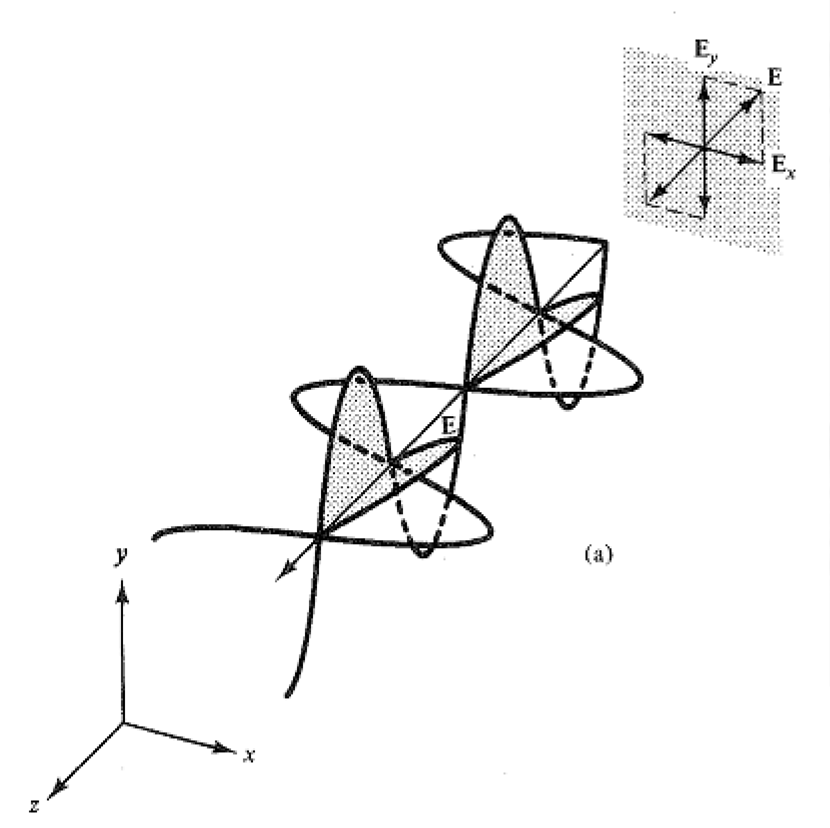
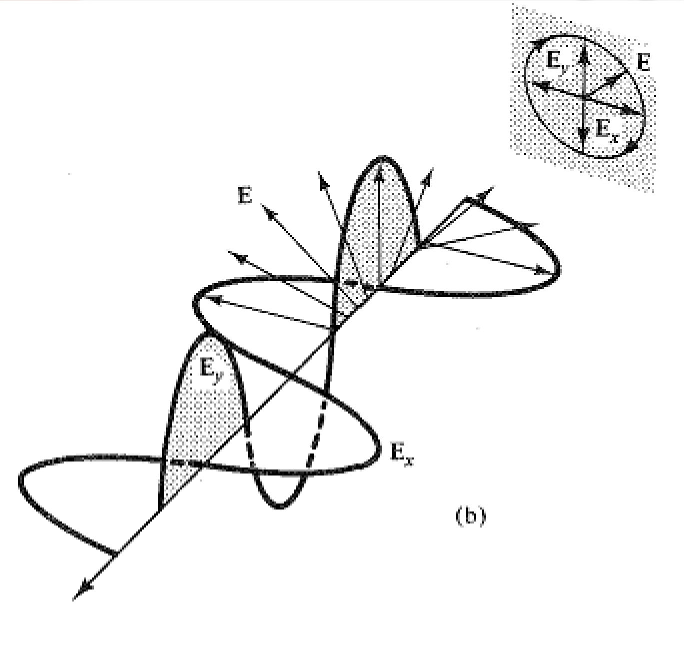
Polarization of light

Linearly polarized

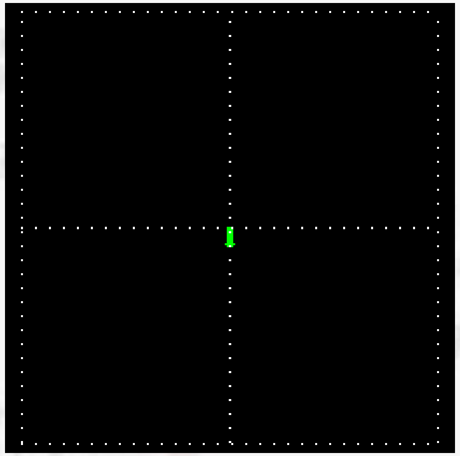


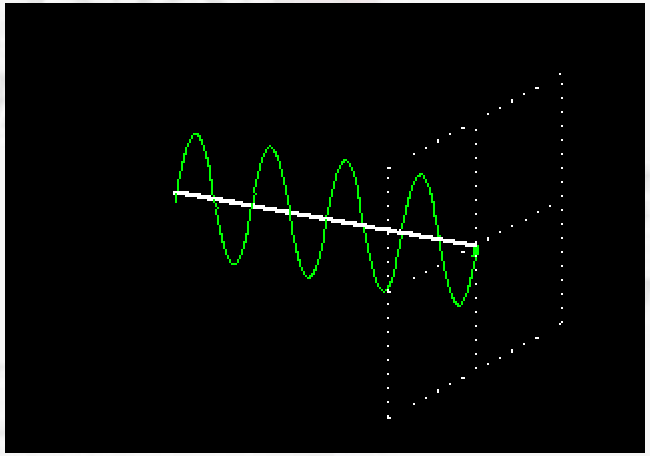
Circularly polarized



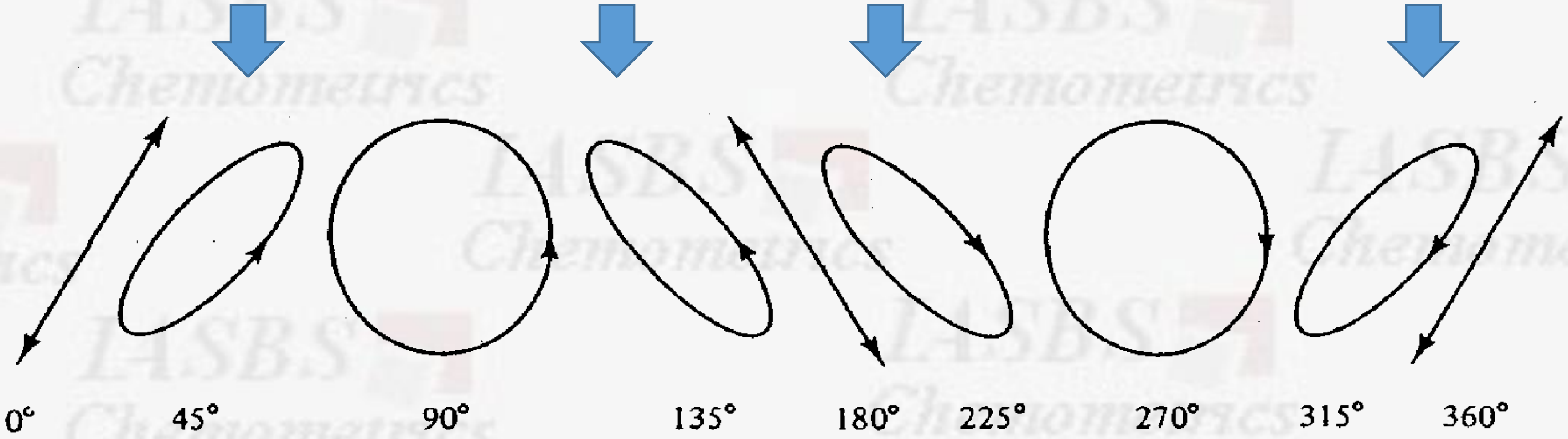
Right circularly polarized

Plane polarized light;





