(II) Doppler width :- It arises from Doppler effect which modifies the apparent frequency of radiation from atoms moving with random thermal velocities. The change in frequency is given by

$$\frac{\Delta\nu}{\nu_0} = \frac{\nu - \nu_0}{\nu_0} = \frac{V\cos\theta}{c} = \frac{u}{c} \quad \text{——} \ (8)$$

where v = velocity of atom.
θ = angle between v & direction of observation.
ν_0 = frequency of the line

According to Maxwell's laws of distribution of velocities half intensity width is given by

$$(\Delta\nu) = \sqrt{\log e^2/\beta} \quad \text{——— (9)}$$

$\beta = \frac{mc^2}{2\pi RT\nu^2}$

And intensity width is

$$2\Delta\nu = 2\sqrt{\frac{\log e^2}{\beta}}$$

M = mol. wt
R = gas constant
T = abs. temp.

$$2\Delta\nu = 1.67\frac{\nu}{c}\sqrt{\left(\frac{2RT}{M}\right)} \quad \text{——— (10)}$$

and $$\Delta\lambda = 1.67\frac{\lambda_0}{c}\sqrt{\left(\frac{2RT}{M}\right)} \quad \text{——— (11)}$$

Thus the Doppler broadening is proportional to

(i) $\sqrt{T}$ (ii) ν (iii) $\frac{1}{\sqrt{M}}$.

for λ = 5893 A° at T = 500°K

$$\boxed{2\Delta\lambda = 0.04\ A^\circ}$$

$\Delta\lambda$ is least for high atomic number and Hg^{198} is the ideal source for sharp sp. lines.