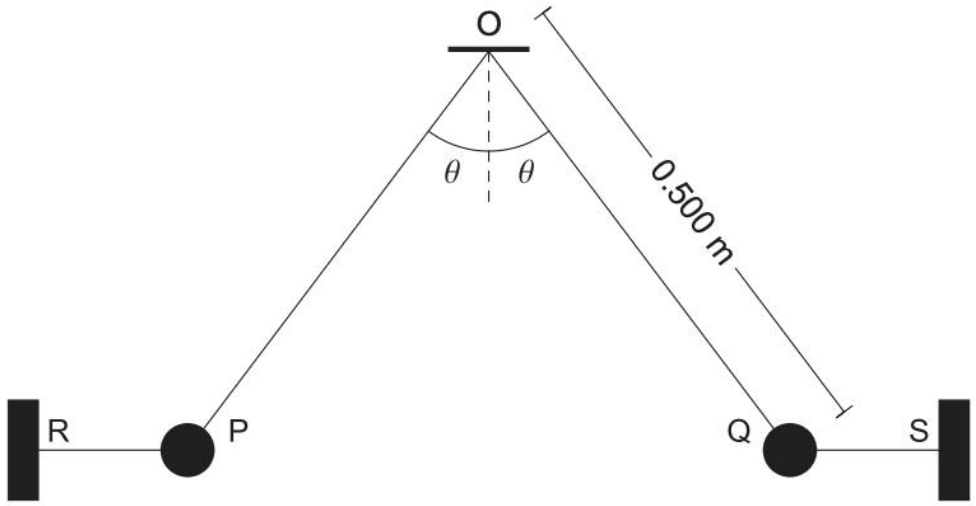
Question 13 **(16 marks)**



Two 0.650 kg metal spheres, P and Q, are each held in place by two strings, as shown in the diagram above. The strings OP and OQ are 0.500 m long. The strings RP and QS are horizontal. The angle θ is equal to 37.0°.

(a) Calculate the tension in either of the strings OP or OQ. (3 marks)

Answer: _____ N

The metal balls are now charged. P is given a charge of -3.51×10^{-5} C and Q a charge of $+2.03 \times 10^{-5}$ C.

(b) (i) Explain why the tension in strings OP and OQ does not change despite the tensions in RP and QS changing. RP and QS remain horizontal and θ remains constant. (3 marks)

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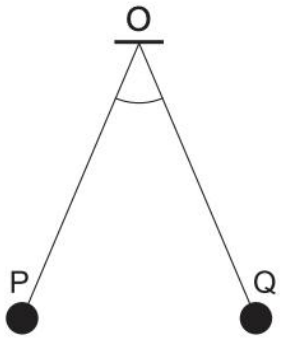
(ii) Calculate the tension in either RP or QS after the balls have been charged. The tensions are equal in magnitude. (6 marks)

Answer: _____ N

(c) The strings RP and QS are now loosened slowly and the two spheres P and Q are allowed to touch gently. After touching, they are observed to be in the position shown in the diagram below.



(i) Calculate the charge on each ball after they have touched. (2 marks)

Answer: _____ C

(ii) Describe why the balls come to rest in the position shown in the diagram above. (2 marks)

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