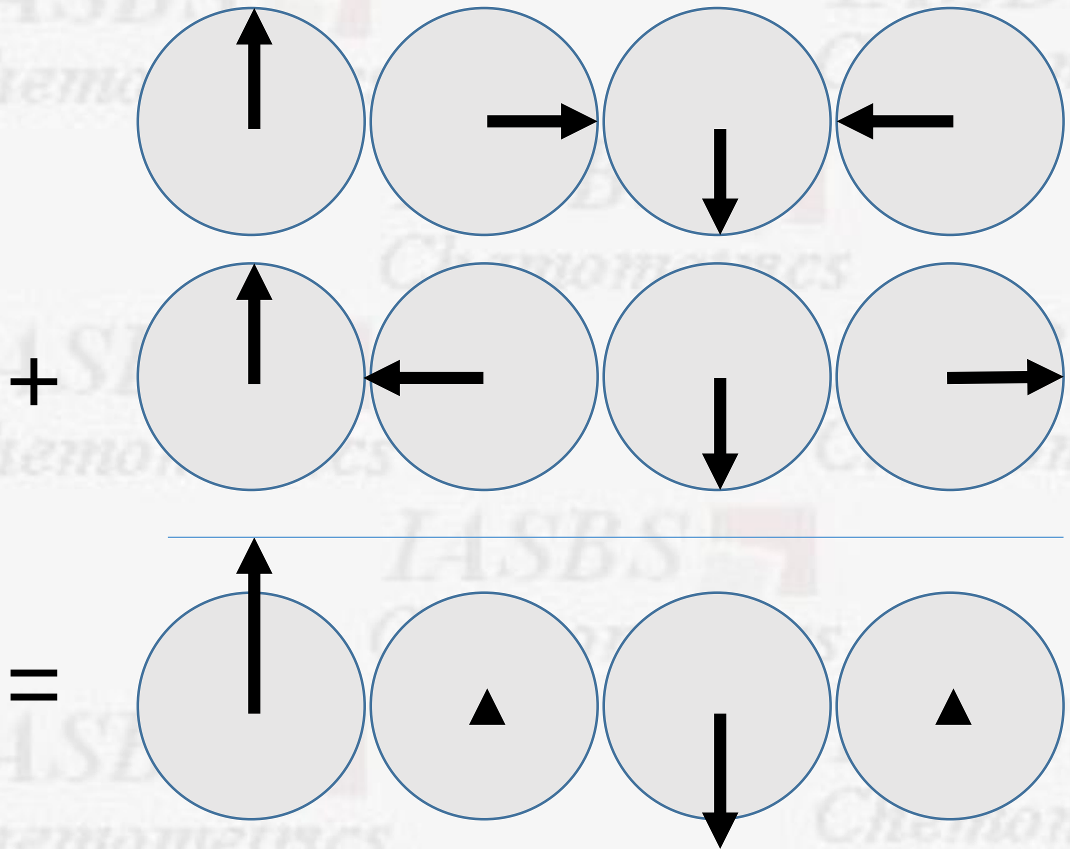
Eliptically polarized

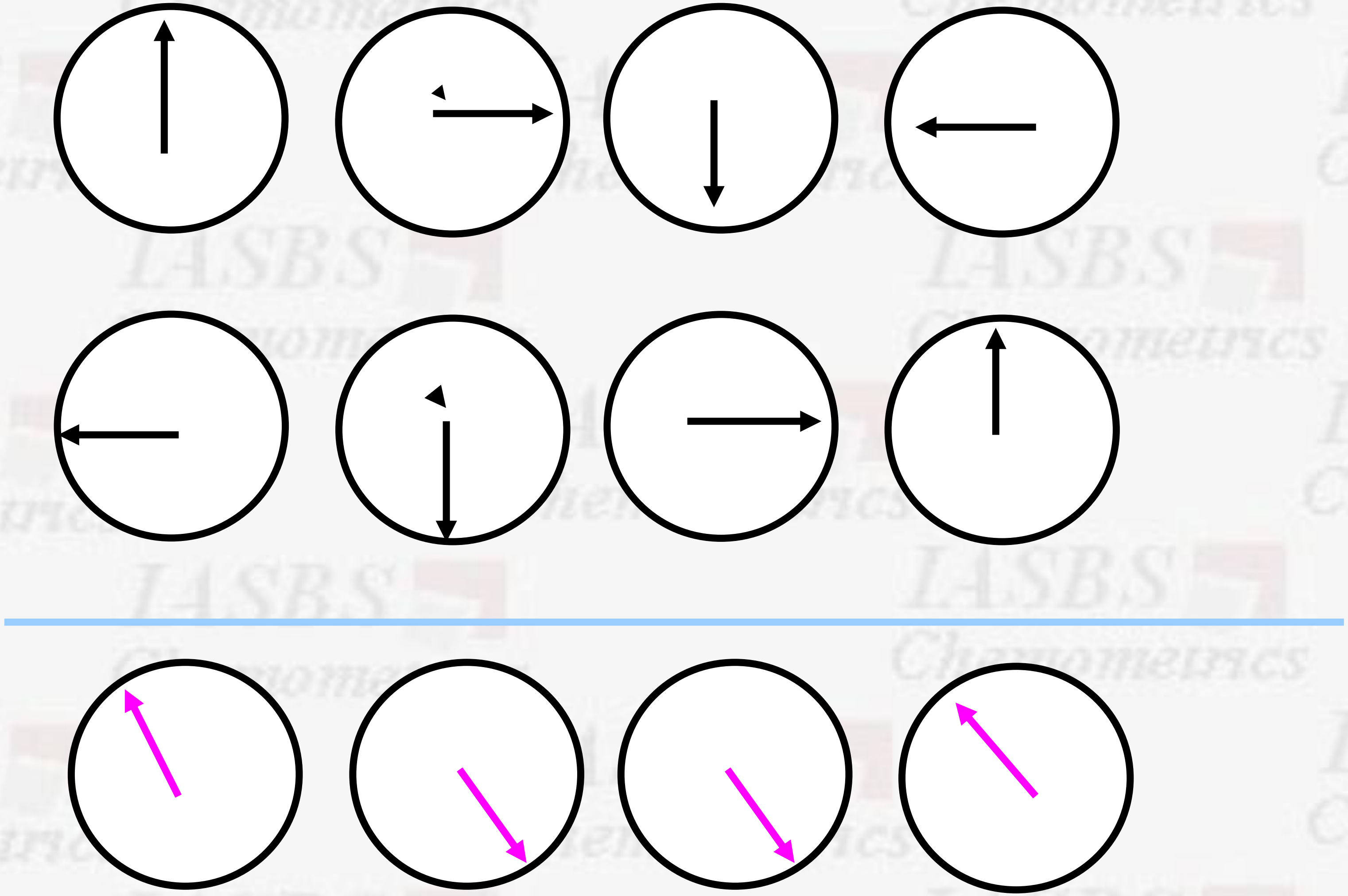


Polarization configuration for various phase differences

Normal light : unpolarized

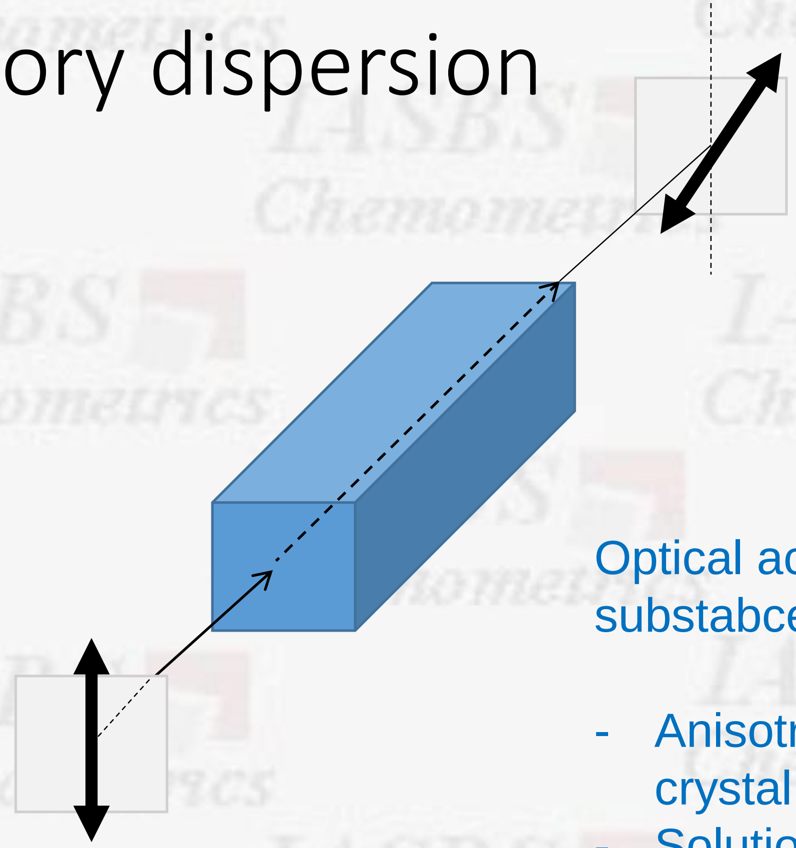
- Plane polarized light is superposition of levo and dextro circularly polarized lights.





When 2^{η} is different then $\Delta\Phi$ occur.

Optical rotatory dispersion



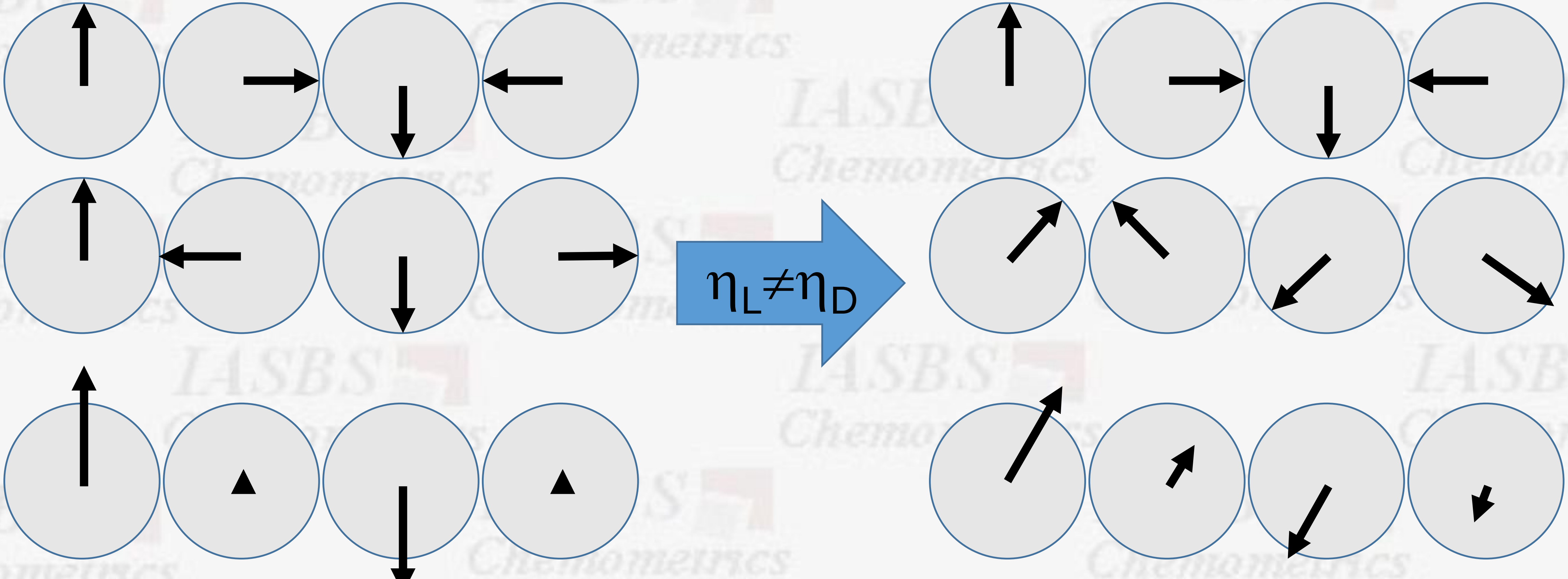
Rotation of oscillation plane

Optical active substabce.

- Anisotrope crystal,
- Solution of an enantiomer

Optical rotatory dispersion

- Plane polarized light is superposition of levo and dextro circularly polarized lights.



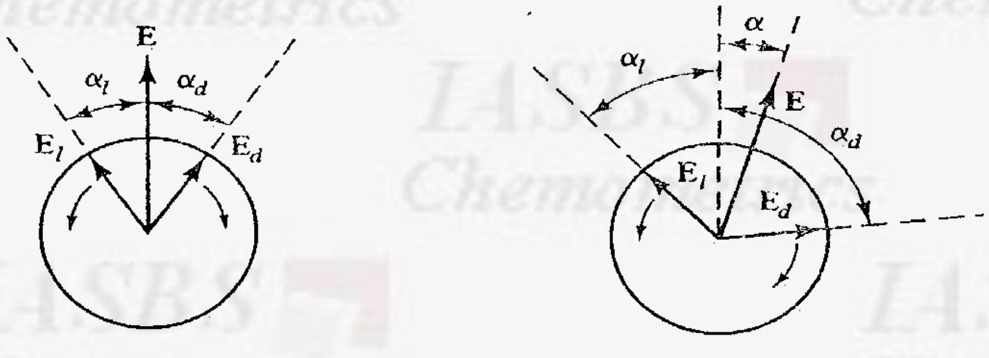
Optical rotatory dispersion

For some substances the characteristic optical phenomena depends on polarization.

