

The City University  
COLOUR VISION TEST

Second Edition, 1980

by

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**CITY UNIVERSITY COLOUR VISION TEST (2nd Ed. 1980)**

Address ..... Patient .....

Examiner ..... Male/Female      Date ...../...../199 .....

Spectacles worn? YES/NO      RE/LE/BE

illumination ("Daylight")      Type ..... level .....

**FORMULA:** Here are 4 colour spots surrounding one in the centre. Tell me which spot looks most near in colour to the one in the centre. Use the words "TOP", "BOTTOM", "RIGHT" or "LEFT". Please do not touch the pages.

	PAGE (A is for demonstration)	SUBJECT'S CHOICE OF MATCH			NORMAL	DIAGNOSIS		
		R	L	Both		PROTAN	DEUTAN	TRITAN
"CHROMA FOUR"	1				B ↙	R	L	T
	2				R ↘	B	L	T
	3				L ↘	R	T	B
	4				R ↘	L	B	T
	5				L ↘	T	B	R
	6				B ↙	L	T	R
"CHROMA TWO"	7				L ↘	T	R	B
	8				R ↘	L	B	T
	9				B ↙	L	T	R
	10				T ↗	B	L	R
AT CHROMA FOUR					/6	/6	/6	/6
SCORE AT CHROMA TWO					/4	/4	/4	/4
OVERALL					/10	/10	/10	/10

Probable type of Daltonism      P; PA, EPA      MIXED  
D, DA, EDA  
TRITAN

### EXAMPLE OF SCORING

	PAGE (A is for demonstration)	SUBJECT'S CHOICE OF MATCH			NORMAL	DIAGNOSIS		
		R	L	Both		PROTAN	DEUTAN	TRITAN
"CHROMA FOUR"	1	B			(B) ↘	R	L	T
	2	L			R ↗	B	(L)	T
	3	L			(L) ↗	R	T	B
	4	R			(R) ↗	L	B	T
	5	B			L ↗	T	(B)	R
	6	T			B ↘	L	(T)	R
"CHROMA TWO"	7	L			(L) ↗	T	R	B
	8	B			R ↗	L	(B)	T
	9	T			B ↘	L	(T)	R
	10	T			(T) ↘	B	L	R
SCORE AT CHROMA FOUR		3/6			/6	3/6		/6
SCORE AT CHROMA TWO		2/4			/4	2/4		/4
OVERALL		5/10			/10	6/10		/10

Probable type of Daltonism    P, PA, EPA    MIXED  
D, DA, EDA    TRITAN

**Notes:-** The subject is clearly deuteranomalous. It is surprising that his "chroma two" record contains two normal responses since pages 7 and 10 are often found to be as sensitive as 8 and 9, or even a little more so. The subject makes extensive mistakes on most other tests but is actually a successful research chemist. On most considerations he would be over the minimum number of errors, going by this record.

A typical case of acquired deficiency such as a slight detachment of the central retina in one eye can be normal in one eye but reveal 5 TRITAN errors and 5 NORMAL choices with the affected eye.

## INTRODUCTORY NOTES AND INSTRUCTIONS

Inherited defects of colour vision, affecting about 8% of men and 0.5% of women, usually involve confusions between red, green and yellow. The "protan" defects, protanopia and protanomalous trichromatism, involve the red sensitive retinal receptors and can be distinguished from the more prevalent "deutan" conditions of deuteranopia and deuteranomaly. The milder "anomalies" are the most common forms. "Colour blindness" is a somewhat misleading term, as explained in the literature recommended. Defects of the sense for discriminating blue and yellowish colours are rare and are called "tritan" conditions; these are usually present in cases of acquired impairment of the colour sense such as may result from general or eye disease or may be a side effect of medicines. Older people may exhibit "tritan" responses caused by clouding of the lens of the eye and such a disability may be *more pronounced* in one eye.

It is possible to find a mixture of types in a person, such as responses indicative of both protan and deutan defects.

The test comprises selected paper colour samples which must be safeguarded from fading or soiling. They must not be touched. On each page, four colour samples surround a central spot and the subject must choose the one which most closely resembles the colour of the central spot. Each page provides the opportunity for a normal response – the patient identifies the "normal" spot as being the one which is identical in colour, or is most nearly similar in colour, to the central spot; that is, the best match for colour. Each page provides possible protan, deutan or tritan confusions which may be mixed with a normal response since some observers may find more than one near match on a page.

