MS0019-01

BELL JAR EXPERIMENT KIT

This pump plate and bell jar can be used to demonstrate the nature of sound waves by showing that sound does not exist in a vacuum. As air is pumped out of the jar the sound from the bell becomes fainter and fainter until it disappears.

Includes bell jar, vacuum plate with valve, rubber seal, bell and instructions
Bell may be removed for other vacuum experiments

Vacuum pump, vacuum tubing and 2 x D (1.5v) batteries required (not supplied).

Instructions:
Always inspect your bell jar and base plate for cracks or weakness before use as this can cause dangerous failure of the apparatus.

Test the electric bell by inserting 2 x D (1.5v) batteries and turning it on. Let students hear how loud it is when outside the jar. Turn the ringer off.
Troubleshooting: If the bell does not ring – check batteries or the connection - adjust the screws on the bell ring post accordingly.

The Ringer sits in the middle of the plate. Turn the ringer on.

Place the rubber gasket on the base plate and lower the bell jar so that it makes a good seal. Grease may be required.
Listen again for the sound of the ringing electric bell. It may be softer than before but still clearly audible.

Attached a vacuum hose between the base plate and vacuum pump and turn it on. Make sure that the valve on the base plate is in the open position.

When the pressure reaches a low point, turn the pump off and close the valve. Listen for the bell. It should be barely audible, if at all. Students can look inside and see that the ringer is still moving. Since the transmitting medium around the bell has been removed, however, the sound does not travel to their ears. Note: Depending on the strength of your vacuum pump, some sound may still be heard, but it will be noticeably reduced.

Turn the release valve to reintroduce air into the jar. The sound will get louder again. Lift the bell jar. Turn off the ringer.

Additional experiments:
Investigate Gas Laws;
Investigate vapor pressure;
Marshmallow in Bell Jar Experiment

General safety considerations when using a vacuum system:
Reference: ASSIST Website

A system under vacuum is commonly conducted using glass containers and therefore runs the risk of an implosion. It is important to check that any glassware being attached is thick-walled, borosilicate and designed to withstand any pressure when using vacuum procedures, and does not show any signs of defects, flaws or other damage that may cause it to implode and generate flying glass fragments and chemical splatter.
Glassware should also be checked after use for any damage.
Any glass vessel that will be evacuated should be shielded either by:
1. Surrounding the vessel with some cardboard, plastic or Perspex safety shields;
2. Sticking adhesive film, tape or netting to the outside of the glass vessel; or 3. use of PVC coated glassware.
If Bell jars are being used, check that they are intended for evacuation, suitable bell jars are thick-walled and often have a tap to which a vacuum line can be attached. Thin walled bell jars are not suitable for sustaining a vacuum.
Always use thick-walled vacuum grade tubing so that it doesn't collapse under vacuum. Use vacuum clamps to securely connect the vacuum apparatus to equipment/glassware.
Tubing should be in good condition, free from cracks and other signs of degradation.

Vacuum Pumps:
There are many types of electric vacuum pumps offering many different features and many different brands and manufacturers. It is therefore necessary to refer to the manufacturer's operating manual in order to correctly set up and use.