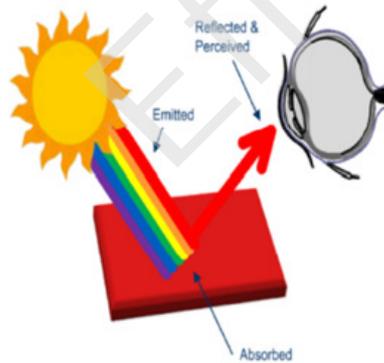


Colour Rendering of Light Sources

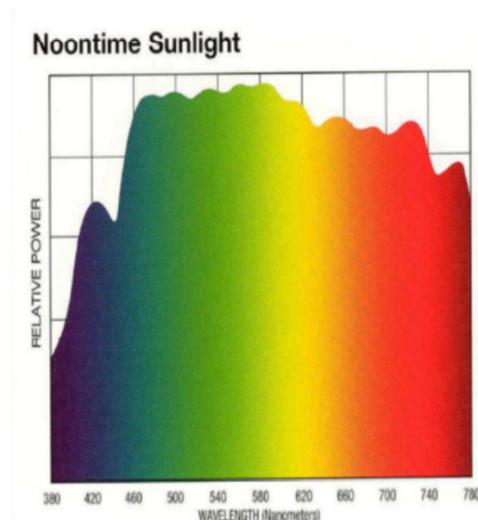
Colour rendering is the property of the light source that affects the colour of the object. The same object looks different in different light sources. An object looks whitish under the fluorescent lamp and meanwhile the same object looks yellowish under the incandescent lamp.



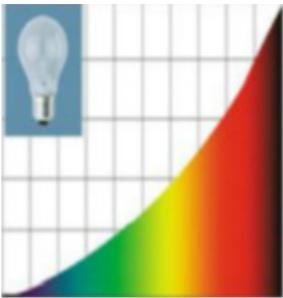
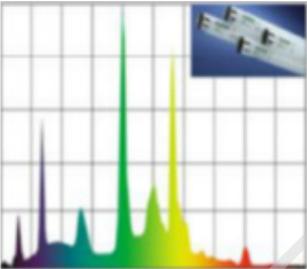
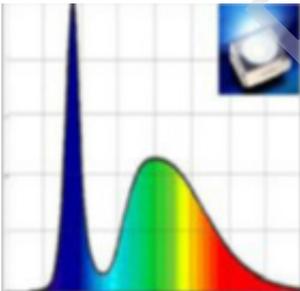
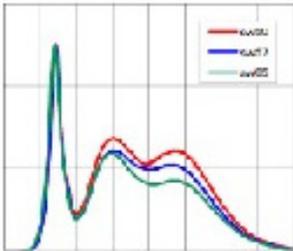
In order to see the colour of an object the light source must emit that colour.



Hence the light source should have all the wavelengths of the visible spectrum to see all the colours. Natural day light has all the spectral components hence we see all the colours in natural sunlight.



Different artificial light sources have different spectral components and different powers of the components hence they differ in the way the object colours are reproduced under them.

TYPE	Spectrum	Efficacy	CRI	Remarks
INCANDESENT LAMP		12 Lumen/Watt	97	These Sources emit large amounts of power in the YELLOW through RED Wavelengths but less in the BLUES and GREENS. It is difficult to distinguish between BLUE and BLACK in this light
FLUORESENT LAMP (high CRI Lamp)		60 Lumen/Watt	90	These Sources emit spikes of Power across different Wave lengths
General Lighting LED		100 Lumen/Watt	80	These sources emit large powers in BLUE, GREEN and YELLOW wavelengths. These Light sources render most objects well but will not render RED colour well as compared to INCANDESENT Lamps
Special LED's with Ra>90		75 Lumen/Watt	95	These Light sources almost resemble to the natural light sources in their capability to render objects

Colour Rendering index CRI is a numeral representation to evaluate the colour rendering property of the light source. CRI shows how accurately a sample light source reproduces an object colour compared to the reference light source.

CRI value of 100 means the sample light source reproduces the same colour as the reference light source. Therefore higher the value of CRI the more it resembles the reference light source.

When evaluating CRI the reference light source is chosen to have the same correlated colour temperature as the sample light source.

CIE defines 14 colours and JIS defines 15 colours to evaluate CRI. CRI Evaluates how accurately the same light source renders the 14 or 15 colours in comparison to the reference light source.



R1 to R8 – typical colour of general existing things.

R9 to R15 –Relatively high valued colour of Red, Yellow, Green, Blue /leaf green and human complexion are selected.

General CRI

$$Ra = \sum_{(i=1-8)} (R_i / 8)$$

Special CRI

$$R_i = 100 - 4.6 * \Delta E_{i(i=1-14)}$$

General LED's and Special LEDs



Regular LED's with CRI > 80

Lot Number	Rank	Quantity	No.	Initial Electrical/Optical Characteristics						Appearance	Verdict
				V _F [V] I _F =65mA	φ _V [lm] I _F =65mA	x I _F =65mA	y I _F =65mA	R _a I _F =65mA	R ₉ I _F =65mA		
		120,000	1	2.92	29.5	0.3140	0.3302	85	14	Pass	Pass
			2	2.90	29.0	0.3123	0.3257	86	22	Pass	
			3	2.88	29.6	0.3149	0.3314	85	15	Pass	
			4	2.92	29.1	0.3155	0.3288	86	20	Pass	
			5	2.92	27.9	0.3125	0.3272	85	18	Pass	

Special LED's with CRI > 90

Color Rank	x coordinate	y coordinate	R _a	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	R ₉	R ₁₀	R ₁₁	R ₁₂	R ₁₃	R ₁₄	R ₁₅
sw50	0.343	0.355	93	98	94	87	93	95	90	95	95	84	83	91	66	97	92	97
sw57	0.334	0.346	91	95	92	86	92	93	87	94	92	75	78	91	62	94	92	94
sw65	0.312	0.329	91	96	91	83	90	94	86	92	95	86	76	87	62	95	90	96

High CRI LED Lighting



Conventional LED Lighting

