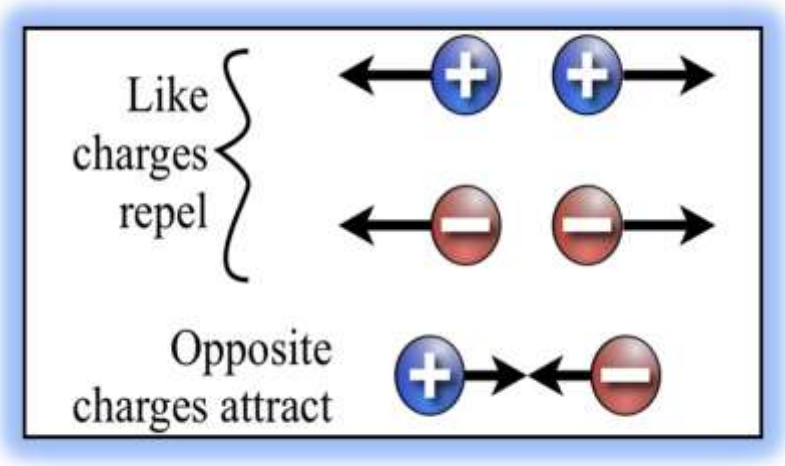
KNOWLEDGEBASE

2020

ELECTROSTATICS I



TEACHERS OF PHYSICS

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11/5/2020

1. State the law of electrostatic charge.

✓ ***Like charges repel, unlike charges attract.***

2. A small chain is often seen hanging at the back of a petrol carrying lorry. State and explain its significance.

✓ ***Earthing, the chain expels charges from the tanks thus preventing explosion.***

3. Explain why a dressing table mirror may become dusty if wiped with a cloth on a warm day.

✓ ***While wiping, the mirror becomes charged thus attracting dust which is oppositely charged.***

4. A polythene rod may be charged by rubbing it with a cloth while being held in the hand but a metal rod cannot be charged in a similar way. **Explain** why.

✓ ***The metal rod held in the hand is earthed thus charges on rod are always neutralized.***

5. Explain why a rubber balloon, if rubbed will often stick to the wall where it has been rubbed.

✓ ***The balloon gets charged opposite to the wall where its rubbed thus getting attracted to the wall as expected by the law of charges.***

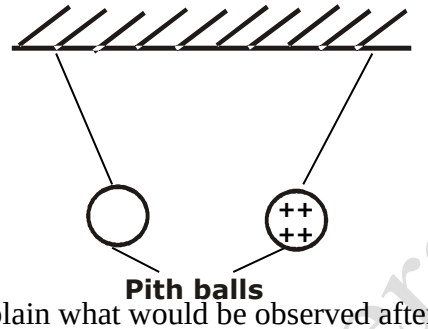
6. On a dusty day, clean polished shoes attract a lot of dust. Explain this.

✓ ***Clean polished shoes get charged during polishing, the charge acquired is opposite to that possessed by the dust particles thus the dust is attracted.***

7. State the precaution that is taken when charging a metal object.

✓ ***The metal should not be held by bare hands to prevent earthing.***

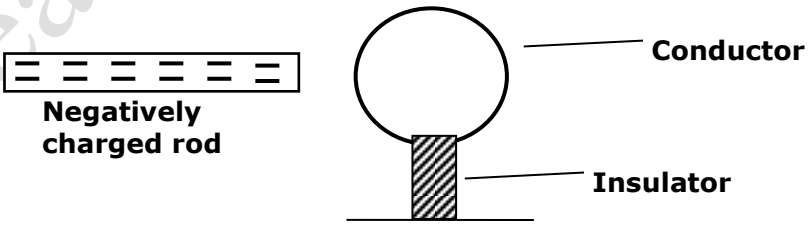
8. The figure below shows an uncharged pith ball under the attraction of a charged ball.



State and explain what would be observed after the two pith ball touch.

