Difference betn Stationary & Progressive waves :-

Progressive waves	Stationary waves
1.// The disturbance travels forward, i.e, it is handed over from one particle to the next after some time.	1.// The distrubance is fixed, i.e. no particle transfers its motion to the next at any time.
2.// Each particle has the same constant amplitude. The phase varies along the wave, i.e, a particle reaches any stage of its displacement at a time different from that of the last & the next particle.	2.// The amplitude of each particle is not the same. It is maximum at an antinode & decreases gradually from an antinode to the node according to the cosine law. All the particles bet^n two consecutive nodes are in the same phase, i.e, they reach their maximum or minimum displacement at the same time. The phase of particles in one segment is opposite to that of the particles in the next or the last segment.
3.// No particle is permanently at rest. Every particle is momentarily at rest at the extreme positions of its displacement. Different particles reach this position at different times.	3.// nodes are permanently at rest other particles are also momentarily at rest at the extreme position of their displacements.

Progressive waves

4:// All the particles have the same maximum velocity which they have on passing through their mean positions one after the other.

5// Every region passes successively through conditions of compression, normal density and rarefaction and these conditions travel forward.

Stationary waves

All the particles reach this position at the same time. This condition repeated after half a period.

4// The velocity at the nodes always zero. It increases gradually as we go to the antinodes and is maximum at the antinodes. All the particles have their maximum velocity when they pass through their mean positions at the same time.

5// The condensation, regions normal density and rarefactions are fixed. In region the same condition appears and disappears alternately.

Progressive waves

6/ The displacement, velocity and strain equations are represented by

$$y = a \sin \frac{2\pi}{\lambda}(vt - x)$$

$$\frac{dy}{dt} = \frac{2\pi a v}{\lambda} \cos \frac{2\pi}{\lambda}(vt - x)$$

$$\frac{dy}{dx} = \frac{-2\pi a}{\lambda} \cdot \cos \frac{2\pi}{\lambda}(vt - x)$$

A particle has its maximum displacement a quarter period later. The velocity and the pressure curves, therefore, agree and are $\frac{T}{4}$ ahead of the displacement curve.

7/ There is a transmission of energy across every plane.

Stationary waves

6/ The displacement, velocity and strain equation are represented by

$$y = 2a \cos \frac{2\pi}{\lambda} x \sin \frac{2\pi}{\lambda} vt.$$

$$\frac{dy}{dt} = \frac{4\pi a v}{\lambda} \cos \frac{2\pi}{\lambda} x \cos \frac{2\pi}{\lambda} vt.$$

$$\frac{dy}{dx} = \frac{-4\pi a}{\lambda} \sin \frac{2\pi}{\lambda} x \sin \frac{2\pi}{\lambda} vt$$

A particle has its maximum displacement and maximum strain at the same time but has its maximum velocity a quarter period later. No two curves agree in this case.

7/ There is no flow of energy across any plane This is due to the fact that ~~ext~~ condensation and velocity curves differ in phase by $\frac{T}{4}$