residual charge on the electroscope is positive.
 - B The residual charge on the electroscope is negative.
 - C The electroscope was originally positively charged, however the rod caused it to become negative.
 - D The situation described above is impossible. Leaves on an electroscope must always spread farther apart when a charged object is brought near.

- 17 An electroscope is charged as shown at the left. Which of the following best explains how it got that way.



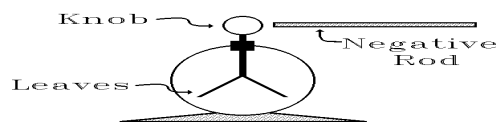
- A A negatively charged rod was touched to the electroscope.
- B A positively charged rod was touched to the electroscope.
- C A negatively charged rod is close to, but not touching the ball of the electroscope.
- D A positively charged rod is close to but not touching the ball of the electroscope.

- 18 A negatively charged rod is brought close to two insulated metal spheres, which are touching at first. While the rod is held close to, but not touching sphere A, sphere B is moved away. What will happen as a result?



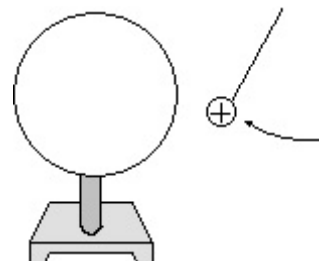
- A Both spheres will be negative.
- B Both spheres will be positive.
- C Sphere A will be positive and sphere B will be negative.
- D Sphere A will be negative. and sphere B will be positive.

- 19 When the negatively charged rod is close to the knob of a grounded electroscope, and the ground is then removed, the electroscope is



- A negative on both the knob and the leaves.
- B negative on the knob and positive on the leaves.
- C positive on both the knob and the leaves.
- D positive on the knob and negative on the leaves.

- 20 The figure shows a metal sphere on an insulating stand. It attracts a positively charged Styrofoam ball which is not allowed to touch the metal sphere. The ball is kept close to, but not touching the metal sphere and the sphere is grounded. After the ground is removed, the ball is still attracted. Which of the following deductions is valid?

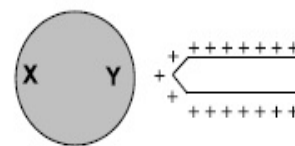


- A The ball on the stand was originally negative.
- B The ball on the stand was originally neutral
- C Both (a) and (b) can be correct.
- D Neither (a) nor (b) can be correct.

- 21 What happens to a grounded object when it is charged by induction with a positively charged rod?
- A Gains electrons from the rod.
 - B Gains electrons from the ground.
 - C Loses electrons from the rod.
 - D Loses electrons from the ground.

- 22 The diagram below shows a positively charged rod placed near, but not touching, a neutral metal ball. Which best describes what happens to the sides of the ball?

- A X becomes negative and the ball is repelled from the rod.
- B X becomes positive and the ball is attracted to the rod.
- C Y becomes negative and the ball is repelled from the rod.
- D Y becomes positive and the ball is attracted to the rod.

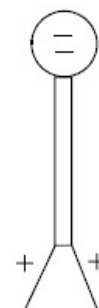


- 23 Which describes a neutral electroscope after it is briefly touched with a positively charged rod?

- A Top of electroscope negative, bottom of electroscope negative.
- B Top of electroscope negative, bottom of electroscope positive.
- C Top of electroscope positive, bottom of electroscope positive.
- D Top of electroscope positive, bottom of electroscope negative.

- 24 Which best explains the charge distribution on the electroscope below?

- A A negatively charged rod is close to, but not touching, the ball of the electroscope.
- B A negatively charged rod has touched the ball of the electroscope.
- C A positively charged rod is close to, but not touching, the ball of the electroscope.
- D A positively charged rod has touched the ball of the electroscope.



- 25 An electroscope is initially observed to have the leaves spread apart. A positively charged rod is brought close to, but not touching, the electroscope. As this happens, the leaves are observed to fall. What can be said about the electroscope?

- A It is negatively charged.
- B It is positively charged.
- C It was negatively charged but is now neutral.
- D It was positively charged but is now neutral.

- 26 How are electrical and gravitational forces similar?

