

REFERENCES

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Ans. Particle accelerator. *A particle accelerator is a device which is used to impart high kinetic energy to the charged particles like electrons, protons, deuterons, α -particles etc.* (1997)

Why particle accelerators are required ? Radiations from certain natural radioactive sources cannot be of much use when the particles are used as 'missiles' or probes against certain nuclear targets. For this purpose (*i.e.*, causing artificial transmutation) very high energy particles are required. Such high energy particles can be produced by particle accelerators. Using these accelerators particles of hundreds or thousands of MeV energies can be produced.

A particle accelerator is a device for increasing the K. E. of electrically charged particles. Methods of acceleration can be classed into three groups : *direct field*, *inductive*, and *resonance*. According to the shape of the path of the particles, accelerators are classified as *linear* and *cyclic*. In linear accelerators, the paths of particles are approximately straight lines; in cyclic accelerators, they are circles or spirals. (i) In a direct field linear accelerator, a particle passes only once through an electric field with a high p. d. set up by electrostatic generators. (ii) The only accelerator of the inductive type is the betatron. (iii) In *magnetic resonance* accelerators, the particle being accelerated repeatedly passes through an alternating electric field along a closed path, its energy being increased each time. A strong magnetic field is used to control motion of particles and to return them periodically to the region of the accelerating electric field. The particles pass definite points of the alternating electric field approximately when the field is in the same phase ("in resonance"). The simplest resonance accelerator is the cyclotron.

Ans. (a) Linear accelerator. A linear accelerator (or a *Linac*) is a device which accelerates charged particles in a straight line by means of oscillating electric field that provides either a series of steady accelerating steps in correct phase at a series of gaps between electrodes or accompanies the charged particles as a travelling wave.

The first type is known as '*Drift tube accelerator*' and the second type as '*Wave guide accelerator*'.

Circular accelerator. A circular accelerator is a device which can accelerate charged particles by passing them again and again in a radio-frequency electric field along a closed path.

Familiar examples are (i) *Cyclotron* which accelerates protons, deuterons and α -particles and (ii) *Betatron* which accelerates electrons.

(b) A *wave guide accelerator* makes use of electromagnetic radiations (waves) travelling in a wave guide to accelerate charged particles.

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