An **optically active** substance **rotates** the **plane polaraized** light plane.

It result from **different propagation rates** for levo and dextro component of circularlly polarized light.

$$\alpha = \frac{180b}{\lambda}(\eta_l - \eta_d)$$

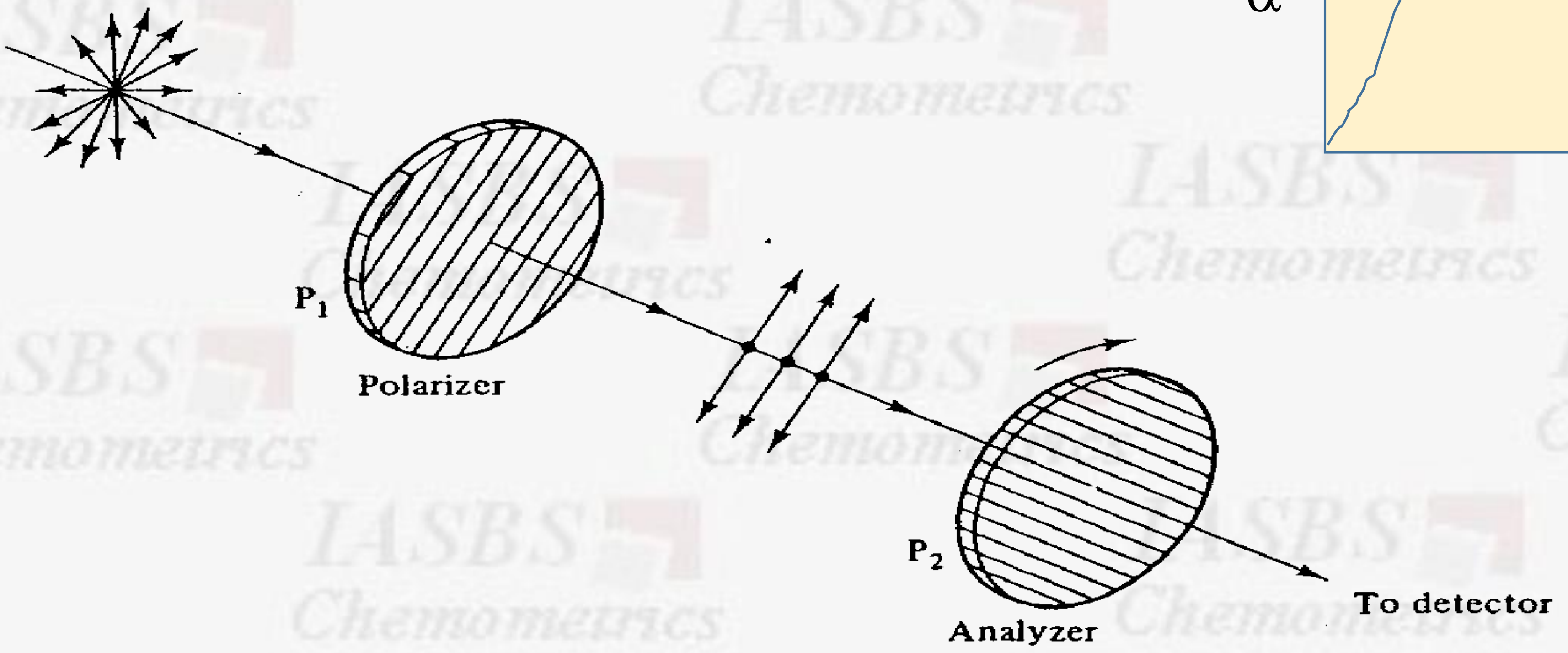


(a) (b)

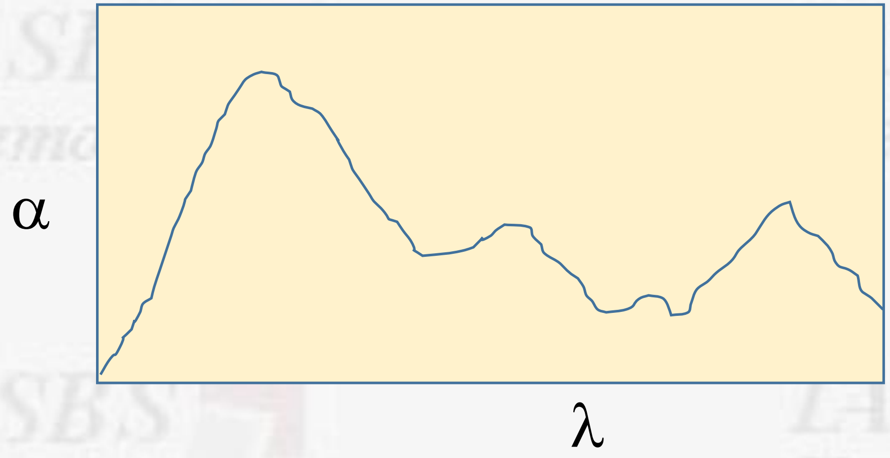
$$[\alpha] = \frac{\alpha}{bc}$$

α can be normalized by Δopl and concentration

A typical polarimeter



Spectropolarimetry



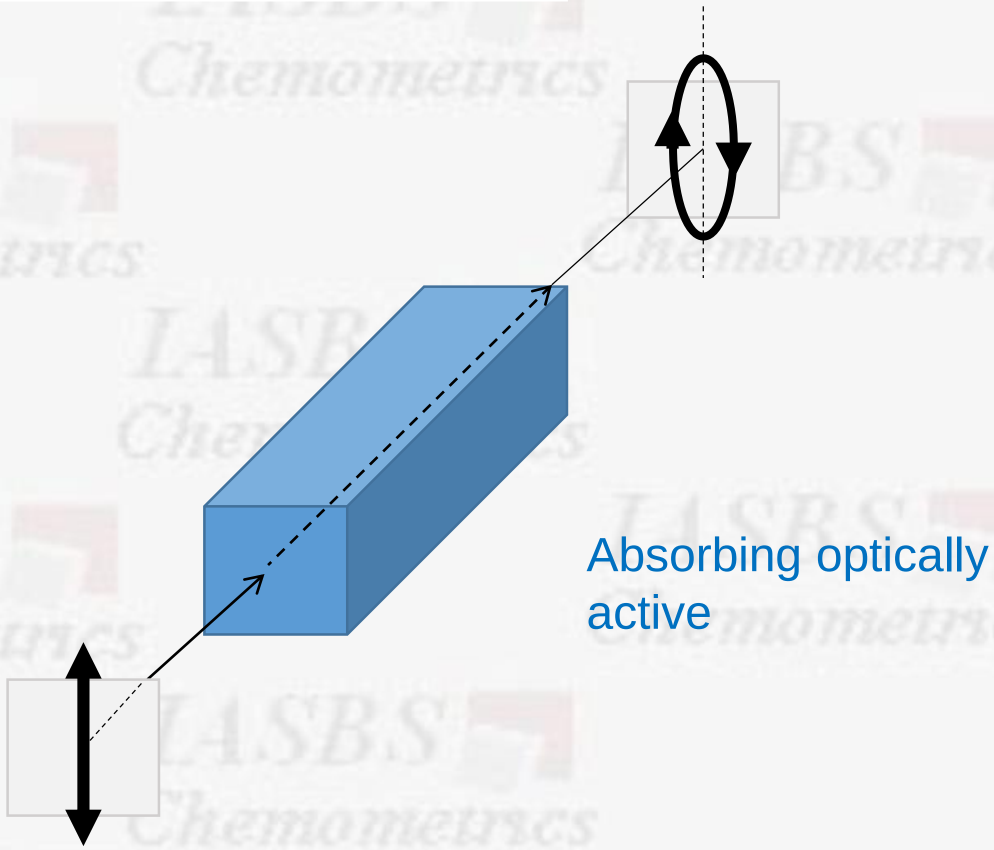
Circular dichroism :

Results from different molar absorptivity of levo and dextro component of polarized light, and it produces elipically polarized light

$$\theta = 33\,(A_l - A_d)$$

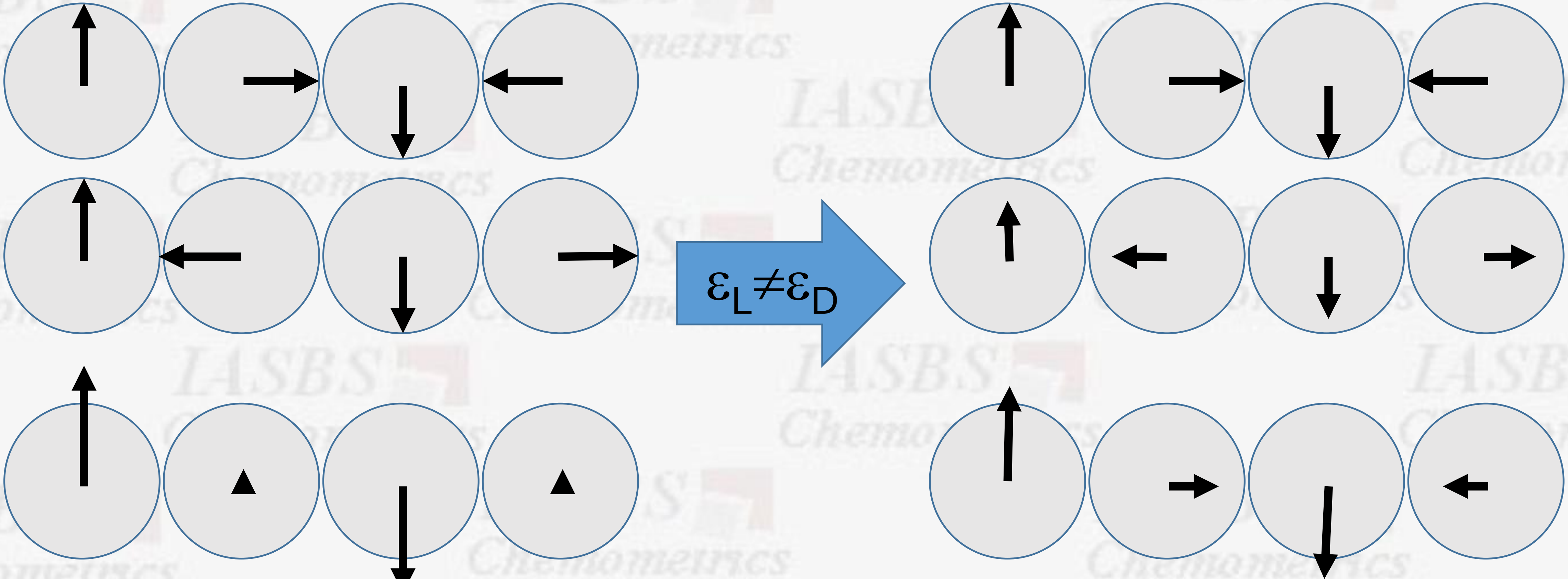
$$[\theta] = \frac{\theta}{bc} = 3300\,(\varepsilon_l - \varepsilon_d)$$

