FUNDAMENTAL VISUAL FUNCTIONS

1) Sensitivity
   a) Scotopic vs Photopic vision
      i) Scotopic
      ii) Photopic
   
   b) Dark adaptation
      i) Moving from light to dark
      ii) Chemical cycle of regeneration of rhodopsin
   
   c) Purkinje shift
      i) Rods react best to light of ~ 500 nm (blues)
      ii) Cones react best to light of ~550 nm (greens)
      iii) As vision shifts from photopic (cone) to scotopic (rod) vision, the sensitivity to different light wavelengths changes
      iv) Light at 500 nm (blue) becomes more bright (perceptually), and light at 550 nm (green) becomes less bright
d) Red light for dark adaptation

e) Thresholds

i) Absolute thresholds
   (1) ~0.000001 mL

ii) Ricco’s Law
   (1) $C = A \times I$

iii) Bloch’s Law
   (1) $C = T \times I$

iv) Flicker
   (1) CFF: critical flicker frequency
2) Acuity

   a) Types
      i) Detection
      ii) Vernier
      iii) Resolution
      iv) Recognition
      v) Dynamic

   b) Visual angle
      i) As an object moves away, it needs to get bigger to maintain the same level of acuity (up to a point)
      ii) Formula (large angles)
      iii) Formula (small angles—most vision purposes)
      iv) Thumb example
c) Eye charts

i) Define: normal = 1 minute of arc is the minimum visual angle for recognition acuity

ii) 1 minute = 1/60 of a degree = 0.0167 degree

iii) ?? minimum size at 1 meter ??

\[ \tan \theta = \frac{S}{D} \]
\[ \tan 0.167 = \frac{S}{100 \text{ cm}} \]
\[ 0.00029 = \frac{S}{100} \]
\[ S = 0.03 \text{ cm, or } 0.3 \text{ mm} \]

iv) Note: this is not the size of the letter, but rather the minimum thickness of the lines that make it up.

v) Snellen acuity

1) 20/20 defines “normal”

2) 20/200 defines legally blind

3) Eye movements

a) Saccades

i) See also fixations and regressions

b) Pursuit movement

c) Vestibulo-ocular movements

d) Vergence movements

e) Miniature eye movements

f) Mixed-mode
4) Temporal factors in vision
   
a) Note Bloch’s Law
   
b) Masking
      
i) Forward masking
      
ii) Backward masking
      
iii) Saccadic omission
   
c) After effects
      
i) Brief stimulus
      
ii) Prolonged stimulus
      
iii) Tilt after effect
      
iv) Curvature after effect
      
v) Note: Color after effects discussed next section