

Practical 2 – Topic 6

Rutherford's experiment (model)

Criteria assessed

- CE

Materials needed

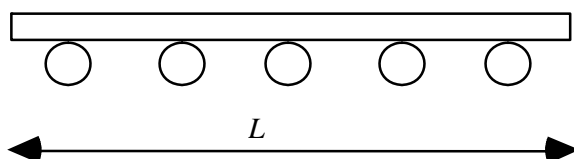
- Wooden board of length 1 m
- 500 g weights from the lab (of diameter D)
- Many marbles of the same diameter d

What to do

- Place the board on the floor and place five of the 500 g weights in front of the board at equal distances.
- Students should throw marbles at the board from a distance of about 5 m. Throw the marbles randomly at the board – do not aim at a particular point.
- Record the total number of hits and the total number of throws.
- You should have a total number of throws of at least 200.

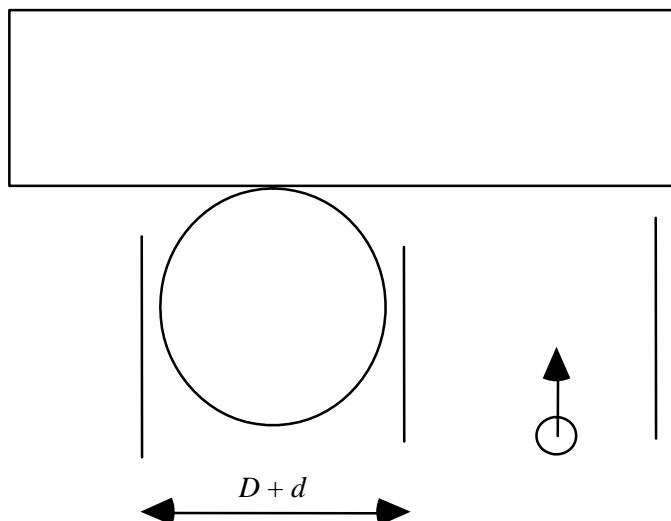
The probability of hits is: $p = \frac{\text{number of hits}}{\text{number of throws}}$

The board has five obstacles (the 500 g weights) in front of it, each of diameter D . The obstacles are equally spaced.



The marble will hit an obstacle if its centre is within a distance $D + d$ for each of the five obstacles. The marbles are to be thrown from a large distance and thus their paths are assumed to be perpendicular to the board. A throw is valid if it hits either an obstacle or the board. Throws that do neither are not to be counted.

Using the diagram below we can calculate the probability of a hit.





The probability of a hit is $p = \frac{5(D + d)}{L - d}$. In this formula L is the length of the board, which is 1 m in our case.

- Compare this with the probability you got.
- By measuring d , find D .
- Measure D and compare.

Conclusion

The important thing in this experiment is for you to answer the question:

- How can this experiment be improved in order to obtain a more accurate value for D ?