✓ ***The balls will repel because the other ball gets charged by contact thus acquire similar charge.***

9. The figure below shows a negatively charged rod placed near an uncharged conductor resting on an insulation support.



a) Show the charge distribution on the conductor.

✓ ***The positive charges will move towards the rod and the negative would move away from the rod to the extreme end.***

b) State the effect

I) Of momentarily touching the conductor with a finger while the charged rod is still near the conductor.

✓ **The conductor is earthed.**

II) On the charge distribution of withdrawing the negatively charged rod after momentarily touching the conductor.

✓ ***The positive charges will be distributed uniformly throughout the conductor.***

10. A sharp point of a pin is held in the bare hands and brought near the cap of a positive charged electroscope. **State** and **explain** the observation made on the electroscope.

- ✓ ***The divergence decreases because the metal pin attracts the positive charge in the cap reducing the divergence in the leaf.***

11. State two uses of a gold leaf electroscope

- ✓ ***Test presence of charges***
- ✓ ***Test type of charges.***
- ✓ ***Test the amount of charges***

12. A plastic rod is rubbed with cotton and it is observed that the rod acquires a negative charge. The same cotton is brought near the cap of positively charged electroscope.

(i) State the observation made on the leaf of the electroscope.

- ✓ ***The leaf divergence increases.***

(ii) Explain the observation

- ✓ ***Cotton acquires positive charges which repel positive charges in the cap increasing the divergence of the leaf.***

13. State the observation on the leaf of a positively charged electroscope when a negative charge is brought near it.

- ✓ ***The leaf divergence first reduces then increases as the rod comes closer.***

14. You are provided with a polythene rod, an Electroscope, two bars; one a conductor and another one an insulator. **Briefly describe** how you will use the electroscope to determine which one is an insulator.

- ✓ ***Use the polythene rod to charge the electroscope by induction.***
- ✓ ***Bring both bars near the cap of the electroscope in turns. Make the observations.***
- ✓ ***The one that makes the divergence of the leaf to charge is the conductor while the other is an insulator.***

15. You are provided with a charged electroscope, an insulator and a conductor. Describe how you would use these apparatus to distinguish the insulator from the conductor.

- ✓ ***If an insulator is brought near the cap of the electroscope there's no effect on the divergence of the leaf. But when a conductor is brought near the cap of an electroscope the leaf divergence charges.***

16. Why is it safer to carry explosive fuels in metal cans instead of plastic can?

- ✓ ***Metal tanks can be earthed thus discharging preventing explosion, the plastic tank would insulate thus leading to build up of charges that can lead to explosions.***

17. An uncharged metal rod brought close to but not touching the cap of a charged electroscope caused decrease in the divergence of the leaf. Explain this observation.

- ✓ ***Uncharged metal rod has both protons and electrons in equal proportions, thus when moved closer to charged electroscope cap, the opposite charged in the rod and cap attract thus moving the charge up in the cap making the plate and leaf momentarily neutral thus the leaf falls.***

18. A positively charged rod is brought near the cap of a lightly charged electroscope. The leaf divergence first reduces and as the rod comes nearer, it diverges more. State and explain the charge on the electroscope.

- ✓ ***The strong postive rod attracts the electrons from the plate and the leaf making the electroscope neutral. On moving it much closer the divergence increase because the strong postive charges attract more electrons from the leaf and plate making them more positive***

19. A negatively charged rod is brought near the cap of a lightly charged electroscope. The leaf divergence first reduces but as the rod comes nearer, it diverges more.

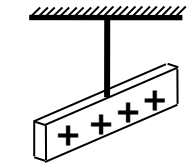
(i) State the charge of the electroscope.

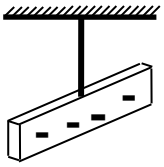
- ✓ ***Positively charged.***

(ii) Explain the behaviour of the leaf above.

✓ ***The strong negative rod attracts the protons from the plate and the leaf making the electroscope neutral. On moving it much closer the divergence increase because the strong negative charges attract more protons from the leaf and plate making them more positive.***

20. The diagram shows a positively charged acetate strip and a negatively charged polythene strip that are freely suspended.