Molar Elipticity



Circular Dichroism

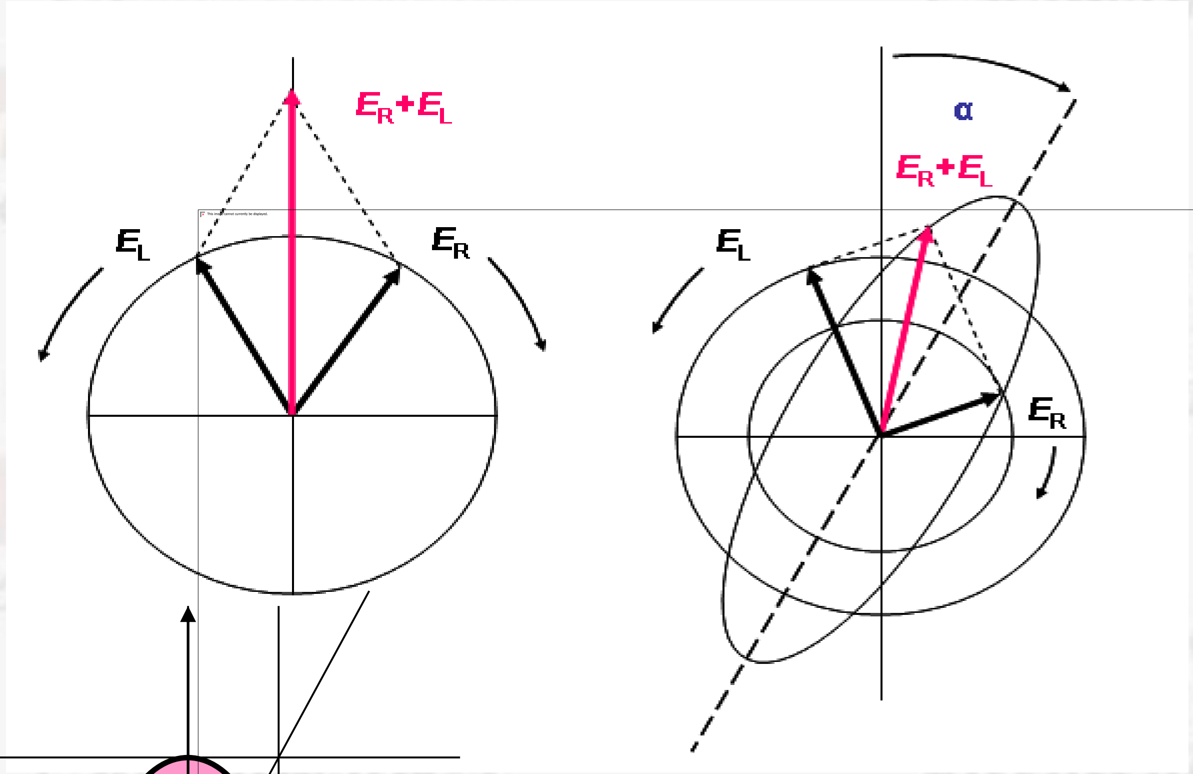
- Plane polarized light is superposition of levo and dextro circularly polarized lights.

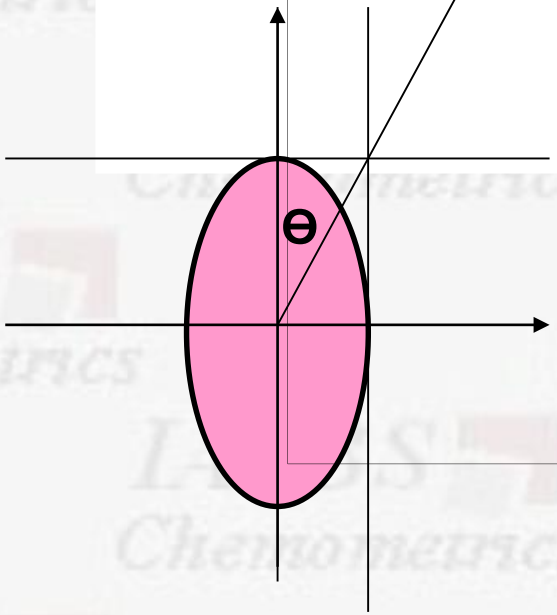


What happen both CD and ORD occur?

Two question?

What’s the Cotton effect?



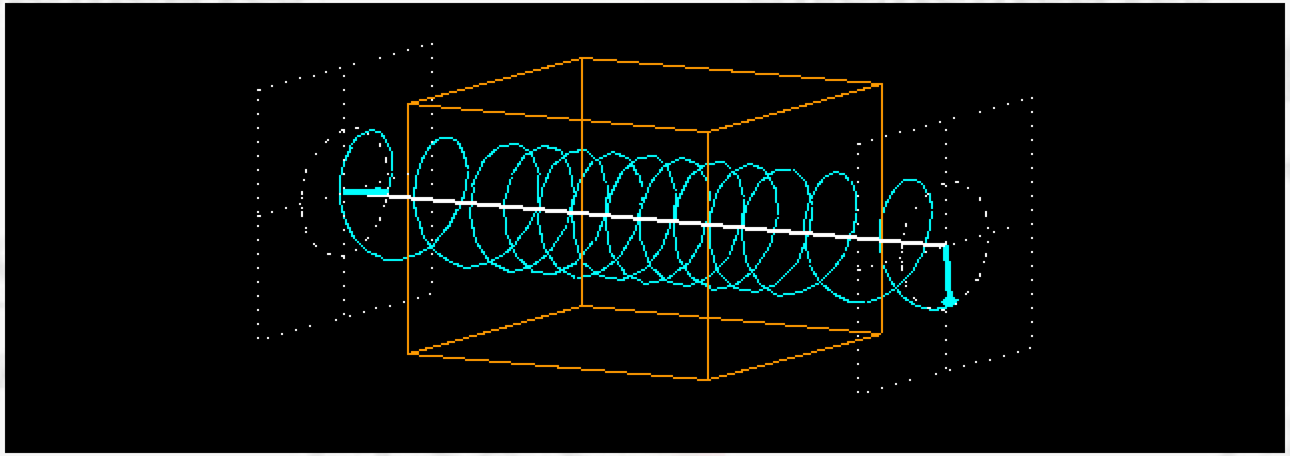


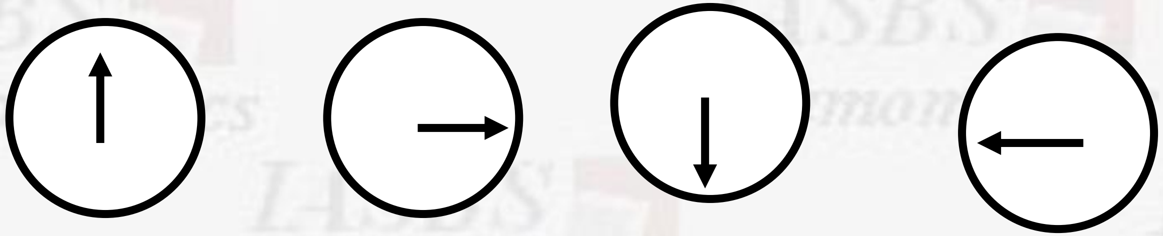
θ=0 → **plane**

θ=45 → **circular**

$$\theta = bck\left(\varepsilon_l - \varepsilon_d\right)$$

Circular polarized light;





Production of circularly polarized light:

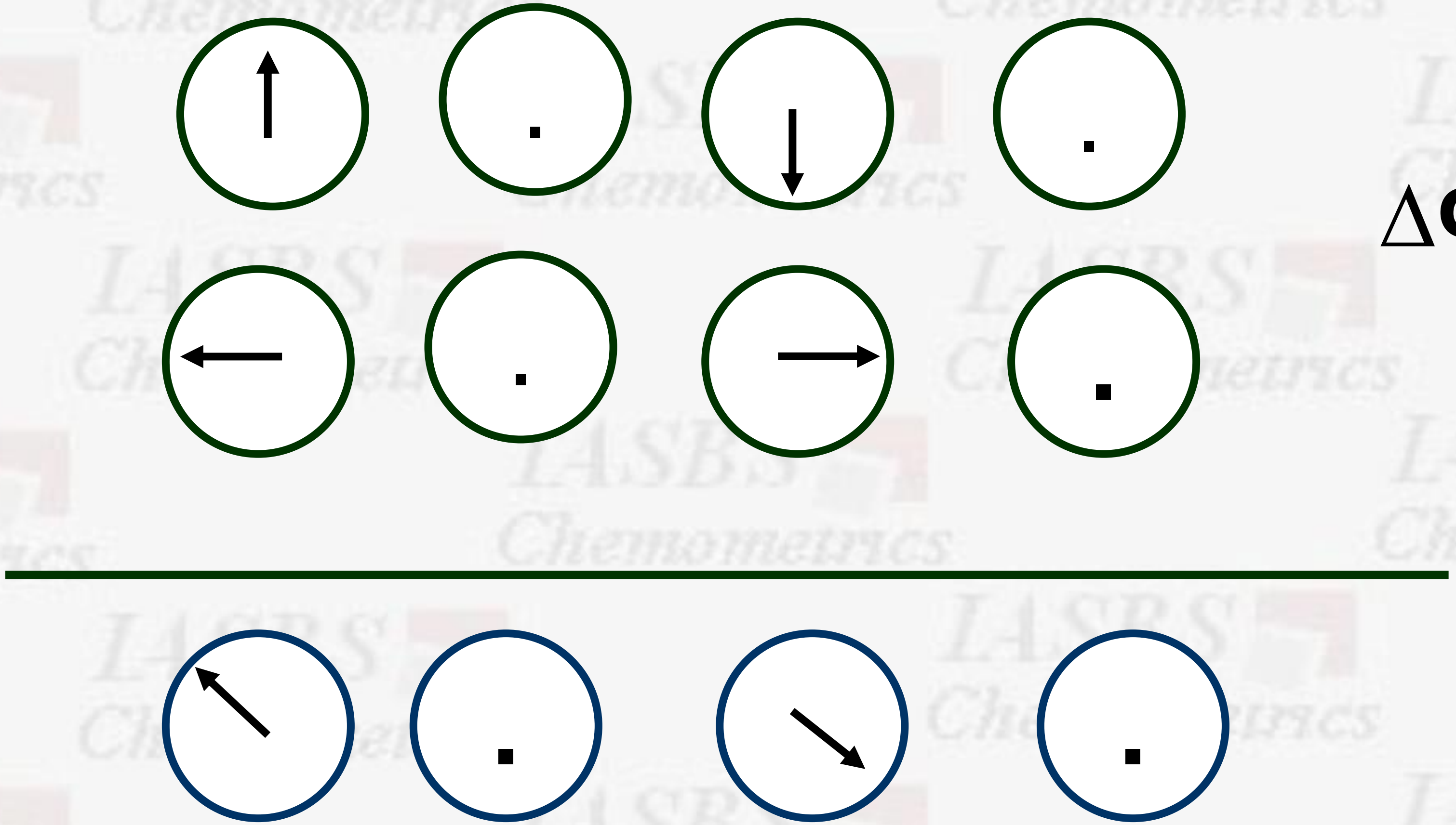
a devise that produces a polarized light from

