EC-106.

Subject : PHYSICS

Topic : Black Body Radiation

Class : TDC-I & paper -II

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8.6 Black Body

A perfectly black body is one which absorbs totally all the radiation of any wavelength which fall on it. As it neither reflects nor transmits any radiation, it appears black; whatever colour of incident radiation. The main characteristic of such a body is that when heated to a high temperature, it emits full or total radiation. As it is a perfect absorber, it is also a perfect its emission being the greatest possible for every wavelength at any given temperature.

8.7 Black Body in Practice

In practice, a perfectly black body is not available. Lamp-black and Platinum black nearest approach to a black body. However, a body showing close approximation to a perfect body can be constructed.

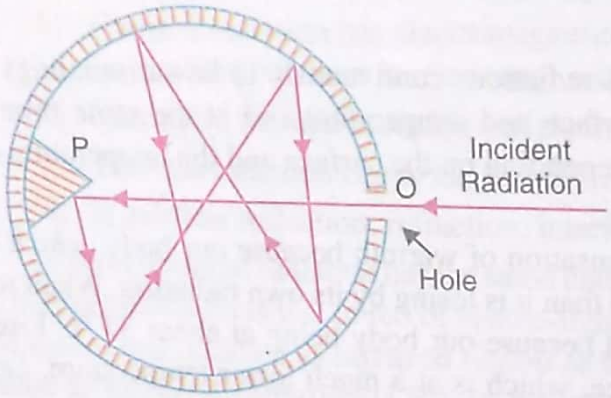

Fig. 8.1: Black body absorber

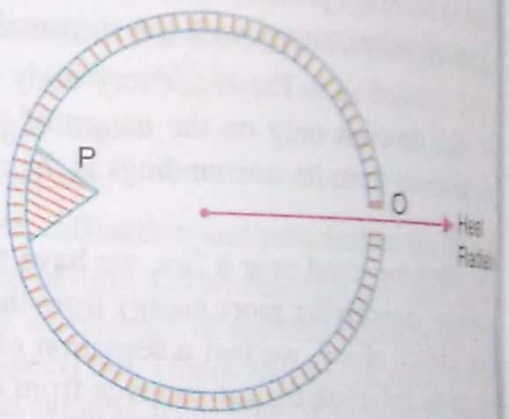

Fig. 8.2: Black body emitter

8.7.1 Fery's black body : A double walled hollow copper sphere is taken and coated with black on its inner surface (Fig. 8.1). A fine hole *O* acts as a very narrow opening. When the radiation enter through the narrow opening they suffer multiple reflections after falling on a pointed projection *P* which is made just in front of the hole. After suffering multiple reflection, the radiation are completely absorbed. This type of black body shown in Fig. 8.1 was designed by Fery. This body acts as a perfect body absorber. When this body is placed in a bath at a fixed temperature, the heat radiation comes out of the hole (Fig. 8.2). The hole acts a black body radiator. It should be remembered that only the hole and not the walls of the body, acts as the black body radiator. Lamp black absorbs about 96% visible light, while platinum black absorbs about 98%.

8.7.2 Wien's black body : Wien also constructed a black body in the form of cylinder. This body is commonly used nowadays, as it is more convenient to use.

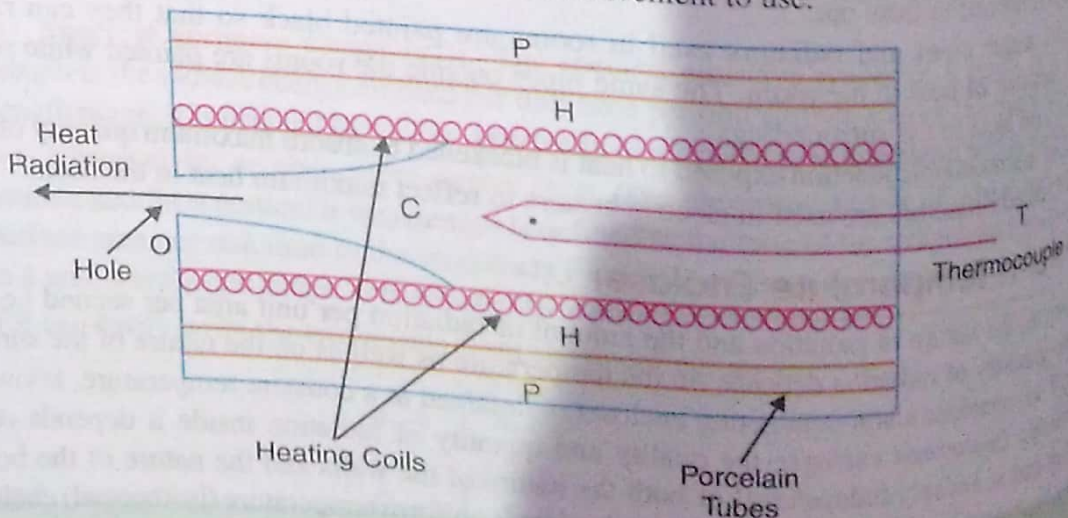

Fig. 8.3

Black Body Radiation and its Temperature Dependence

When a black body is placed inside a uniform temperature (isothermal) encloser, it will emit full ...ation of the encloser after it is in equilibrium with the encloser. These radiations are independent ...e nature of substance, nature of walls of the encloser, and presence of any other body in the ...loser but depends only on temperature. Since a perfectly black body is one which absorbs all the ...ations that fall on it, of whatever wavelength they may be, the radiation emitted by it will possess ...aracter independent of the property of any particular substance, purely dependent on the temperature ...hich it is raised. Hence it is solely temperature dependent.

Such radiation in a uniform temperature encloser are known as *black body radiation.*