* Write notes on
a) Doppler effect of light or optical Doppler effect.

b) Astronomical ~~aberration~~ abernation.

a) The apparent change of frequency of a source of light due to it's motion relative to a static observer is known as optical Doppler effect.

For calculating this apparent change of frequency, let us consider figure 1.

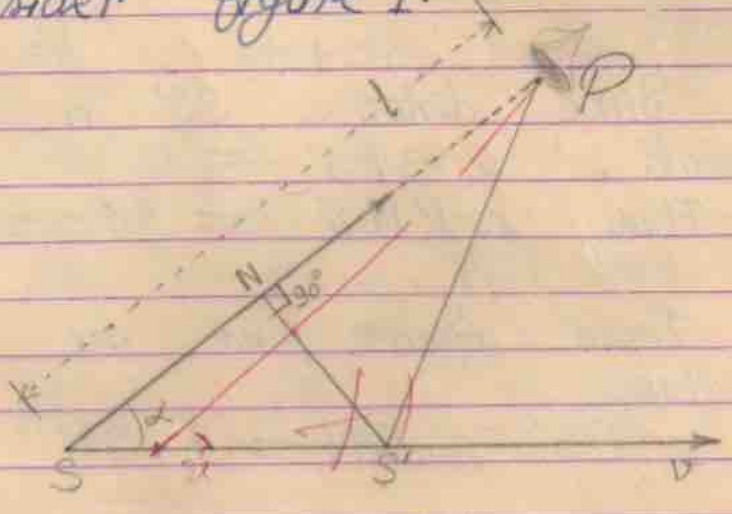

figure — 1

In this figure position S is for static source of light as observed from static position P. The source of light moves in positive x-direction with velocity v. such that in time dt a small distance

$SS' = v \cdot dt$ ..... (i)

is transversed.

During this time the source will emit $\nu \cdot dt$ waves.
where ν is the frequency in static condition of S.
The line of sight SP makes angle α with velocity direction which is also SS' direction.

If distance $SP = l$
and c = velocity of light,
then the first wave will reach point P after time l/c from start at t. Such that the instance of time is

$$t + \frac{l}{c}$$

Since distance SS' is very small, $\angle SPS' \simeq 0$
Thus $\angle PNS' \simeq 90^\circ \simeq \angle PS'N$

From figure we see that distance

$$PS' \simeq PN = l - SN$$

$$= l - v\,dt \cdot \cos\alpha \quad \ldots\ldots\ldots (ii)$$

[from equation (i)]

The last of the waves (the last wave of the wave train) under consideration is emitted from the source at position S', i.e., time dt from start at t. This wave will reach point P at the ~~instance~~