

# Blackbody

**Aim:** To show the quintessence of a black body.

**Subjectcode:** 6B40 (Blackbodies)

**Diagram:**



**Equipment:**

- Two shining tins (1 litre each); one painted dull black on the inside.
- Two covers with a small hole ( $d=3\text{mm}$ ) drilled in the centre.

**Safety:**

- No remarks.

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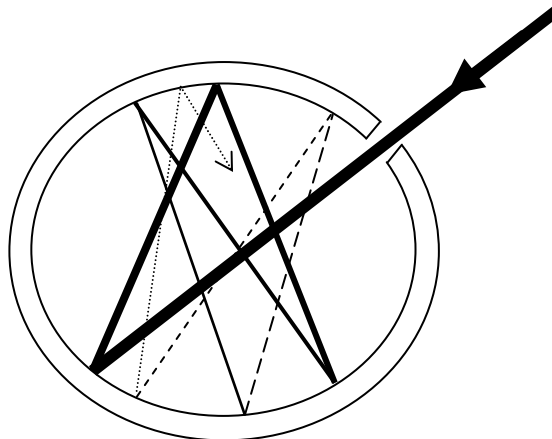
**Presentation:** First the two tins are presented without the lids (see Diagram). Students see the difference between the insides: one being highly reflecting, the other being very much light absorbing. Next the two lids are placed:



Figure 1

Now the students see the two small holes and no difference is observed between them. Both holes are equally black!

**Explanation:** This demonstration shows experimentally what a blackbody is: a body that does not reflect light and appears completely black. So the two holes in the lids are two equal black bodies. Explaining the light absorption can be done using a drawing like the next one:



Radiation incident on the hole is completely absorbed after successive reflections (in every reflection the reflection coefficient is smaller than 1). There are so many reflections that the hole absorbs like a black body. This absorption does not depend on what is inside the body.

**Remarks:**

- In the reverse process, in which radiation leaves the hole, the hole emits like a black body. Also in that situation it is found experimentally that all black bodies at the same temperature emit the same thermal radiation (see the demonstration "Black body radiation" In this database).

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**Sources:**

- [Eisberg, R and Resnick, R., Quantum Physics of atoms, molecules, solids, nuclei and particles](#) Second edition, pag. 2-5.
- [Giancoli, D.G., Physics for scientists and engineers with modern physics](#), Third edition, pag. 950.