Optics & Refraction

- electromagnetic spectrum : 390nm &760nm.
- focusing power is : 2/3 cornea & "air/tear" interface : fixed power
  1/3 lens : power increases with accommodation
- Power of lens = 1/meters … +ve in convex & -ve in concave
- ***Emmetropia*** —> parallel rays focus on the retina with the eye at rest "not accommodating"
- ***Ametropia*** —>parallel rays are not // // // // … It's simply "***refractive error***".

1) Hypermetropia:
   -short eyeball, less powerful eye's optical system, normal at birth
   - accommodate with distant gaze, use ***Convex lens***
   - symptoms : Eye-strain, Redness, Headaches/ later, blurring of text
   - Complication: Angle-closure glaucoma

2) Myopia:
   - long in length , more powerful system
   - 10s-30s , with keratoconus,
   - Complications : retinal tear or detachment, macular hole, and open angle glaucoma.
   - use ***Concave lens***

3) Astigmatis
   - non spherical shape of cornea or lens —> different points of focus —> difficult to see fine details
   - Corrected with a ***cylindrical lens*** or refractive eye surgery.

- Accommodation —> Near focusing of the eye:
  - Ciliary muscle contraction —> zonules relax —> lens more spherical,thick and globular
  - Eyes converge, pupils constrict.
    - ➔ Presbyopia : normal aging process—> reduced accommodative ability —> bifocal glass

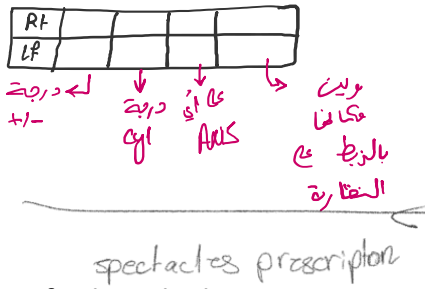
\\\ *Refractive error correction*

1) Contact lenses
   - ➢ ***Soft, hydrophilic*** : better tolerated, less permeable to oxygen—> Optical correction+ relief of pain like in epithelial defects or bullous keratopathy
   - ➢ ***Rigid gas permeable:*** low risk of corneal damage from hypoxia + easier cleaning and offers less risk of infection + effective correction of astigmatism + Proteinaceous debris + for keratoconus

✓ Complications:
& Superficial punctate keratitis
& The tight lens syndrome(indentation and staining in the conjunctival epithelium in a ring around the cornea)
& Acute hypoxia (necrosis and endothelial blebs)
& Chronic Hypoxia (Vascularization and lipid deposition)

2) Spectacles / Refraction

- Objective Refraction:
  i. Automated refractor : quick and easy to use and require no feedback from the patient.
  ii. Retinoscopy : A series of lenses are flashed —> light reflex—> measure refractive state
- Subjective refraction
  - requires responses from the patient, u can use phoropter



3) Refractive surgery

- ✓ ***PRK*** : PhotoRefractive Keratectomy —> on epithelium, healing ; pain for days , for low thick cornea
- ✓ ***LASEK*** : laser assisted in sub epithelial keratomileusis—>corneal flap + reshape
- ✓ ***LASIK*** : laser assisted in situ keratomileusis —> same // but different layer

- Complications Of PRK
  Overcorrection, Under correction, Corneal haze, Infection

- Complications of LASIK

Operative Complications:

- Flap complications:

1) Free flap
2) Incomplete flap
3) Button hole of the flap 4) Irregular cut
5) Epithelial defects
6) Corneal perforation

- Laser Complications:

1) De-centered ablation

Post Operative Complications:

1) Overcorrection
2) Under correction
3) Infection
4) Epithelium in-growth under the flap