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FACULTY OF ENGINEERING AND
TECHNOLOGY

Lecture- 30

Nuclear accidents and holocaust



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Subject : Environmental Studies and Disaster Management

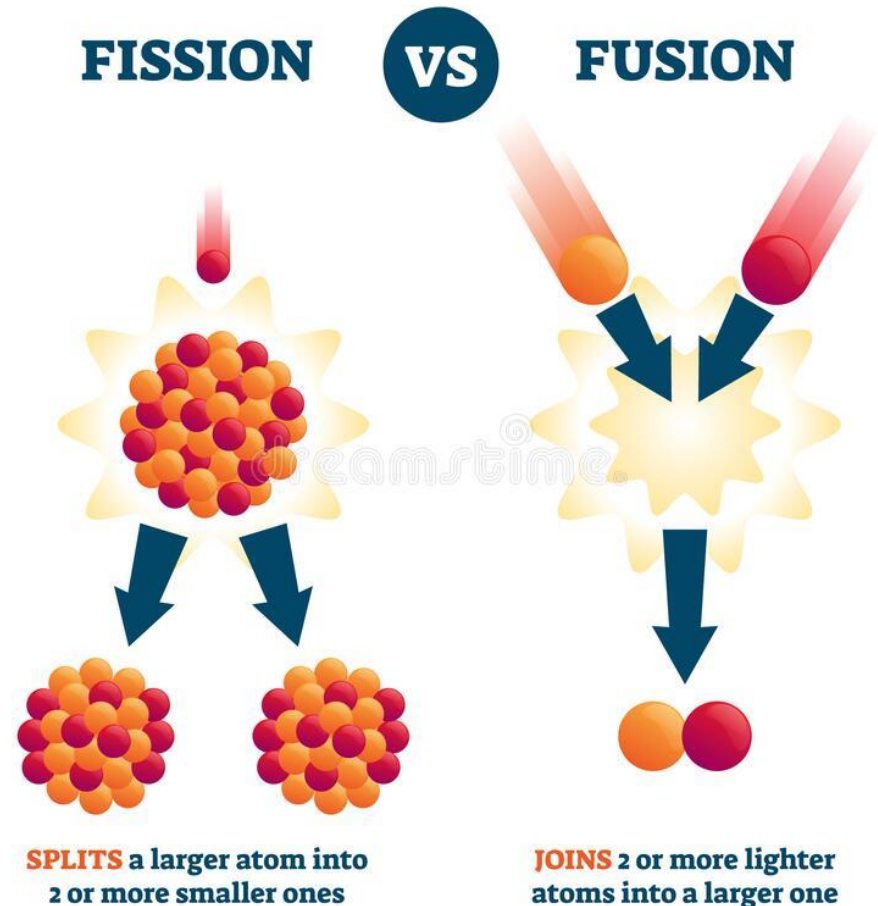
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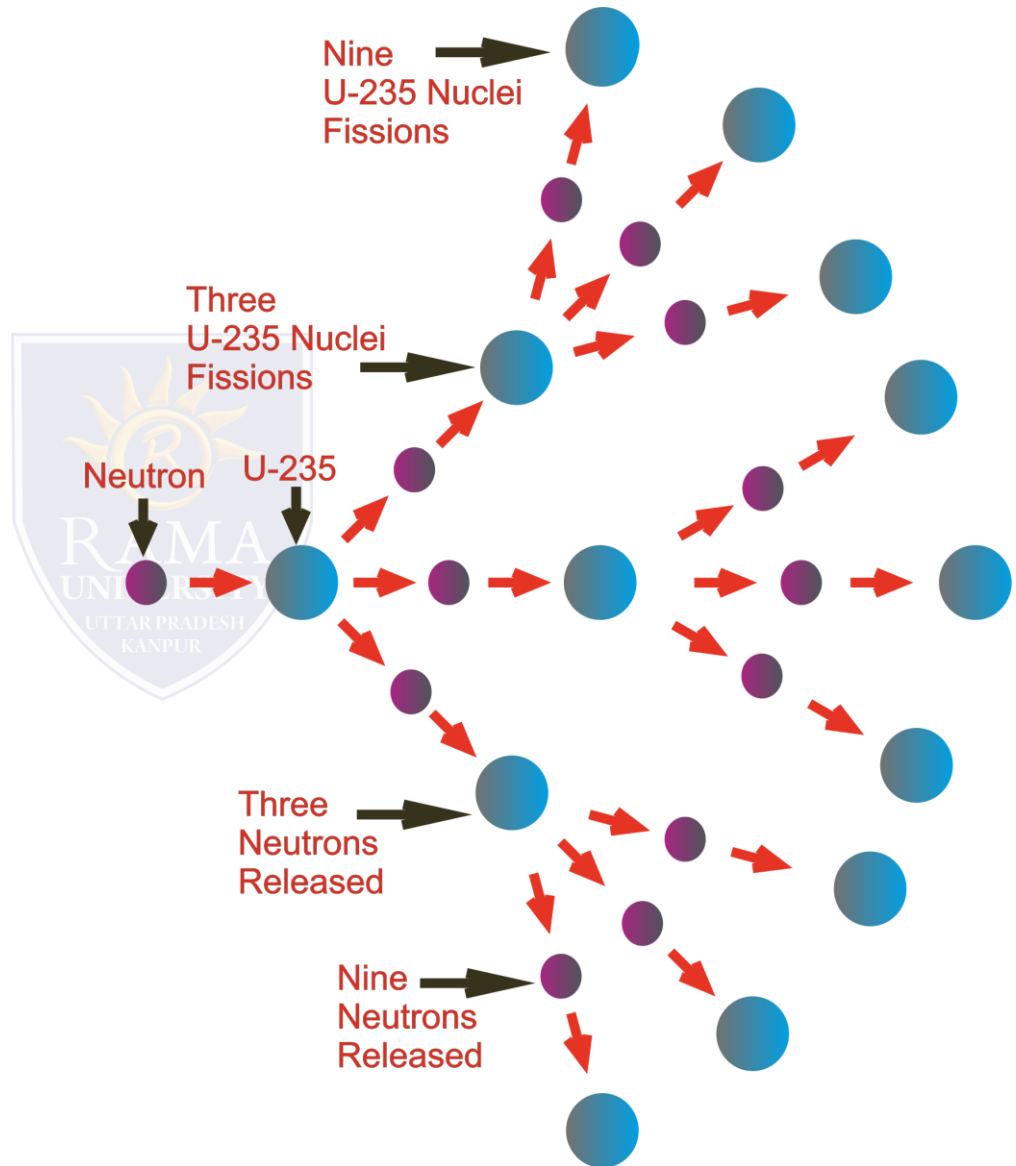
Nuclear reaction