Normal polarized light is known as polarizer

By means of

1. linear dichroism
2. Reflection
3. Scattering
4. Double refraction

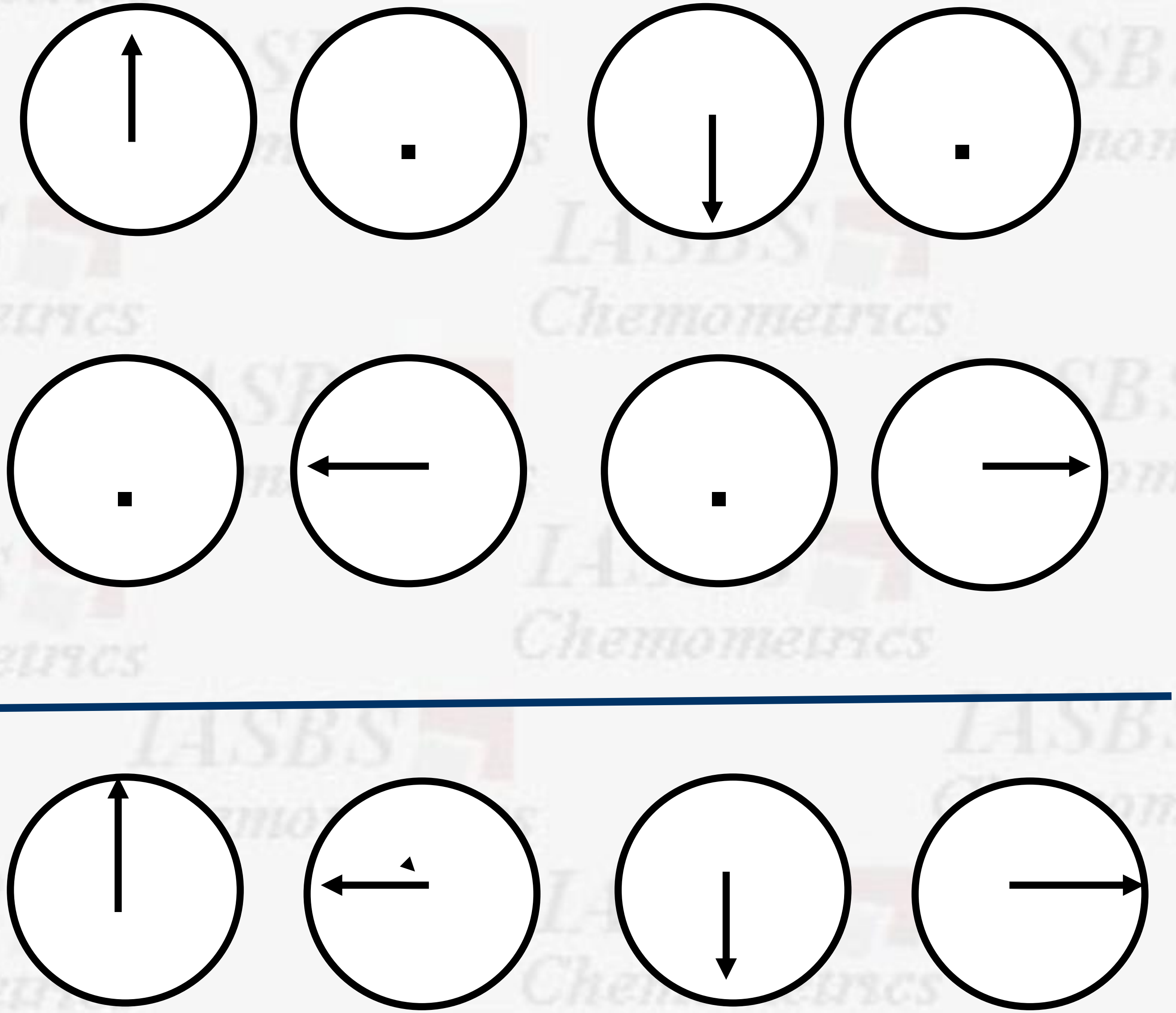
Retarder plate ?



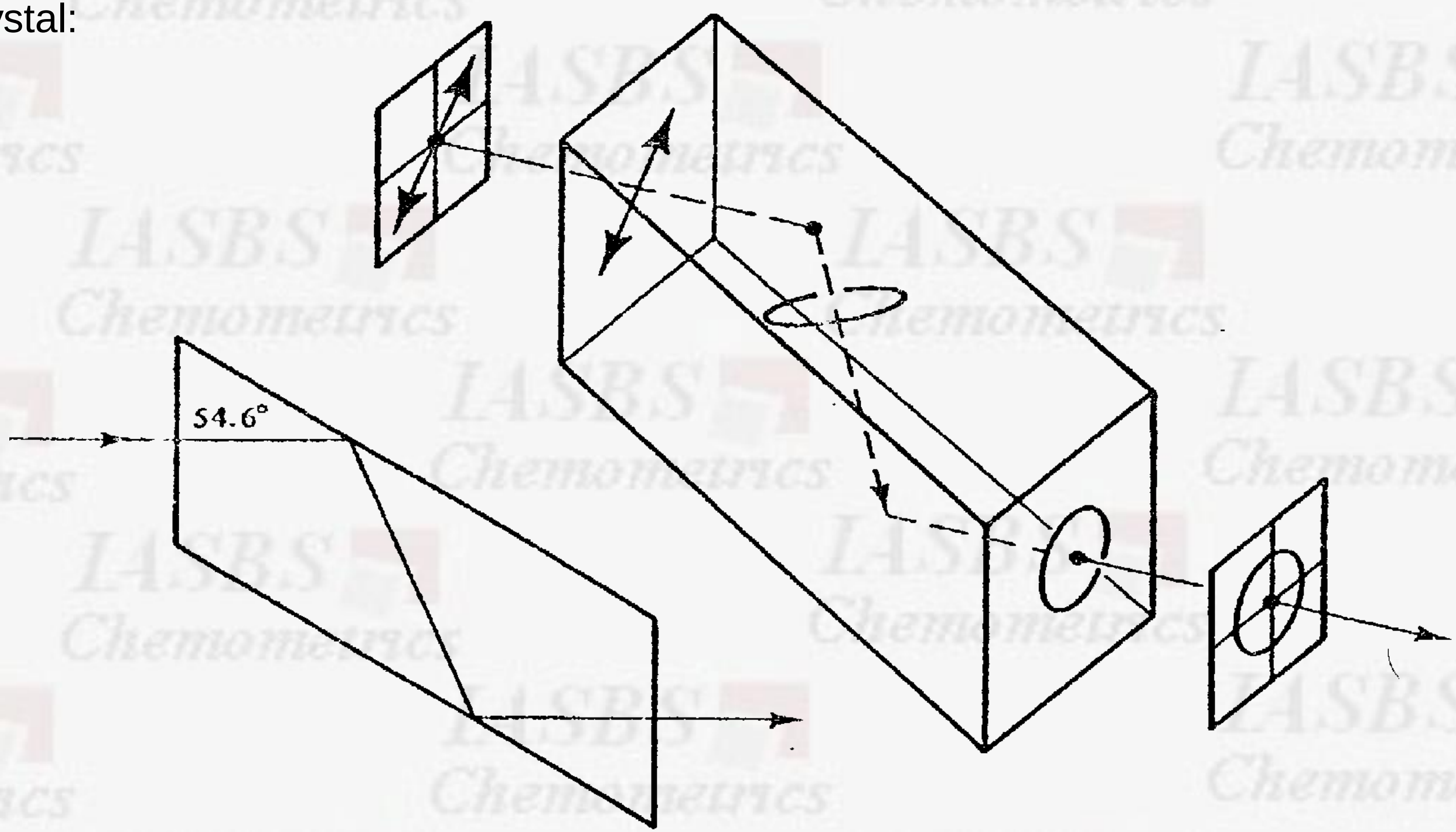
$\Delta\Phi^{\circ}=0$

If two plane polarized wave with no phase difference interfered then construct one polarized wave .

$\Delta\Phi° = \Pi/2$



Rhomboid Crystal:



An internale reflection introduces phase difference between to perpendicular component of light and produces polarized light.