- A both act over long distances.
- B both are caused by moving charged particles.
- C both can be either attractive or repulsive.
- D both follow an inverse square law.

- 27 Which of the following is **not true** regarding the electric forces between charged objects?

- A It can be either attractive or repulsive.
- B It can not travel through a vacuum.
- C It gets weaker as the charges are decreased.
- D It gets stronger as the separation is decreased.

- 28 Where will the charge distribution be more concentrated?

- A On a flat surface
- B On a sphere
- C On a pointed surface
- D On the inside of a conductor

- 29 Electric arc welders generate intense heat by creating a large spark. To do this the tip of the device needs to be able to discharge a large current across an air gap. With this in mind, what design would make a good tip for an arc welding device?

- A A rough tip with lots of surface area.
- B A sharp pointed tip.
- C A smooth oval tip.
- D A smooth spherical tip.

- 30 A charge is placed on an oval hollow metal sphere. Which of the following best describes the distribution of charge?

- A It is greatest on the sides.
- B It is greatest on the smaller ends.
- C It is the same outside as inside.
- D It is uniformly distributed

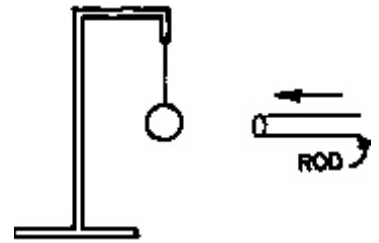
- 31 Even though we accept that there are two types of charge, positive and negative, it is generally accepted that all charge is caused by the movement of one particle. Explain how the movement of one charge can cause two different charges. How is it that only one particle is believed to move?
- 32 A ping pong ball is sitting on a table and you wish to know if there is a charge on it. Are the following tests equally good or is one better than the other? Explain.
- TEST 1: You bring a positively charged rod near the ball and the ball moves toward the rod.
- TEST 2: You bring a negatively charged near the ball and the ball moves away from the rod.

- 33 One way to create a charge imbalance is through friction. Briefly explain how friction can cause such an imbalance. Why can't friction be used to place a charge on conductors?

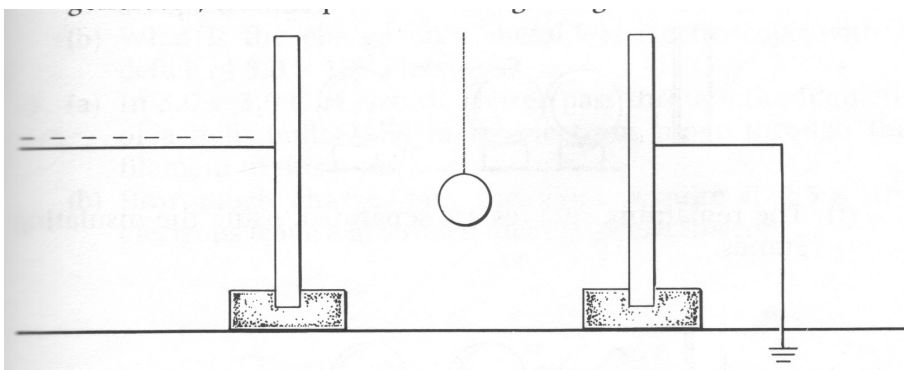
- 34 Explain why Mrs. Kelly receives a shock when she slides down a plastic sliding board in her wool tights and then touches the metal railing. Would she get a shock if the slide was metallic? Why or why not?



- 35 A small neutral pith ball is suspended from a thread and a charged acetate rod is brought near. Using a series of diagrams, explain what happens.



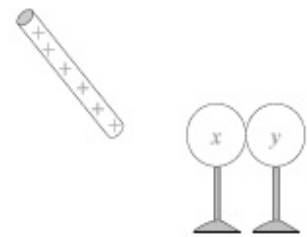
- 36 A neutral pith ball is lowered by a long insulated string between two metal plates on insulated stands, as shown. The plate on the left is connected to the negative terminal of an electrostatic generator, and the plate on the right is grounded.



