

SOUND PROPAGATION IN A VACUUM



Material:

Item Code	Qty	Description
DM503-2A	1	Vacuum pump, electric 12, two stages
C1520-1M	1	Vacuum hose, plastics, D=6 mm, L=100 cm
DM520-2G	1	Bell jar 7 Litres
DM522-1K	1	Alarm bell with sound-absorbing plate

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Goal:

Can sound waves propagate without air?

Setup:

- The absorber plate is placed centrally on the bottom of the vacuum vessel.
- The alarm clock is set to ring permanently.
- We place the alarm clock centrally on the absorbing plate. It must not touch the wall of the vessel.
- The vessel is closed with the lid. The tap on the lid must be open.
- We connect the recipient with the vacuum pump to the hose. It should be noted that the hose is firmly inserted into the connections.

Experiment 1:

The vacuum pump is switched on and the air is sucked out of the vessel.

If no more suction noise (bubbling) can be heard from the vacuum pump, the pump is switched off.

Attention:

When the pump is switched off, the tap on the lid of the vessel must be closed immediately, otherwise the oil of the pump will be sucked into the vacuum vessel!

Result:

The ringing noise, which is clearly audible at first, becomes much quieter as the air pressure inside the vacuum vessel drops becomes significantly quieter until it is almost inaudible.

We thus have proof that sound needs a medium (such as air) to propagate.

Experiment 2:

By lifting the inlet valve slightly or pushing it to the side, we can let air flow in again.

We note the ringing sound again.

Note:

Care must be taken to ensure that the bell does not touch the vacuum vessel, otherwise the sound will be transmitted to the outside via the wall by vibration and thus become audible again.

If a DE722-2B Barometer is available, it can also be placed in the vacuum vessel. This allows the students to follow the air pressure inside the vessel.

Additional experiment:

The experiment is performed again, but this time without the absorber plate. The alarm clock is thus placed directly on the bottom of the vessel. However, it is even better if the alarm clock also touches the side wall. In this case, the sound is transmitted to the outside via the wall by vibration, and the ringing noise is thus audible again.