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$1.00

Instruction Sheet for the PASCO Model SF-8563

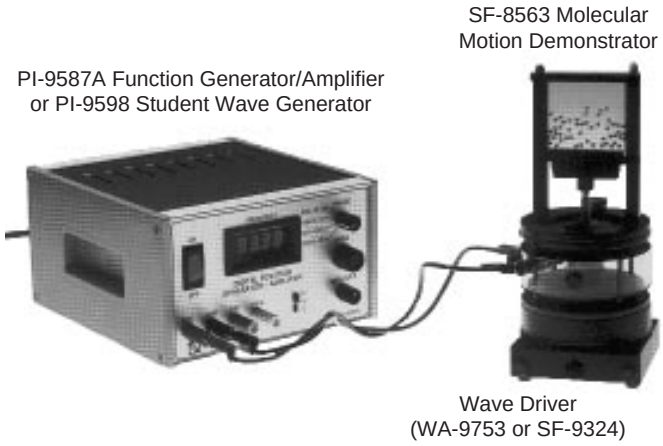
Molecular Motion Demonstrator

Introduction

The PASCO Model SF-8563 Molecular Motion Demonstrator is used to model the behavior of gas molecules in a closed container. The molecules of the gas are represented by fifty-one steel ball bearings. In the kinetic theory of gasses, as a gas is heated, the random kinetic energy of the molecules increases, increasing the pressure of the gas on the sides of the container. In this demonstration, kinetic energy is imparted to the ball bearings by a vibrating plunger which fits into a slot in the bottom of the container.

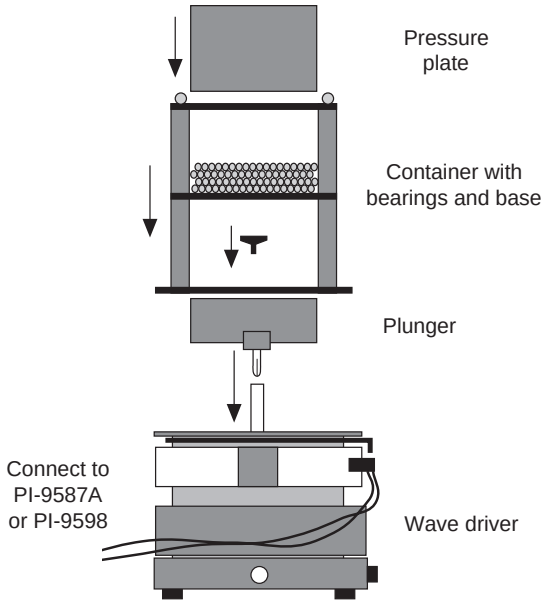
Operation

> ➤ **Note:**
> The SF-8563 Molecular Motion Demonstrator is designed to be used with a wave driver. The wave driver must be powered by a function generator capable of delivering at least 0.5 A of current into an 8 Ω load. (We recommend the PASCO Model PI-9587A Function Generator/ Amplifier or PI-9598 Student Wave Generator.)



① Set up the Molecular Motion Demonstrator as shown below, but leave the pressure plate out for now.

The banana plug connector on the plunger mates with the drive arm of the wave driver. The base of the ball bearing container then mounts to the top of the wave driver using the thumbscrews to hold it in place. The plunger slides through the slot in the



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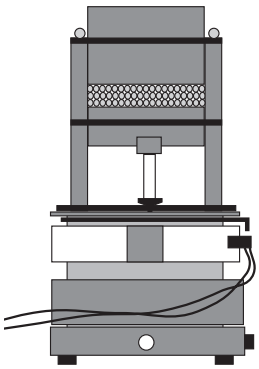
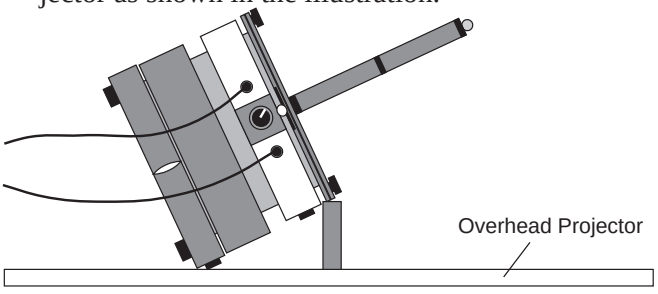
bottom of the glass-walled container.

② Connect the function generator to the wave driver. Start with minimum amplitude and low frequency (a few Hertz) vibrations. Vary the amplitude and/or frequency of the vibrations and observe the effects on the ball bearings. As the energy transfer to the ball bearings increases, the motion of the bearings increases. Your students can get a sense for how a solid substance, when heated, goes through phase transformations, first to a liquid state, then to a gaseous state. They can also note how the bearing density varies with altitude, much as the density of atmosphere varies with altitude.

③ Now slide the pressure plate into the slot in the top of the container as shown. Vary the amplitude and/or frequency of the vibrations. Your students can see how the pressure exerted by the bearings increases with increasing kinetic energy. They can also see how increasing the kinetic energy of the bearings (heating up in a gas) can cause work to be performed on the pressure plate, as heating a gas can cause a piston to rise in a heat engine.



④ You can use an overhead projector to help your students see the demonstration more easily. Just tilt the Molecular Motion Demonstrator over the projector as shown in the illustration.



Limited Warranty

PASCO scientific warrants this product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. PASCO will repair or replace, at its option, any part of the product which is deemed to be defective in material or workmanship. This warranty does not cover damage to the product caused by abuse or improper use. Determination of whether a product failure is the result of a manufacturing defect or improper use by the customer shall be made solely by PASCO scientific. Responsibility for the return of equipment for warranty repair belongs to the customer. Equipment must be properly packed to prevent damage and shipped postage or freight prepaid. (Damage caused by improper packing of the equipment for return shipment will not be covered by the warranty.) Shipping costs for returning the equipment, after repair, will be paid by PASCO scientific.