- Nuclear reaction is a process whereby one or more new nuclides are generated on collision between two nuclei, or a nucleus and an external subatomic particles.
- The nuclear reaction result in production of vast amount of energy, thus this energy is harvested to fulfil human's energy demand.
- Nuclear reaction occur through two different processes i.e., nuclear fission and nuclear fusion.



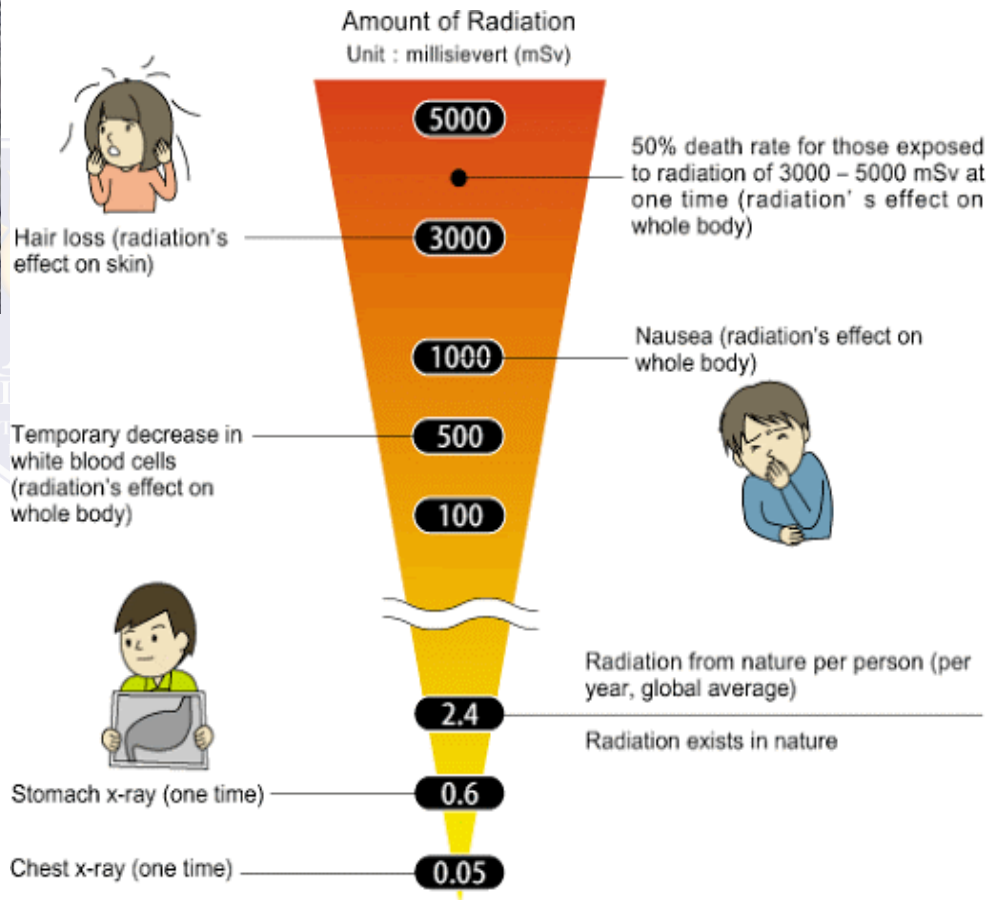
Nuclear fission and chain reaction

- The nuclear fission reaction occurs as a chain reaction which means that the nuclei generated from parent nuclei again result in production of another nuclei on collision with another particle and the process goes on.
- This process can be controlled as in nuclear reactors or can be uncontrolled as in nuclear or atom bombs.