Polarized light

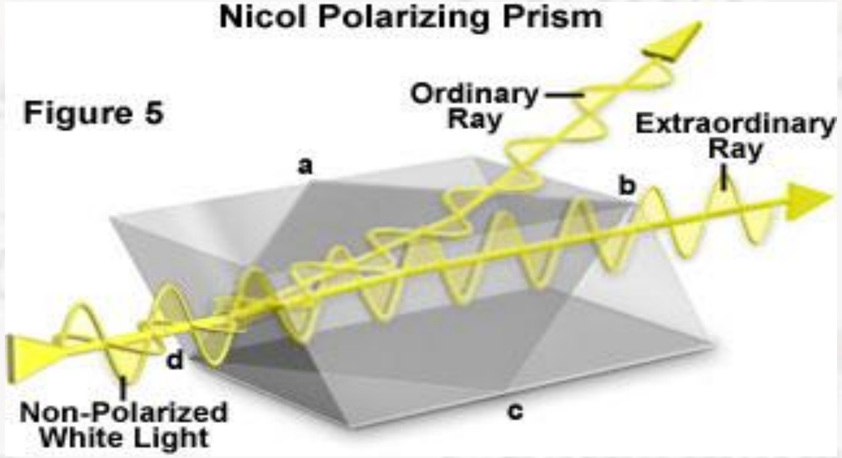
1-polarizing by polarizing prism

2-polarizing by reflection

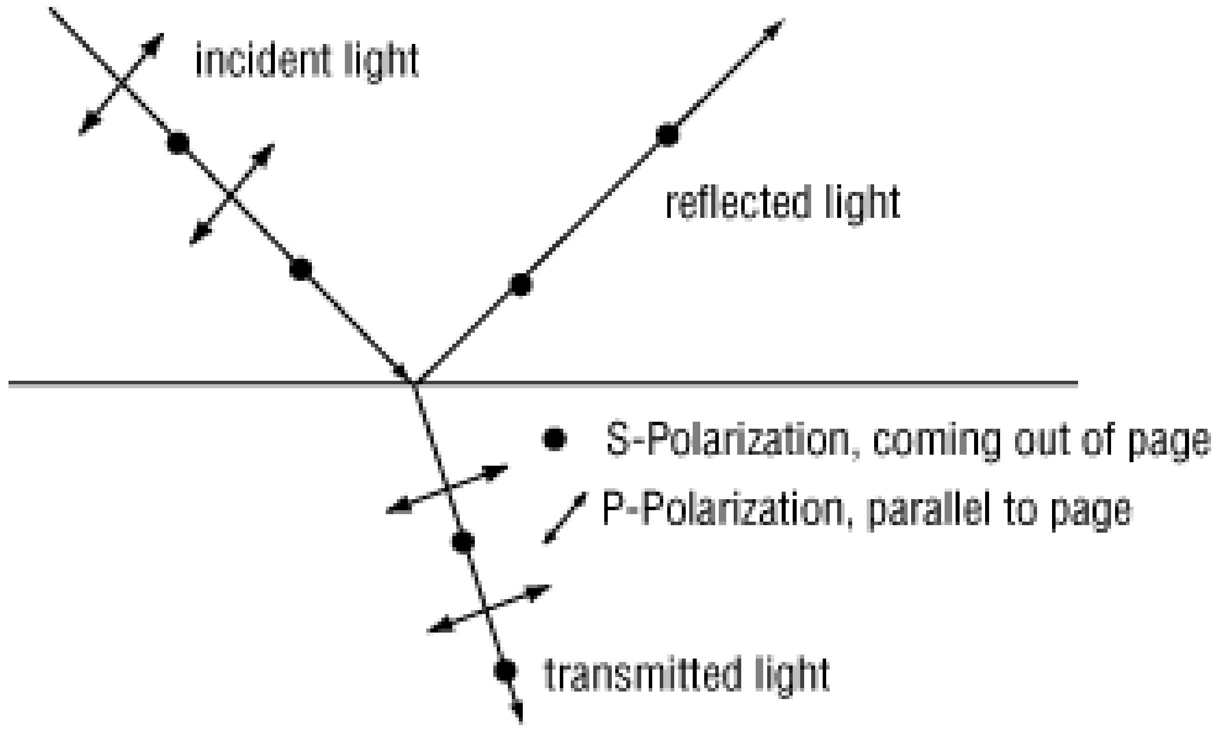
3-polarizing by refraction

4-polarizing by Scattering

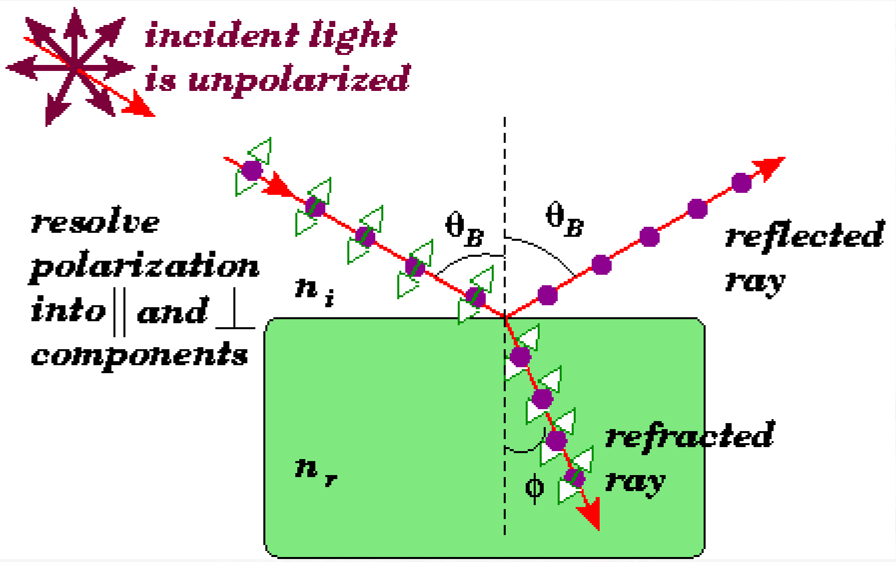
Polarization by Use of a Polarizing prism;

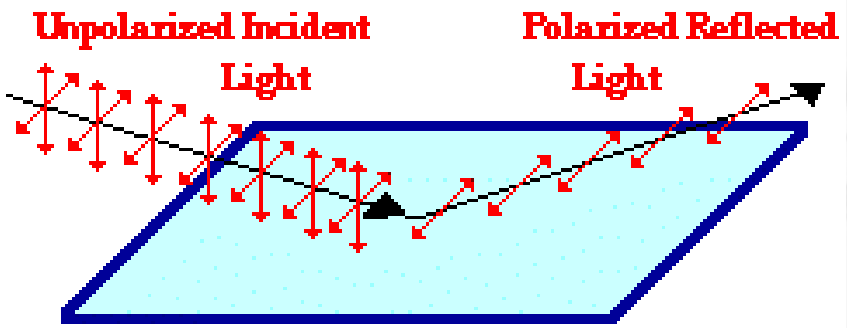


Polarization by reflection. Prependicular component of light will not reflect
By polaro sheet



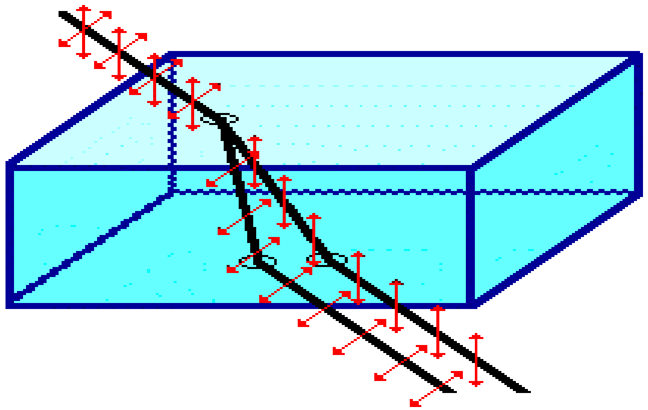
Polarization by Reflection;





Reflection of light off of non-metallic surfaces results in some degree of polarization parallel to the surface.

Polarization by Refraction;



The two refracted rays passing through the Iceland Spar crystal are polarized with perpendicular orientations.

بنام خدا

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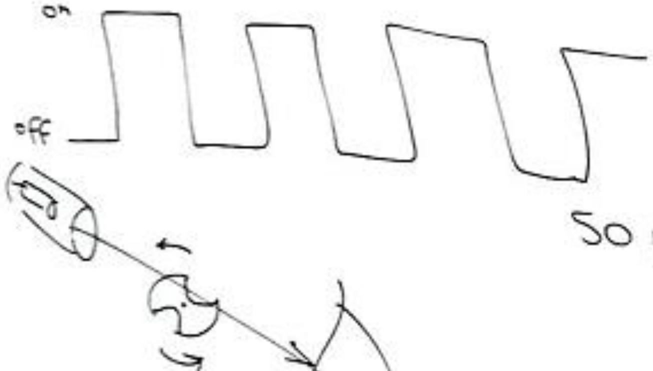
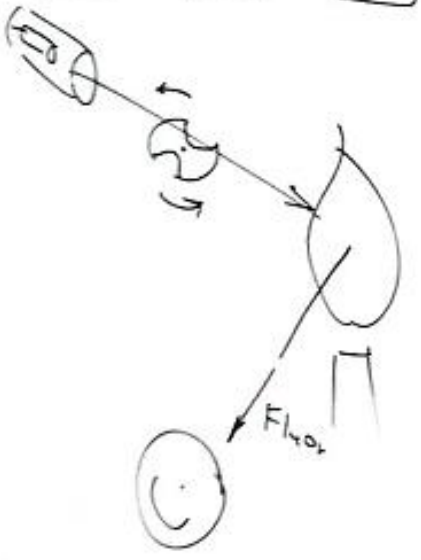
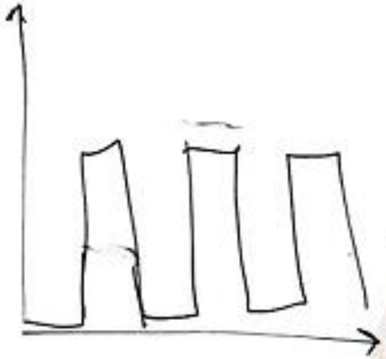
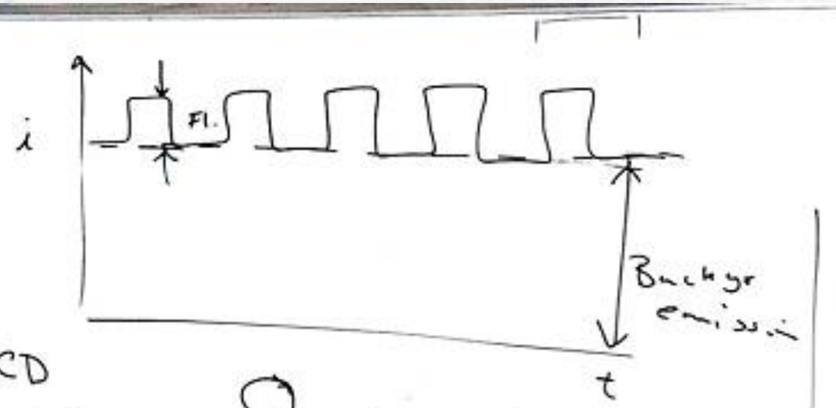
Modulator

