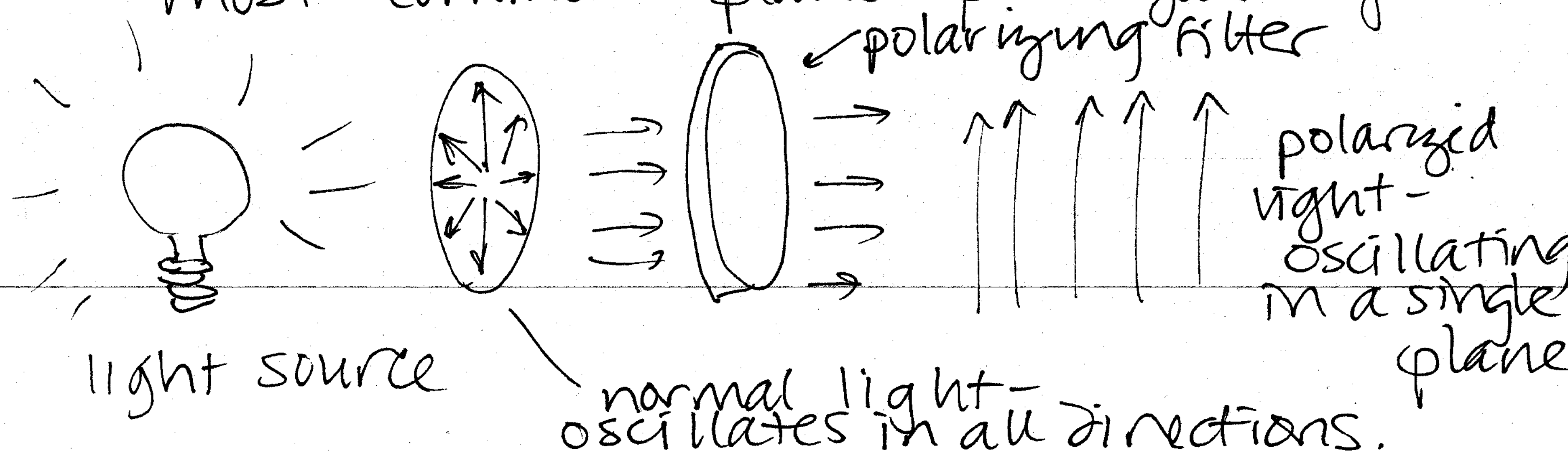
Properties of stereoisomers

* pairs of enantiomers have <u>identical</u> physical properties (mp, bp, n_D, density)

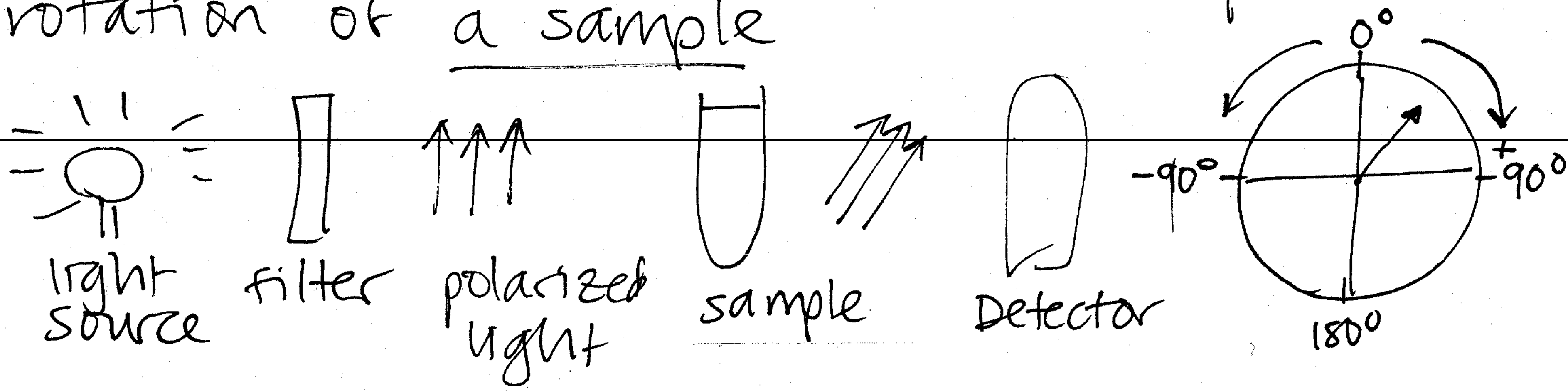
* pairs of diastereomers have <u>different</u> physical properties.

so how can we tell enantiomers apart? Look at how they interact in a chiral environment.

most common - plane - polarized light.