Nuclear accidents

- Nuclear accidents is a situation that occur due to uncontrolled chain reaction in nuclear reactors, and/or improper handling of radioactive materials.
- Natural disasters such as earthquakes, Tsunami sometimes become major cause of nuclear accident.
- A nuclear accident is defined by the International Atomic agency as an “event that has led to significant consequences to people, the environment or the facility”.
- Nuclear accidents can be devastating and have effects that are long lasting.
- Single nuclear accident can kill thousands of people, make many others seriously ill, and destroy an area for decades by its radioactivity which leads to death, cancer and genetic deformities.
- Land, water, and vegetation are destroyed for long periods of time.
- There have been many nuclear accidents that has devastated life as well as made areas uninhabitable such as **Chernobyl accident in USSR** (Union of Soviet Socialist Republics) in year 1986; and at the **Three Mile Island in USA** (1979), **Fukushima Daiichi nuclear disaster in Japan** (2011).



Source: UN Scientific Committee report, others

Chernobyl nuclear accident

- On April 26, 1986, a sudden flow of power during a reactor system test destroyed unit 4 of the nuclear power station at Chernobyl, Ukraine, in the former Soviet Union.
- Chernobyl is approximately 80 miles (which is 120 kilometers) north of the capital city of the Ukraine, Kiev.
- The accident and the fire that followed released massive amounts of radioactive material into the environment.
- The accident took lives of 30 people immediately.
- After the accident, officials closed off the area within 30 kilometers (18 miles) of the plant.
- The Soviet (and later on, Russian) government evacuated about 115,000 people from the most heavily contaminated areas in 1986, and another 220,000 people in subsequent years.

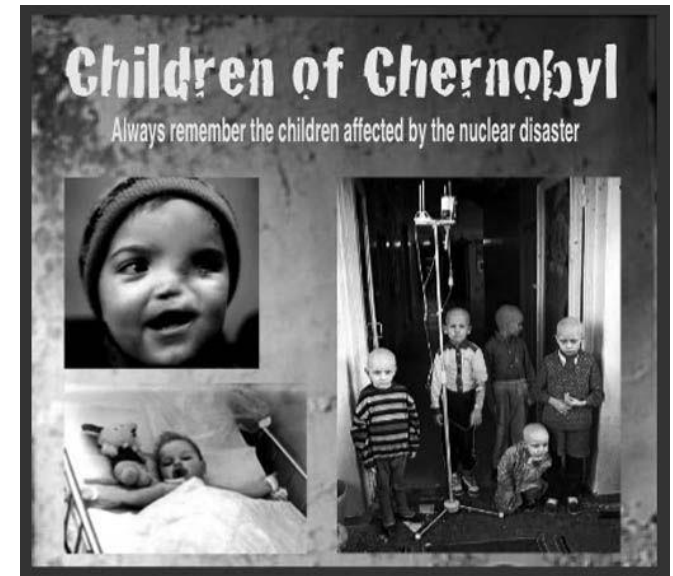
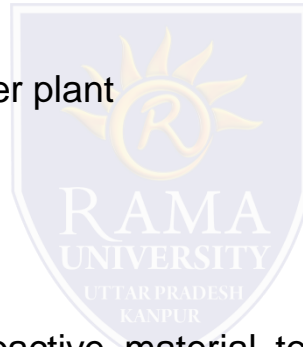


Major causes of the accident

- Design fault in RBMK reactor (high-power channel reactor)
- A violation of procedures
- Breakdown of communication
- Lack of a 'Safety Culture' in the power plant

Effects of the accident

- The radioactive fallout caused radioactive material to deposit over large areas that lethally affected small mammals such as mice and coniferous trees.
- Increased incidence of thyroid cancer in Ukrainian children (from birth to 15 years old).
- Increased psychological disorders such as anxiety, depression, helplessness and other disorders due to the stress of evacuation and others.
- Affected the agricultural productivity of the area.



Holocaust

- **Holocaust** means killing or destruction on mass scale.
- **The Holocaust** also known as **the Shoah**, was the genocide of European Jews during World War II. Between 1941 and 1945, Nazi Germany and its collaborators systematically murdered some six million Jews across German-occupied Europe, around two-thirds of Europe's Jewish population. The murders were carried out in pogroms and mass shootings; by a policy of extermination through work in concentration camps; and in gas chambers and gas vans in German extermination camps.
- In Nuclear holocaust in Japan 1945, two nuclear bombs were dropped on Hiroshima and Nagasaki cities of Japan. One fission bomb was dropped on Hiroshima. This holocaust (large scale destruction of human lives by fire) killed about 100,000 people and destroyed the city. This forceful explosion emitted neutrons and gamma radiations. It had the power of 12 kilotons of trinitrotoluene (TNT). The radioactive strontium (Sr90) liberated in the explosion resembles calcium and has the property of replacing calcium of the bones. As a result large scale bone deformities occurred in the inhabitants of these cities. Even after more than 50 years the impacts of the nuclear fallout are still visible.