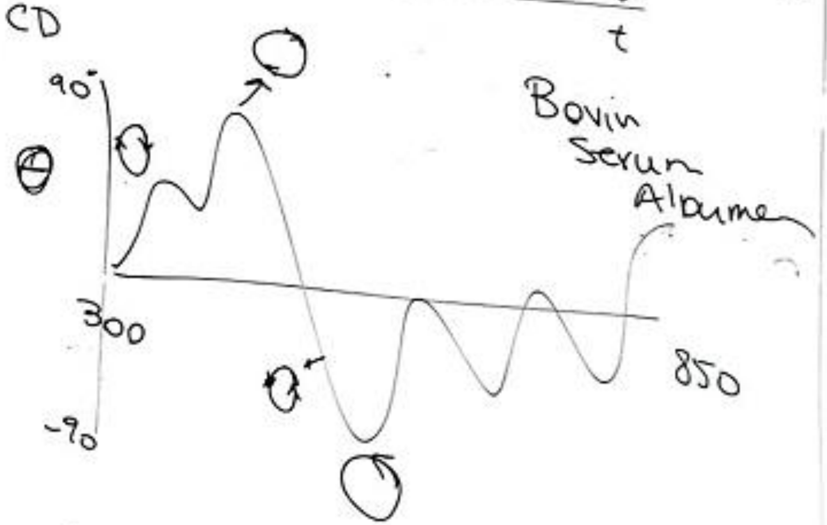
Chopper



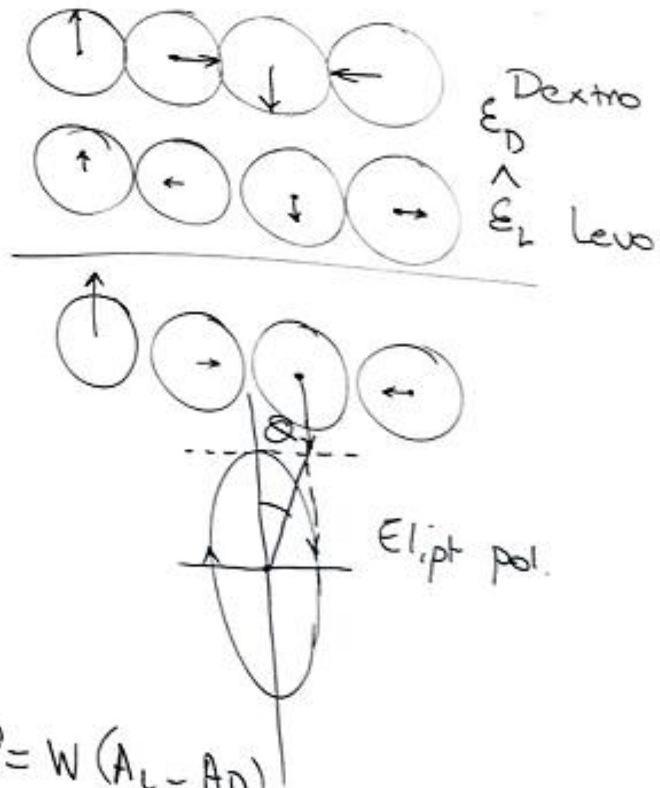








CD Circular Dichroism



$$\theta = W(A_L - A_D)$$

$$= W(\varepsilon_L bc - \varepsilon_D bc)$$

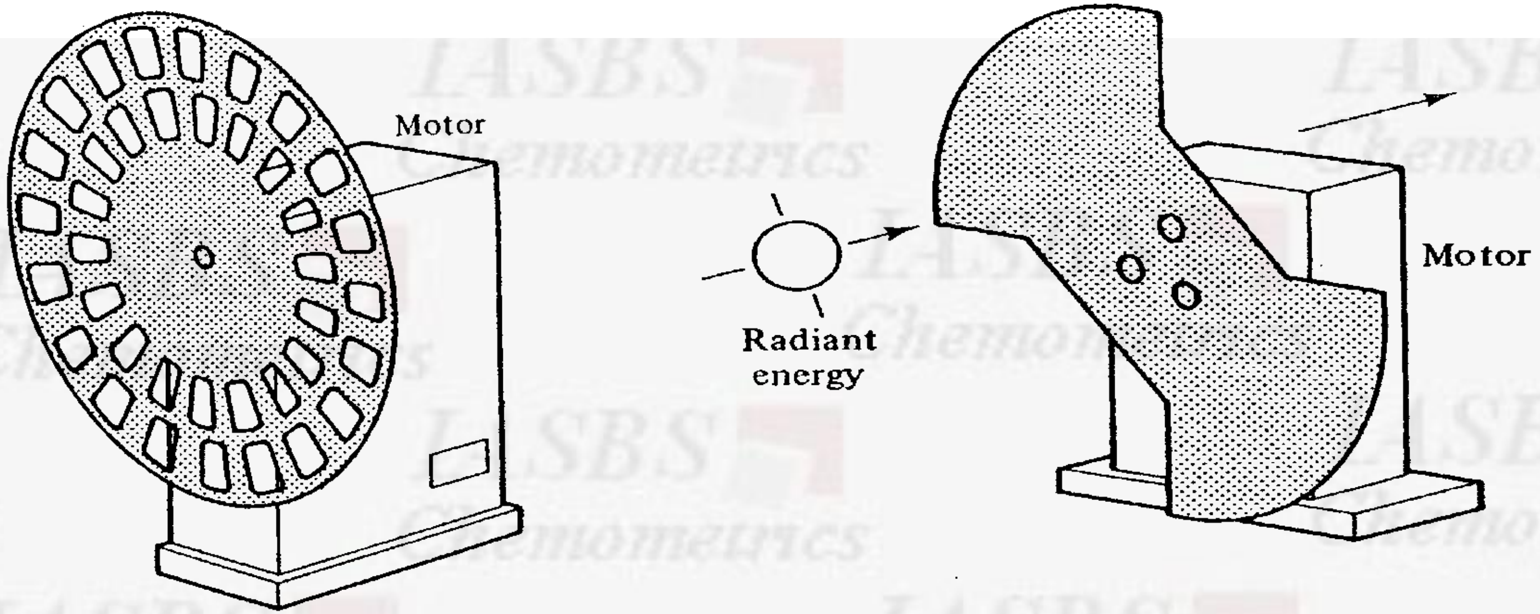
$$= \omega\, bc\, (\varepsilon_L - \varepsilon_D)$$

$[\theta]$

3. Modulators

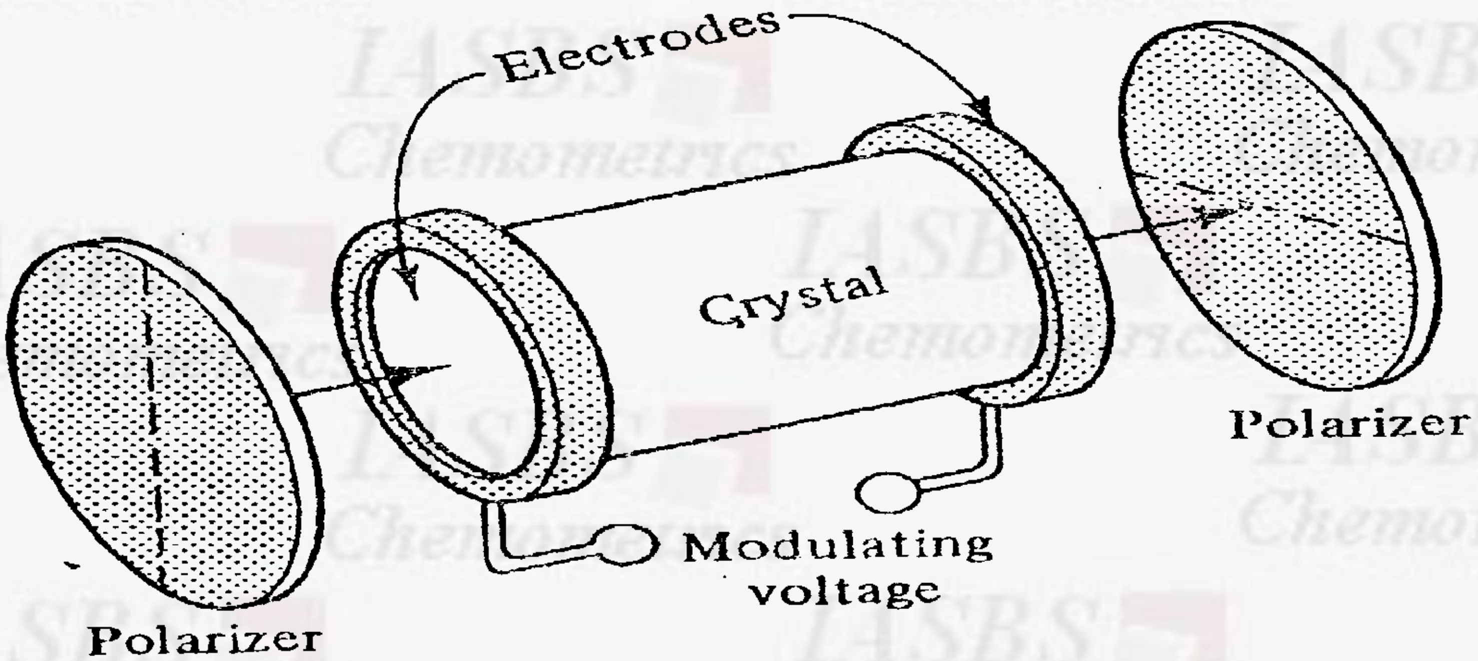
- Mechanical (Chopper)
- Electro optic
- Magneto optic
- Acousto optic

Several types of optical devices are used to amplitude modulate radiation
Source .modulation mechanical or magneto optic
Or electro optic or acousto optic interuption of light beam.

