ESTIMATION OF FLICKER FUSION THRESHOLD OF PHOTORECEPTOR CELLS OF THE HUMAN EYE

Equipment:

Perimeter

Course of the practical:

I. Preparing the perimeter:

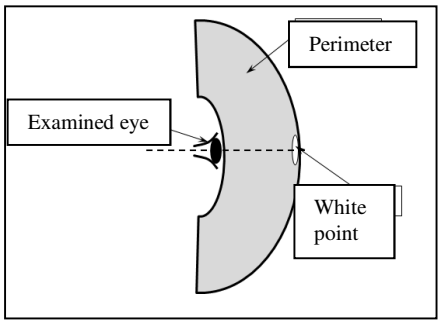
a. take a comfortable sitting position in front of the perimeter,
b. set the perimeter in front of the eyes (the perimeter's slit must be placed on the height of eyes of the student),
c. turn on the frequency generator using the button „**POWER**" (the display unit will shine).

II. Course of measurements:

1. examination of the right eye for the green light
a. put the diode into the metal socket connected with a cable to silver plug.

b. put the socket with a diode on the white point (white dot) on the back side of the perimeter using a magnet. In such a position of the diode the examination will be done for the angle equal to 0^0 ,

c. lean your forehead against the upper edge of the perimeter to put the right eye on the line connecting the eye to the white dot on the back side of the perimeter (such as on the scheme on the right),



d. close your untested eye,

e. turn the button „**FREQUENCY**" on the generator slowly to the right to increase the frequency of diode flickering until the "critical value", when the flickering is disappearing and your right eye is seeing a constant light beam emitted by the diode, is reached.
Write down this „critical value of the frequency" measured in Hertz [Hz] to the Table 1 of the practical's final report sheet,

f. repeat the procedure described in the point 1 b - e for positive and negative angles, until the diode is disappearing from your vision field. Write down the „critical values of the frequency" measured in Hertz [Hz] for each angle to the Table 1 of the practical's final report sheet.

h. repeat all the measurements described in the point 1 b – e for second student.

After having finished the examination of both eyes for the green light ask the tutor to choose another diode that emits light other than green (red, yellow or blue). Repeat the measurements for both eyes described in the point 1 for the tutor's chosen diode. Write down the results to the Tables 1.

III. Presentation of the results:

1. Calculate the time resolving power of an eye as a reciprocal of the „critical value of the frequency".
2. Plot on a sheet of a plotting paper:
    a. relationship between the „critical value of the frequency" (y axis) and the angle of a position of a source of a flickering light (x axis) for both eyes and applied colours.
    b. relationship between the time resolving power of an eye (y axis) and the angle of a position of a source of a flickering light (x axis) for both eyes and applied colours.
3. On the basis of obtained plots draw logical conclusions and answer the two questions below the Table 2 on the practical's final report sheet.

Required knowledge:

1. Distribution of photoreceptor cells in retina.
2. Photoreceptor cells: rods and cones. Structure and function.
3. Channel proteins in the cell membrane of the outer segment of a rod.
4. Ion currents flowing through the membrane of a rod „in darkness".
5. Mechanism of generation of electrical signals in rods.
6. Frequency of summation of electrical signals in cones and rods.
7. What is the "critical frequency" of a light stimulus ?
8. What is the "time resolution" of photoreceptor cells ?
9. Sensitivity of photoreceptor cells on different wavelengths of visible light.
10. Relationship between the „critical value of the frequency" and the angle of a position of a source of a flickering light.

Required literature:

1. L. Stryer „Biochemistry"

Wroclaw Medical University Department of Biophysics and Neuroscience	**Practical No 6** **Estimation of flicker fusion threshold of photoreceptor cells of the human eye**
…… ……..…...…….. ……. Names of students	Faculty: …….. Group No: …….……. Date: …….……..
Grade:	Tutorial signature

Table no 1.

	Student (I)……..				Student (II)……..			
Angle [^{o}]	Right/left eye				Right/left eye			
	green light		tutor's chosen light		green light		tutor's chosen light	
	$f[Hz]$	$\frac{1}{f}[ms]$	$f[Hz]$	$\frac{1}{f}[ms]$	$f[Hz]$	$\frac{1}{f}[ms]$	$f[Hz]$	$\frac{1}{f}[ms]$
0								
20								
40								
60								
80								
-20								
-40								
-60								
-80								

Give short written answers to the following questions:

1. Why does the critical value of the frequency decrease when the angle of a position of a source of a flickering light is rising?

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2. Why does the colour of light influence the time resolving power of an eye?

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