A consistent regime must be used, as described below, taking care to illuminate the test correctly.

### METHOD OF USE

1. Hold the pages about 35cm (14 inches) from the patient's eye, with the pages at right angles to the patient's line of sight.
2. Show the demonstration page "A" and say "Here are 4 coloured spots surrounding one in the centre. Tell me which spot looks most near in colour to the one in the centre. Use the words 'top', 'bottom', 'right' or 'left'. Please do not touch the pages".
3. If an absurd response is made, ensure that the task is understood.
4. Decide whether the right or left eye only, or both, should be used, indicating this on the record.
5. Show the test plates 1 to 10 in turn. To overcome memorisation, sometimes vary the order of presentation but ensure that each page is recorded on the correct line.
6. Allow about 3 seconds for each page. Defective patients may move their heads or hesitate, to try to reach a decision. More time may be allowed for the first two pages but most must be shown at the rate of 3 seconds a page.

### SCORING

Record the subject's choices for each page and later encircle the appropriate letter in the diagnosis columns. For example, if on page four the patient chooses "right" and "left", ring the "R" in the Normal column and the "L" in the Protan column.

At the conclusion, total scores can be recorded, either overall (out of ten) which is most useful, or as a fraction of six for the easier "chroma 4" and as a fraction of four for the "chroma 2" pages.

Users without experience of grades of colour deficiency may assume that the "depth" of defect is approximately indicated by the number of mistakes made.

In acquired deficiency, scores for a given eye may alter as the condition progresses or recovers; also there may be difficulty in making a decision so that two or even three "matches" on one page may emerge.

#### LEVEL OF DIFFICULTY – INTERPRETATION

The test gives a reasonable but not excessive difficulty, equivalent to the Farnsworth D15 test. It does *not* "fail" all colour defectives but only those who are likely to have a significant handicap with their colour discrimination in most industries; many mild defects of colour vision enable a range of occupations to be undertaken, despite "failure" on one of the very sensitive tests such as Ishihara or Dvorine plates.

The "chroma 2" plates are slightly harder to pass than plates 1 to 6. Therefore failure in more than two plates, particularly if these are "chroma 2" (7 to 10) suggests that the subject is borderline. Errors on more than three pages usually indicate an "unsafe" degree of deficiency. However it is often reasonable to retest and to rule out misunderstanding; ideally persons who are borderline should be more fully evaluated by an expert, using three or more tests.

Assuming that a person makes more than three errors on Ishihara plates but passes all T.C.U. pages, he is probably very slightly anomalous; an extensive failure on both tests would point to his being at the other end of a scale of deficiency and "unsafe". Between these extremes there are many grades which have to be treated in context but the general rule above may be adopted in the absence of professional interpretation.

#### CHILDREN OR MENTALLY HANDICAPPED ADULTS

A "Q-tip" pointer with a cotton wool end may assist very small children to indicate their choice on each page. If the concept of "nearest colour match" fails, point with a *covered* pen or "Q-tip" to the centre spot and seek from the patient a colour name, on his own terms. Obtain names for the colours of all the other spots, in turn, and use this information to interpret how normally the subject sees.

#### ILLUMINATION

An illumination of about 600 lux (60 lumens per square foot) should be used, which can be measured with a simple light meter. Patients over 50 years need about 50 per cent more light, as do some eye conditions. The light should be directed at 45 degrees to the page but not so that it is reflected into the eye as glare must be avoided. Daylight from a blue North sky (Northern hemisphere) is ideal but as daylight varies an adequate substitute is light from a tungsten bulb filtered by blue glass to approximate to a "colour temperature" of between 6000 and 7000 degrees Kelvin. A Chance's 0B8 glass of suitable thickness (approx 1.8mm) can be used as a filter, or a combination of Lee plastic filters (one 201 plus two thicknesses of 203). Such a filter can be placed in front of the patient's eye, perhaps in a trial frame.

The use of a fluorescent lamp is more problematical since there are "spikes" of emission but if such a lamp has to be used it should be to BS 950 Part 1 1967; the ADLAKE 1210 lamp is convenient.

#### RECOMMENDED READING

Voke, J. (1980) Colour Vision Testing in specific Industries & Professions, Keeler Instruments Ltd. London

Voke, J. (1978) Colour Vision Defects – Occupational Significance & Testing Requirements. J.Soc.Occup. Med, 28, 51-56.

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