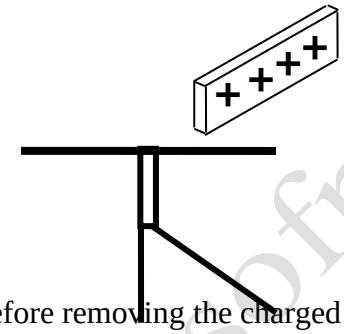


Two rods **X** and **Y** are brought up in turn to these two strips. Rod **X** attracts the acetate strip but repels the polythene strip. Rod **Y** does not repel either the acetate strip or the polythene strip. State the type of charge is on each rod. (2mk)

✓ ***Rod X is positively charged.***

✓ ***Rod Y is not charged.***

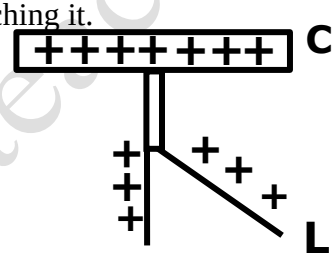
21. The figure below shows a charged rod held close to the cap of an uncharged leaf electroscope.



If the cap is momentarily earthed before removing the charged rod, what charge is left on the electroscope?

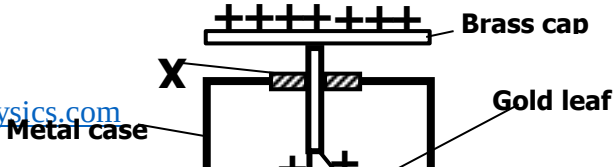
✓ ***negative charge because that's charging by induction.***

22. A gold leaf electroscope is positively changed as shown in the figure below where **C** is the cap and **L** is the gold leaf. State and explain what happens to **L** when a negatively charged rod is brought near **C** without touching it.



✓ ***The divergence of L reduces because the +ve charge in the leaf are attracted to the cap buy –ve charge in the rod.***

23. The diagram below shows a gold leaf electroscope which is positively charged. A charged polythene rod is brought near the brass cap.



i) Explain briefly how the electroscope was charged using negatively charged rod.

✓ ***Charged by induction. A positive charged rod was brought close but not touching the electroscope.***
✓ ***The with the charged in position the electroscope was earthed, the earth connection was removed then the charged rod was removed.***

ii) Suggest a suitable material of the part labeled **X**.

✓ ***plastic or rubber (insulator)***

ii) What is the function of part**?**

✓ ***Earth connection, earthing charges to and from the earth.***

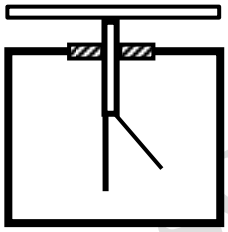
iii) Why does the electroscope fall when the polythene rod is brought near it.

✓ ***The polythene rod is negatively charged thus attracts the positive charge up to cap leading to the collapse of the leaf.***

v) How could you make the leaf fall and stay down.

✓ ***Earthing-touching the cap with a figure.***

24. Figure below shows a charged leaf electroscope.



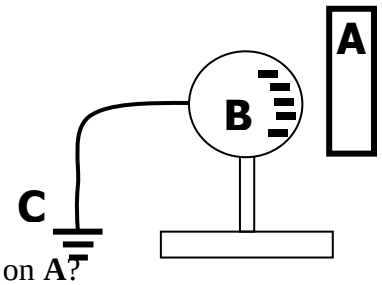
(i) Given a dry glass rod and a silk cloth, **explain** how you would determine the type of charge on the electroscope.

✓ ***Charge the glass rod positively using the silk cloth,bring it near the cap of the electroscope, if the leaf divergence decreases its negatively charged if it increases its positively charged.***

(ii) An identical but uncharged electroscope is brought near the electroscope shown above and the two connected with a conducting wire. **State** and **explain** what is observed on the leaves of the two electroscopes.