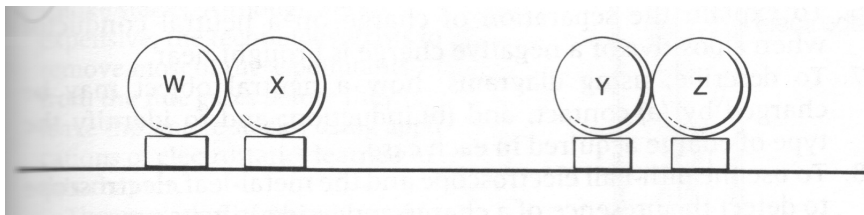
Predict the behaviour of the pith ball and explain your prediction by drawing the diagrams(minimum of 3) and showing the charge distribution on each.

- 37 If a negatively charged rod is brought near the knob of a positively charged leaf electroscope, what happens? Why? Use diagrams to help show what happens.

- 39 The diagram below shows a positively charged glass rod and two neutral metal spheres, x, and y, in contact and on insulating stands. Describe how you could cause one sphere to obtain a residual negative charge and the other a residual positive charge, without touching either sphere with the glass rod.

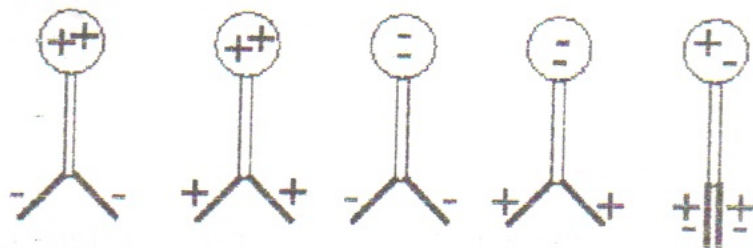


- 40 Four neutral metal spheres W, X, Y, and Z are located as shown:



A negatively charged plastic strip is inserted between X and Y. While it is held there, sphere W is moved to the left away from X and sphere Z is moved to the right away from Y. The charged plastic strip is then removed. What charge will be found on each of the spheres? Explain using a series of 4 diagrams.

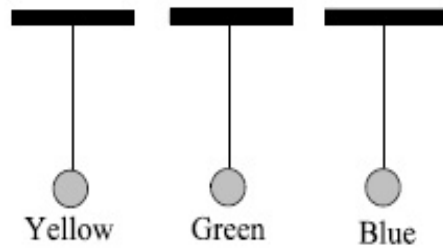
- 41 The pictures show 5 charged electroscopes. Match each of the statements below the pictures with the appropriate electroscope.



- _____ 1. A positively charged rod is brought near, but not touching an uncharged electroscope.
- _____ 2. A glass rod is charged positively by rubbing it with silk. The silk is touched to an initially neutral electroscope.
- _____ 3. A positive rod is brought near a neutral electroscope, and the electroscope is given a residual charge by induction.
- _____ 4. The electroscope is charged by conduction with a positive rod.
- _____ 5. A negatively charged rod is brought near a neutral electroscope.
- _____ 6. A metal rod is brought in contact with the positively-charged electroscope.

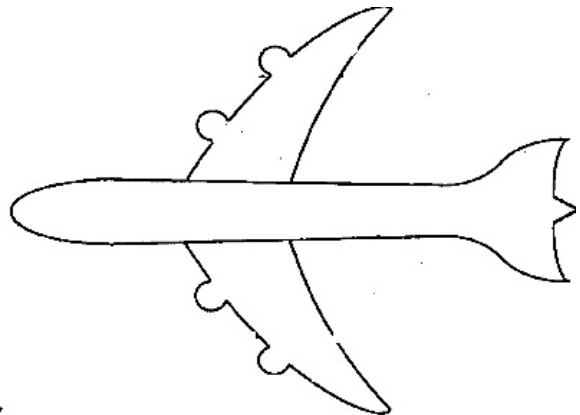
- 42 Three different pith balls are suspended by separate strings. Use the information below to determine the charges on the blue and green balls. Explain.

- The yellow ball was charged by induction using a negatively charged rod.
- The blue ball repels the green ball.
- The blue ball is attracted to the yellow ball.



- 43 An airplane was hit by lightning(collection of positive charge) as it was flying.

- A) Sketch the charges distribution on the plane in the diagram provided.



- B) Would the passengers inside get injured? Why or why not?

- 44 In the winter a spark sometimes jump between a person's hand and a metal object he is about to touch. Why? Why does this occur less frequently in the summer?