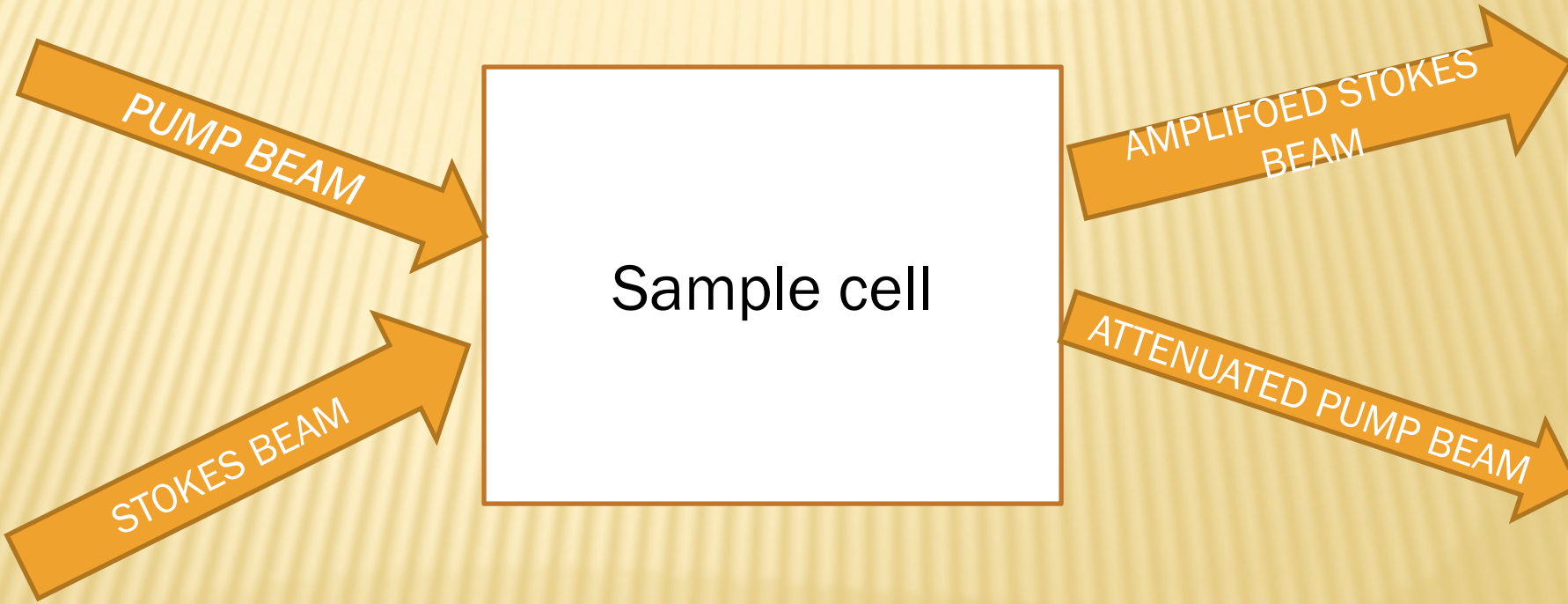
SPECTROSCOPIC TECHNIQUES

PHOTOACOUSTIC RAMAN SCATTERING

PHOTOACOUSTIC RAMAN SCATTERING

- It is the phenomenon associated with third order nonlinear polarizability.
- It requires simultaneous illumination of the sample by two laser beams such that ν_p and ν_s
- $\nu_p - \nu_s = \nu_m$


PUMP BEAM
STOKES BEAM
Sample cell
AMPLIFOED STOKES BEAM
ATTENUATED PUMP BEAM

The frequency vs is tunable and satisfy the given condition.

The incident beam with the frequencies i.e. pump beam and stokes beam interact with two energy states of the molecule.

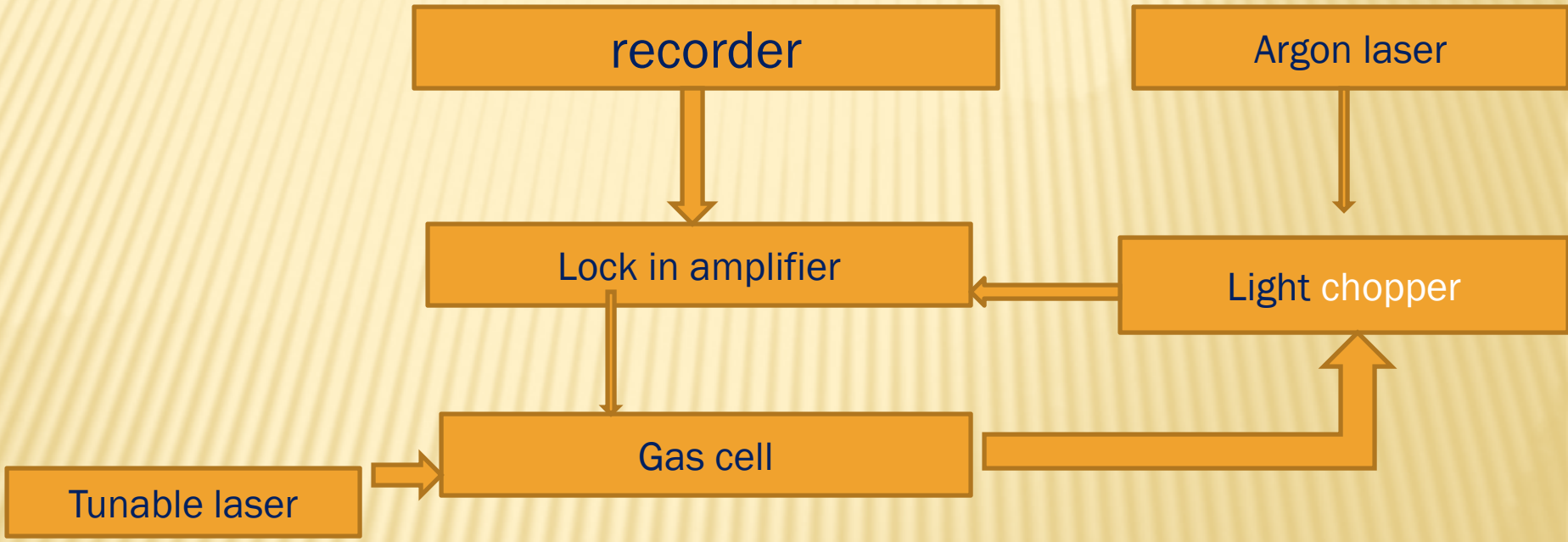
BY STIMULATED RAMAN SCATTERING

- The intensity of the stokes beam increases and pump beam decreases.
- This led to the increase in the upper molecular population state |b>.
- For this to happen, the pump and stokes beam must mix spatially and temporally in the gas sample.

DURING STIMULATED RAMAN SCATTERING

- Collisional relaxation of these excited molecules produces the pressure changes in the sample,
- It causes acoustical wave which is detected by the microphone.

- If the input lasers are modulated at a rate which is low compare to the vibrational to translational relaxation rate, then the temperature and hence the gas pressure will vary at modulated frequency.
- This modulated pressure wave is the sound wave which is detected


recorder
Argon laser
Lock in amplifier
Light chopper
Gas cell
Tunable laser

- The diagram represents the experimental arrangement used for obtaining PARS signal.
- PARS is differ fro other non linear Raman techniques.
- This technique involves the acoustic detection of pressure change in the sample .

- While other raman techniques are concerned with optical signal.
- This provides the new way for detecting the energy deposited in the sample.
- The PARS technique has been successfully used for the study pure rotational Raman transitions.

THANK YOU