

Que. Give an account of the growth and development of nuclear science and technology in India. What is the advantage of nuclear research in welfare in India? (150 words).

Ans India has a largely indigenous nuclear power programme. Presently, India occupies a leading place among Asian nations in the indigenous design, development, construction and operation of nuclear power reactors.

GROWTH AND DEVELOPMENT OF NUCLEAR SCIENCE & TECHNOLOGY IN INDIA

1. India's journey in the field of nuclear science and technology began with the formation of Department of Atomic Energy (DAE) in 1954. The aim was to harness nuclear resources for peaceful purposes.
2. In 2018, India commemorated 20 years since it conducted its five nuclear tests, known as Operation Shakti.
3. On 5 November 2018, India declared that its nuclear triad, is operational after indigenous ballistic missile nuclear submarine INS Arighat achieved a milestone by conducting its first deterrence patrol.
4. A three stage nuclear power programme was formulated by Homi Bhabha in 1950s.
 - * Stage 1 → Use natural Uranium to fuel a Pressurized Heavy Water Reactor (PHWR).
 - * Stage 2 → Develop Fast Breeder Reactor (FBR) which will

lead to the conversion of Thorium to fissile Uranium.

* Stage 3 → Develop Breeder Reactors, these are Thorium based Nuclear Reactors.

5. Indian govt. has ambitious plans to increase nuclear power generation capacity to 275 GWe by 2052.

ADVANTAGES OF NUCLEAR RESEARCH IN WELFARE IN INDIA -

1. FOOD - Food irradiation is the process of exposing foodstuffs to gamma rays to kill bacteria that can cause food-borne disease and to increase shelf life. India is exporting radiation hygienized spices and dry ingredients to several countries since 2000.

2. MEDICINE -

→ Diagnosis - Diagnostic techniques in nuclear medicine use radiopharmaceuticals which emit gamma rays from within the body which permit specific physiological processes to be scrutinised.

→ Therapy - Radioactive iodine ($I-131$) which is a nuclear medicine, is used in small amounts to treat cancer and conditions affecting thyroid gland.

3. AGRICULTURE - Radiation is used to control insects via Sterile Insect Technique (SIT) which involves rearing of insects that are sterilised through irradiation (gamma or X-rays) which enable them to remain sexually competitive but they cannot produce offspring.

4. CONSUMER PRODUCTS - Many consumer products use small amount of radioactive material like smoke detectors, watches & clocks, non-stick materials etc. which are important part of everyday life.

5. ENVIRONMENT - Radioisotopes can help in solving a no. of pollution problems like analysing pollutants, smog formation, sewage dispersal from ocean outfalls, oil spills etc.