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Nuclear Reactors "

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The main elements of a nuclear reactor are

- (a) the nuclear fuel
- (b) the neutron moderator and reflector
- (c) the cooling agent
- (d) the control rods for controlling the rate of development of the chain reaction.

The nuclear fuels are uranium ${}_{92}^{235}\text{U}$ and ${}_{92}^{238}\text{U}$,

plutonium ${}_{94}^{239}\text{Pu}$ and

thorium ${}_{90}^{232}\text{Th}$.

A natural sample of uranium contains 140 times more of ${}^{238}\text{U}$ than ${}^{235}\text{U}$.

To maintain stability of the reactor (at $k=1$) control rods are inserted into the reactor core. The rods are of boron or cadmium. These absorb thermal neutrons. The coolant may be water, liquid sodium or other substances. To protect the attendants from the action of neutrons and gamma radiation, the reactor is shielded and the reactor processes are carried out by remote control.

The conversion of nuclear fuel takes place in reactors using fast neutrons. Neutrons captured by ^{235}U produce ^{239}Pu , that can be chemically separated from ^{238}U .

An average of 2.5 neutrons are formed in one fission event, in ^{235}U only one of these is required for sustaining the chain reaction.

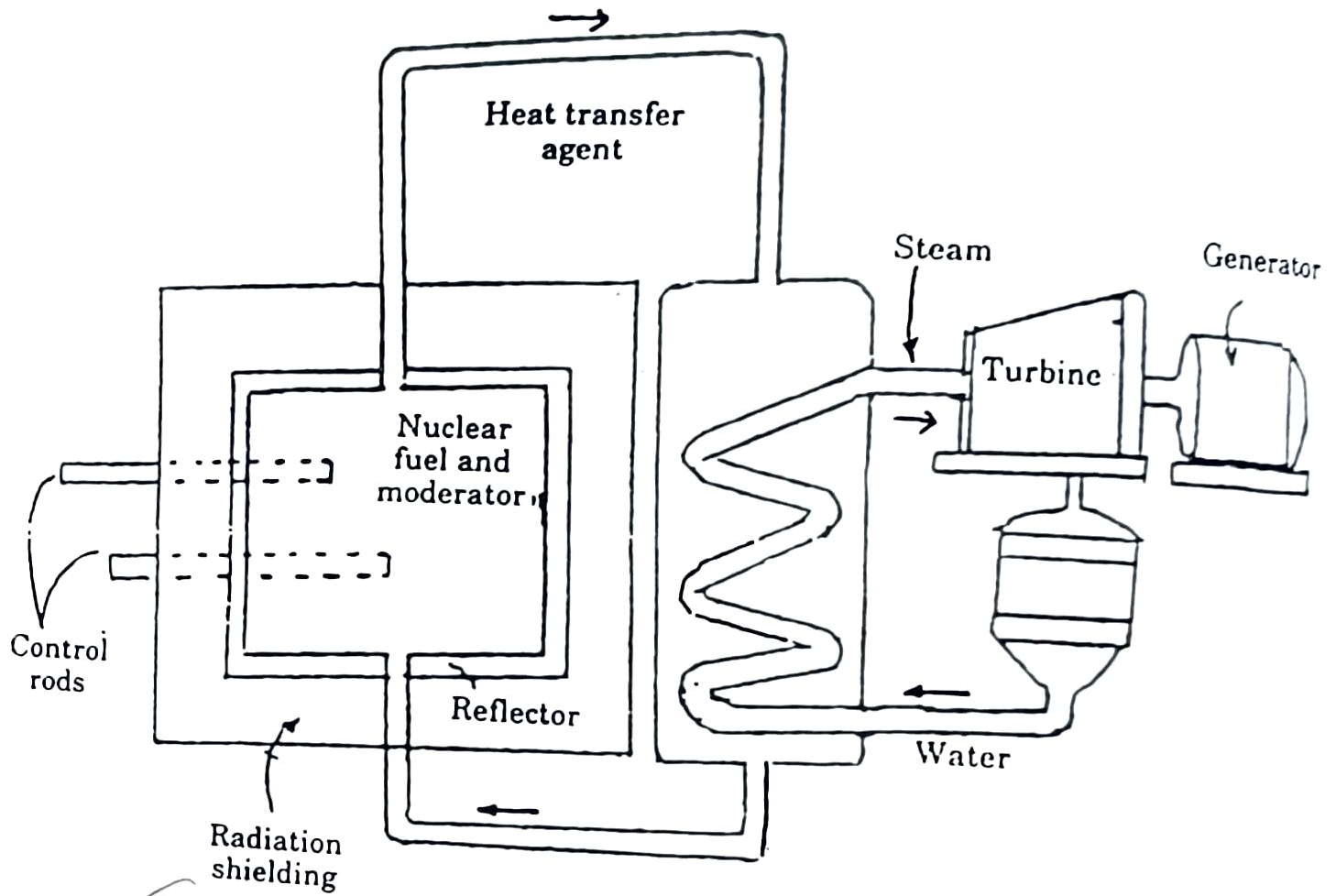


Fig. 31