✓ ***The leaf of the second electroscope diverges because its charged by contact while the leaf of the initial electroscope remains the same.***

25. Figure represents a step in charging a material **B** negatively by induction.



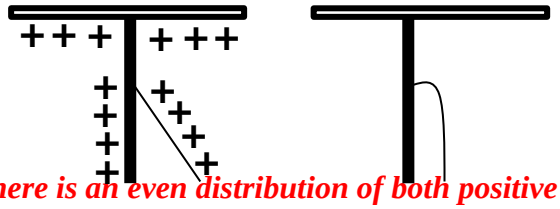
(i) What is the charge on **A**?

✓ ***Positive charge.***

(ii) Explain what happens at **C**.

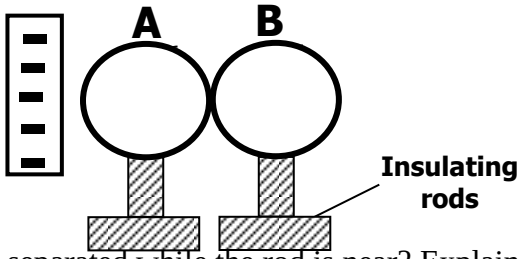
✓ ***Earthing, negative charge from the earth neutralizes the repelled positive charge.***

26. The figure below shows two identical electroscopes. The one on the right is charged but the one on the left is not. On the space besides the diagram, show the charge distribution after the caps of the two electroscopes are connected by a thin conducting wire



✓ ***There is an even distribution of both positive charge and negative charge. The charges with equal in number.***

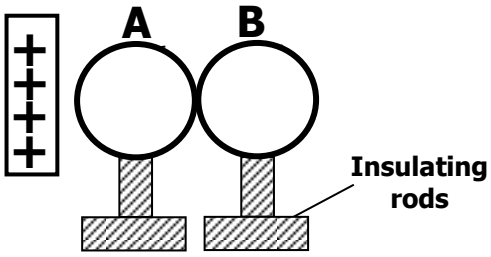
27. Two identical spheres A and B each standing on an insulating base are in contact. A negatively charged rod is brought near sphere **A** as shown below.

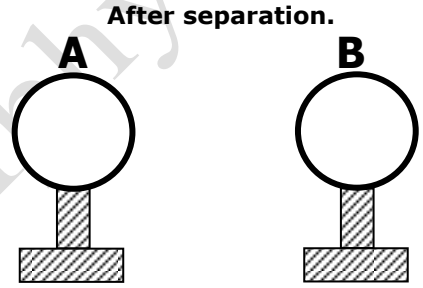


In what way will **A** differ from **B** if separated while the rod is near? Explain.

✓ ***A will be positively charged while B will be negatively charged because negative charge in A repel similar charge into B.***

28. Two metallic spheres **A, B** stand in contact as shown. A positively charged rod is held near sphere **A**.





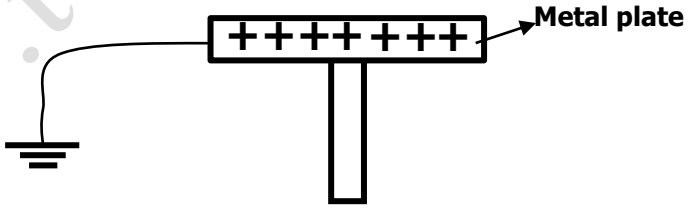
(i) Show the charge on each sphere when the metallic balls are separated and the rod is removed.

✓ ***A is negatively charged while B is positively charged.***

(ii) Why are the balls supported on insulated stands?

✓ ***To avoid discharging by losing the charge to the earth (earthing).***

29. The figure below shows a positively charged metal plate with an earthing connection. Using an arrow, show the direction of charges through the earth connection and explain the final charge of the plate. (2mk)



✓ ***From the earth to the plate.***

✓ ***The final charge is neutral because charge from earth discharges the electroscope.***