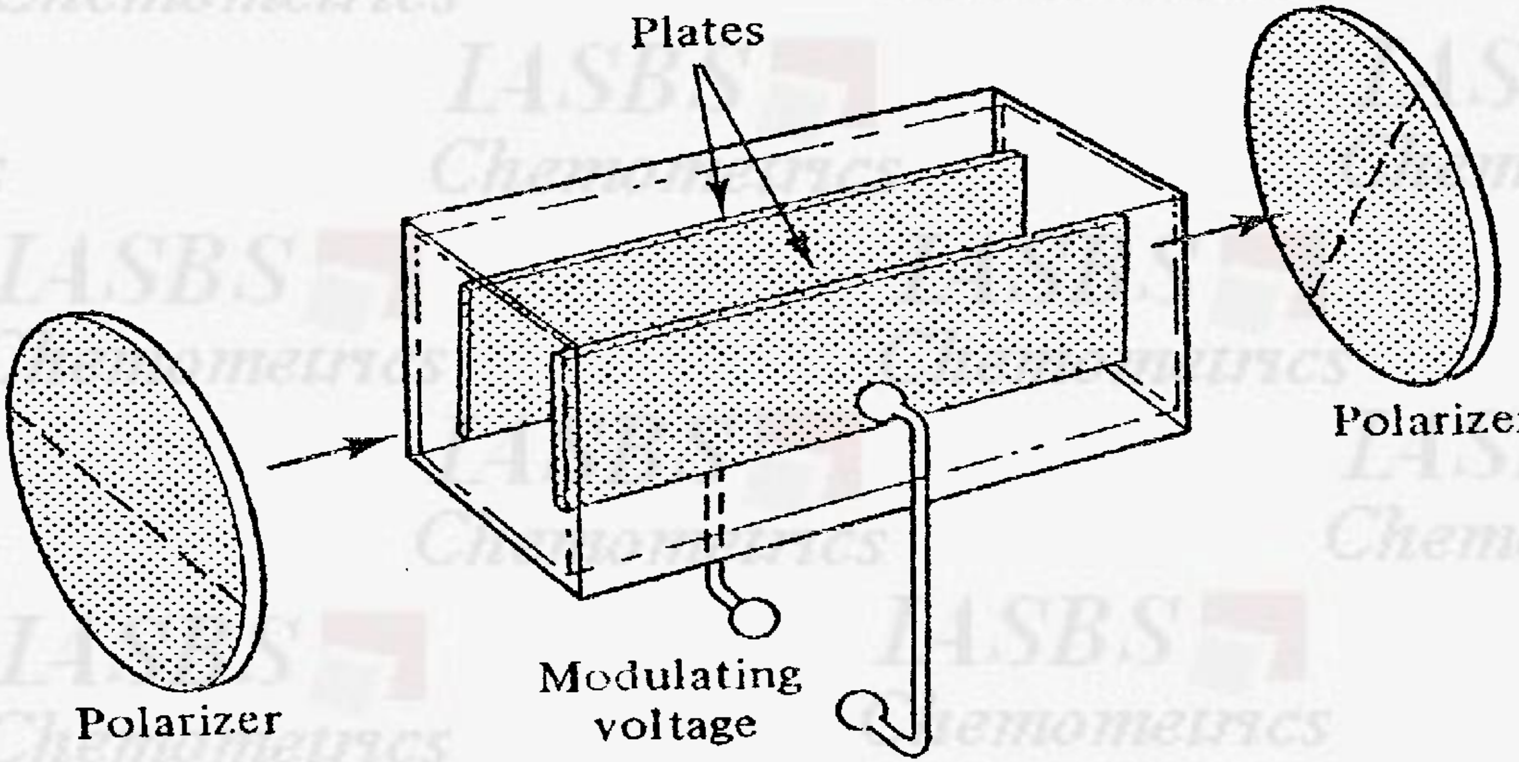


Two mechanical choper

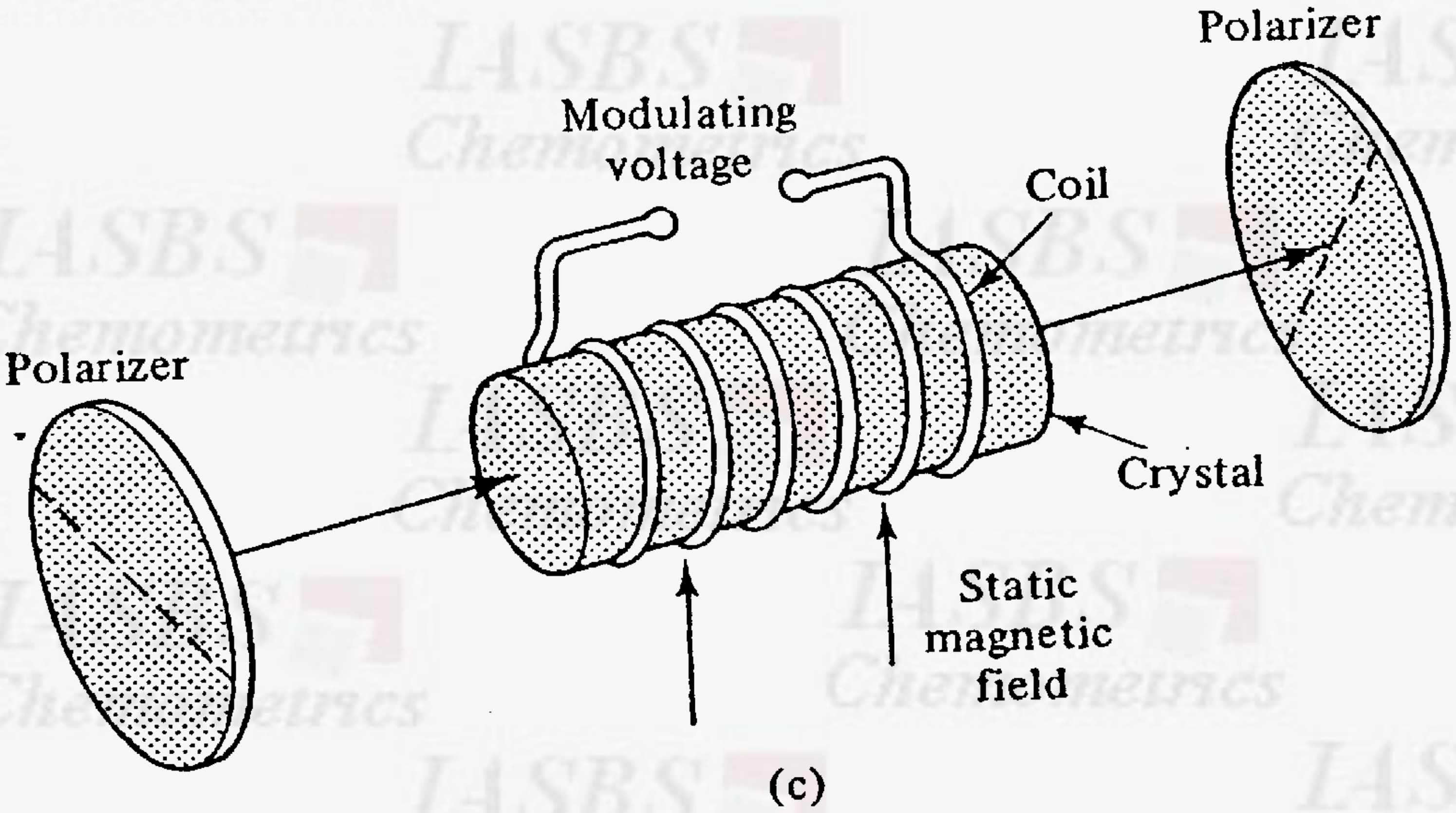
In some aplications it is only necessary to block or unblock a radiation beam at Certain time in experiment(for example to determine dark current)



Electro optic modulator



Electro optic modulator



Magneto optic modulator

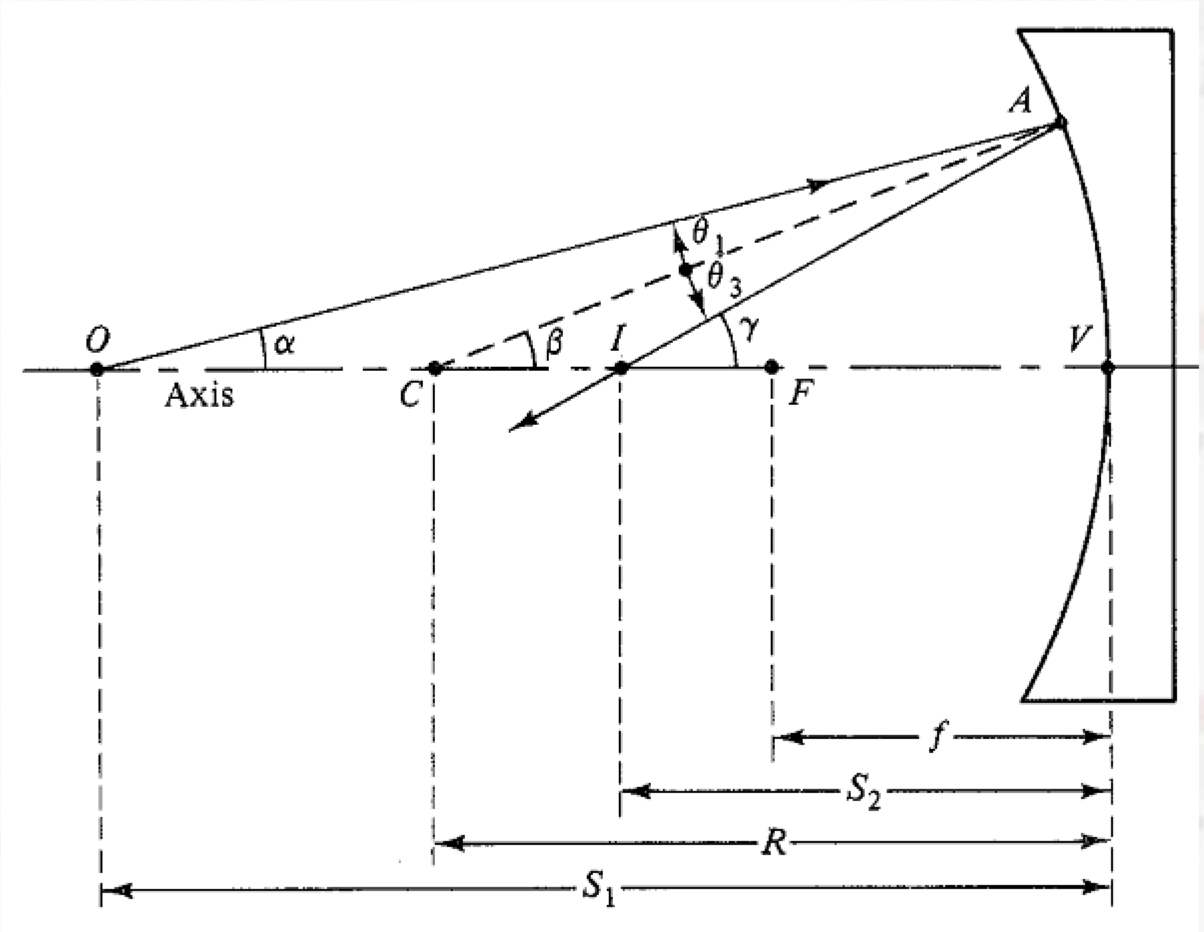
3.4 Image and beam direction optics

Imaging optics

- Mirrors
- Lenses
- Focusing elements (Collecting)

Mirrors:

(UV to IR)
- **Coating behind** glass (Ag), old fashion
- Front surface (Vacuum evaporation of Al + SiO_2 protection → 99% reflection)



$$\frac{1}{S_1} + \frac{1}{S_2} = \frac{-2}{R} = \frac{1}{F}$$

+ real
- virtual

(+) convex
(-) concave

S1 → ∞ ➔ S2 → F

Obj → F ➔ Image→ ∞