

# Determination of the human visual field

 (Item No.: P4070200)

## Curricular Relevance

**Area of Expertise:**  
Biology**Education Level:**  
University**Topic:**  
Human Physiology**Subtopic:**  
Visual Sense**Experiment:**  
Determination of the human visual field**Difficulty**

Easy

**Preparation Time**

10 Minutes

**Execution Time**

1 Hour

**Recommended Group Size**

2 Students

**Additional Requirements:****Experiment Variations:****Keywords:**

Perimeter, Visual field (for white, blue, red, green), Field of view, Blind spot, Scotoma, Rods and cones

## Overview

## Principle

Determination of the visual field of the right and left eye for white, blue, red and green. Detection of any visual field deficiency (scotoma). Location of the blind spot (site of optic nerve emergence). The extent of the visual fields of both eyes and the position of the blind spot are determined with the aid of a perimeter.



Fig. 1: Experimental set-up

## Equipment

Position No.	Material	Order No.	Quantity
1	Perimeter, diameter 60 cm	65984-00	1
2	Support rod, stainless steel, 500 mm	02032-00	1
3	Bench clamp PHYWE	02010-00	1
4	Boss head	02043-00	1
5	Protractor scale with pointer	08218-00	1
6	Stand tube	02060-00	2
7	Support base, variable	02001-00	1
8	Table top on rod	08060-00	1

## Tasks

Determination of the visual field of the right and left eye for white, blue, red and green. Detection of any visual field deficiency (scotoma). Location of the blind spot (site of optic nerve emergence). The extent of the visual fields of both eyes and the position of the blind spot are determined with the aid of a perimeter.

## Set-up and procedure

### Set-up

- The perimeter is attached to the edge of the workbench using a bench clamp, rod, stand tube and right-angle clamp so that the opening points towards a window (Fig. 1 ).
- The pointer is screwed into the stand tube (without touching the perimeter holding rod) vertically upright and locked with the milled nut.
- The protractor scale is put onto the perimeter holding rod, adjusted so as to be exactly horizontal and fixed firmly in place with the milled screw.
- The table top is attached to the support base by means of a stand tube and its height is adjusted so that the eye to be tested is exactly in the centre of the perimeter.
- As a check, the perimeter is rotated once through  $360^\circ$ . The protractor scale should rotate at the same time and the perimeter must not strike against the bench or the headrest. The perimeter is then reset to the horizontal position.

**Procedure**

- The test subject should sit so that his/her head can be kept still on the headrest for long periods without moving (adjust the chair height if necessary). The inside centre of the perimeter must be fixed by the tested eye throughout the experiment. A white marker is attached to the perimeter inside centre as an aid to fixation with the eye. The other eye must be kept closed during the experiment. The experimental assistant moves the white or coloured fixation markers across the visual field by means of a magnet applied to the outside of the perimeter.
- A white fixation marker is first moved slowly from the periphery towards the centre of the inside perimeter surface until the test subject just perceives it (always fixing his/her gaze on the centre). The value is read from the scale on the outside surface of the perimeter and is entered into the circular coordinate system (Fig. 2).

