

7.3 Fire Syringe

Subjects: Thermodynamics, combustion, work, Ideal gas law

Description: When a volume of confined gas is rapidly compressed, enough heat is produced to initiate the combustion of flammable materials.

Materials:

Fire syringe

Material to ignite:

match head

paper towel or tissue

cotton or gun cotton

Procedure:

Note: You may want to use a demo camera as the flame is brief and small inside the tube

1. Place the material to be ignited at bottom of tube chamber.
2. Attach the piston and screw the cap on firmly.
3. Compress the plunger rapidly and forcefully in order to ignite the material.
4. Repeat if necessary.

Discussion:

The sudden increase in air pressure increases the temperature enough to ignite the material. Use this as part of a discussion of the Ideal gas law and as an activity try to determine the final pressure and temperature of the gas in the tube just after ignition. Compare what is happening in the tube in relation to diesel engine ignition.

Safety: None

Disposal: Clean the burnt residue out of the syringe and throw in the trash.

References:

1. The "Fire Syringe" is a product produced by Educational Innovations. See website: www.teachersource.com for info
2. Also see Purdue University Physics demo web page:
https://www.physics.purdue.edu/demos/display_page.php?item=3E-03