

The Physics Experiments of Robert Wichard Pohl (1884–1976)

For decades, Robert Wichard Pohl taught his famous lectures of introductory physics in the old lecture hall of the Physics Institute at Goettingen University. These lectures became the foundation for three volumes entitled „Introduction into Physics“. Now, using Professor Pohl’s original instruments in the same lecture hall in which he taught, this set of videos captures his extraordinary ingenuity and once more brings to life Pohl’s great experimental skills.



Elastic collision in slow motion

Video title: Elastic collision in slow motion

Signature: C 14824

Series title: The Physics Experiments of Robert Wichard Pohl (1884-1976)

Abstract: To demonstrate the elastic collision between two bodies in slow motion through the proper choice of the experimental conditions. (Note that a collision is called elastic if the total kinetic energy before and after the collision remains unchanged, i.e. none of it is converted into other forms, like heat.) It will be shown that during the collision the kinetic energy is briefly converted into potential energy and then back into kinetic energy.

Source: Pohl's Einführung in die Physik - Mechanik, Akustik und Wärmelehre. Lüders, Klaus; Pohl, Robert Otto (Hrsg.) 19. Aufl., 2005, Springer Berlin Heidelberg New York; p. 54

Key words: Mechanics, elastic collision, momentum, conservation of momentum

Goal of the experiment: To demonstrate the elastic collision between two bodies in slow motion through the proper choice of the experimental conditions. (Note that a collision is called elastic if the total kinetic energy before and after the collision remains unchanged, i.e. none of it is converted into other forms, like heat.) It will be shown that during the collision the kinetic energy is briefly converted into potential energy and then back into kinetic energy.

Experimental setup: Two flat carts face each other on a level floor, both carrying large buffers with springs. The experimenters kneel on the carts so that they can propel themselves by reaching to the floor. The loaded carts have identical masses (note the 25 kg weight on one of them to compensate for the different masses of the experimenters). Think of two railroad cars which are about to collide.

Experiment: One cart is at rest in the middle of the lecture hall, the other approaches head-on from the side with a constant velocity. During the collision, both buffer springs deform, the moving cart comes to rest, while the other cart begins to move. After the collision, the momentum has been completely exchanged, from the one cart to the other. The experiment is repeated by changing the roles of the carts.

The slow collision, achieved through the proper choice of masses and spring constants, demonstrates clearly the transformation from kinetic to potential energy, and back again, as is characteristic for elastic collisions. This experiment also demonstrates the conservation of momentum (see also exps. C 14822, C 14823). Because of the equal masses used in this experiment, the momentum is completely transferred between the two colliding objects.

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