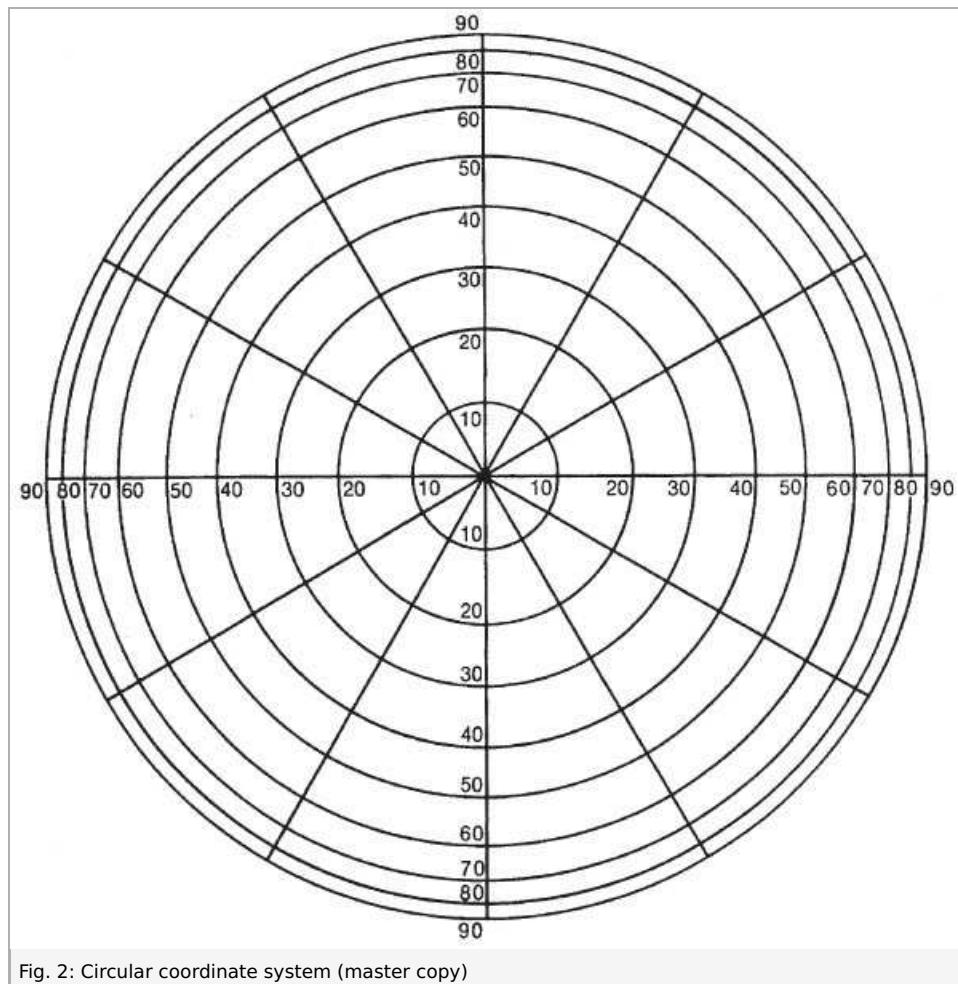


Fig. 2: Circular coordinate system (master copy)

- The measurement is repeated in  $30^\circ$  steps (read from the protractor scale) until the visual field is fully mapped. The visual field of the other eye is then mapped in the same way.
- Without telling the test subject, the experiment is repeated with blue, red and green markers (change the colours often). The test subject should say when he/she can just see the colour of the marker (an impression of a colourless, greyish marker is always perceived much earlier).

## Result and evaluation

### Results and evaluation

- The part of the surroundings perceived with an unmoved eye is called the visual field. In contrast, the field of view is that part of the surroundings perceived by the eyes when allowed to move freely but without moving the head.
- Depending on the uneven distribution of rods and cones in the retina (only cones in the centre and only rods at the periphery, with mixed rods and cones in between), the size of the visual field varies with the colour of the test object. The visual field is greatest for white, followed by the visual fields for blue, red and green (Fig. 3; blind spot shown as a black spot). Due to the nose and cheeks, the visual field has a slightly indented, asymmetrical shape. The horizontal extent of the visual field is about 180° for white.

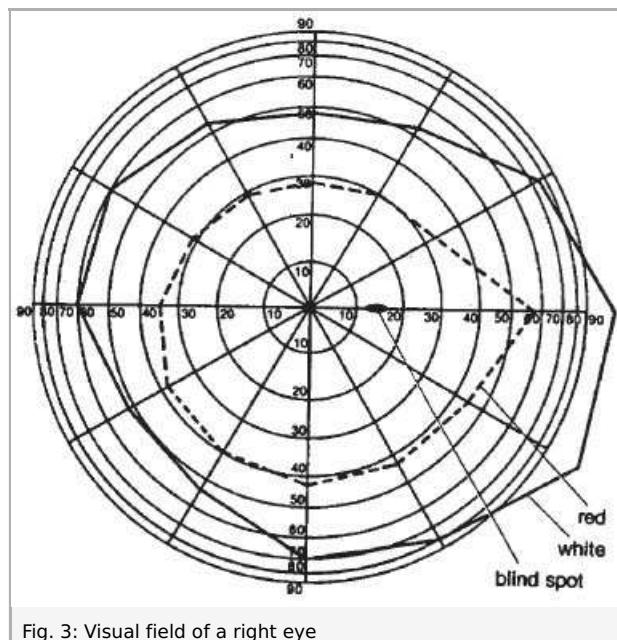


Fig. 3: Visual field of a right eye