We use a polarimeter to measure optical rotation of <u>a sample</u>



If the sample is <u>achiral</u> it will not interact w/ light - 0° rotation.

1. molecules themselves are achiral.
2. sample is <u>racemic</u> — contains equal amounts of the two enantiomers.

* There is no correlation between R/S and +/- But - if the R enantiomer rotates +8.37°, the S will rotate -8.37°. The number is the same.

specific rotation: $[\alpha] = \frac{\alpha}{c\,l}$ ← observed rotation

c → g/mL

l → pathlength in dm (usually 1)

If the sample contains both enantiomers in unequal amts, describe it by % ee (enantiomeric excess)

ex. 50% ee ≡ 50% of the sample is enantiomerically pure
50% is racemic

⇒ 75% of one, 25% of the other

$$\%\,ee = \frac{[\alpha]_{obs.}}{[\alpha]_{pure}} \times 100\%$$

20% ee = 20% (R) + 80% racemic
⇓
40% R + 40% S

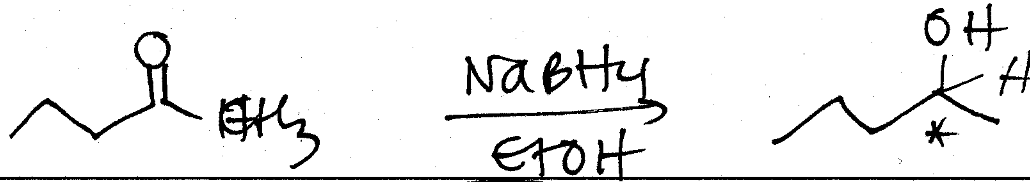
Example:

$[\alpha]_{obs.} = +1.151$

$[\alpha]_{pure\ R} = +5.756$

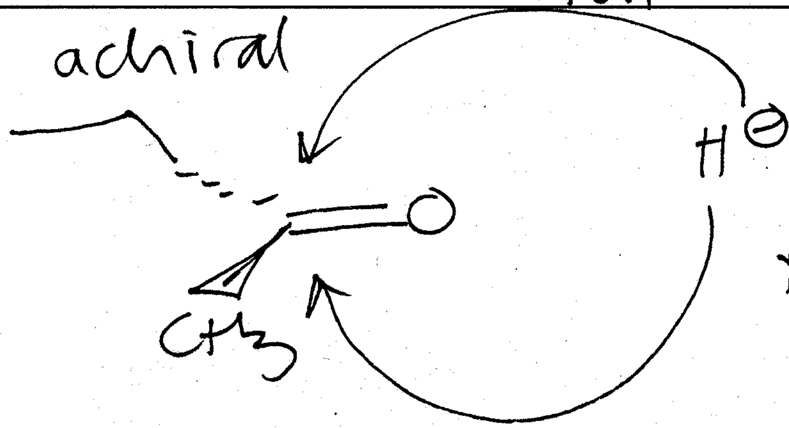
$\frac{+1.151}{+5.756} \times 100\% = 20\%\ ee$ ⇒ 60% R, 40% S

Synthesis of Chiral Molecules



racemic mixture.

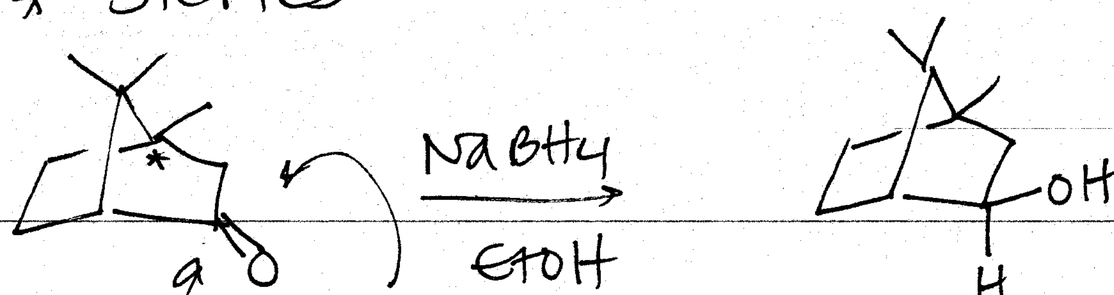
achiral



no difference ⇒ 50/50 mix

Enantioselective synthesis - achiral precursor but one enantiomer is favored.

* enzymes
* sterics



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