1. An electroscope consists of neutral (uncharged) conducting material in contact with two gold leaves at the bottom (which are also conducting). A positively charged conducting rod is brought close to, but is not allowed to touch the electroscope. What is the sign of the net charge on each of the gold leaves?

A. One is negative, one is positive.
B. Both are negative.
C. Both are positive.
D. Zero because the net charge in a conductor is 0.
E. Zero because there is no contact with the conducting rod.

Explain:

2. Instead, a negatively charged rubber rod is brought near the knob of a positively charged electroscope. The result is that:

A. the electroscope leaves will move farther apart.
B. the rod will lose its charge.
C. the electroscope leaves will tend to collapse.
D. the electroscope will become discharged.
E. nothing noticeable will happen.

Explain:
3. Each of the spheres (balls) in the below diagram are made of pith (a light weight sponge like material found in some plants) and start the scenario neutrally charged. The pith balls, of mass m, are then charged, by touching them with a charged rod, such that the now each ball has the same amount of charge little q. Assume the balls are not accelerating and that \( \theta \) is a small angle.

a) Draw the Free Body Diagram for the forces acting on the ball attached to the string of length L.

b) Write the Newton’s second law expression for the sum of the forces in the x-direction.

c) Write the Newton’s second law expression for the sum of the forces in the y-direction.

![Diagram of a pendulum with a charged ball at an angle \( \theta \).](image)

\[ F_E = \frac{mg X_{ball}}{L} \]

Is that student correct? Why or why not?

Show All Work: