

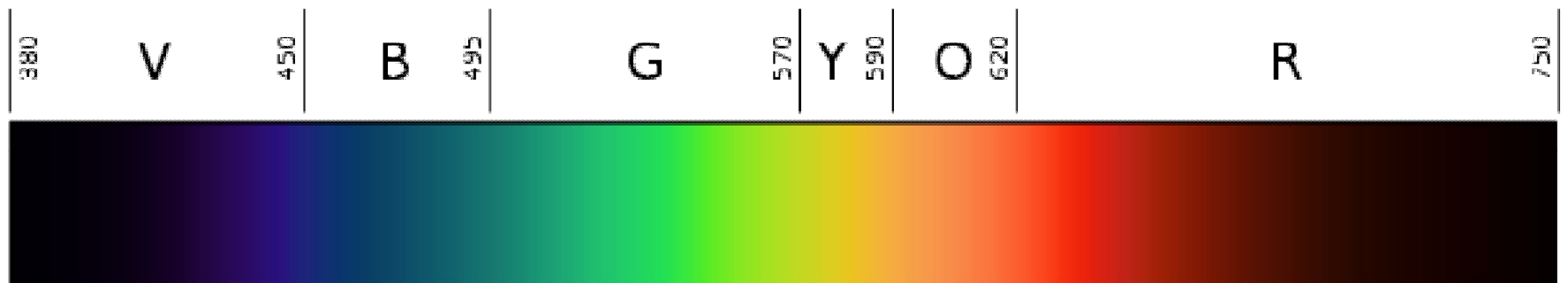
Light & Colour

Colour

- Colour is the visual perceptual property in humans to the categories called red, green, blue, and others.
- Colour derives from the spectrum of light interacting in the eye with the spectral sensitivities of the light receptors.
- Colour of a light is determined by its wavelength.
- Light which contain a balanced combination of wavelength is considered to be white light.

Colours and wavelength

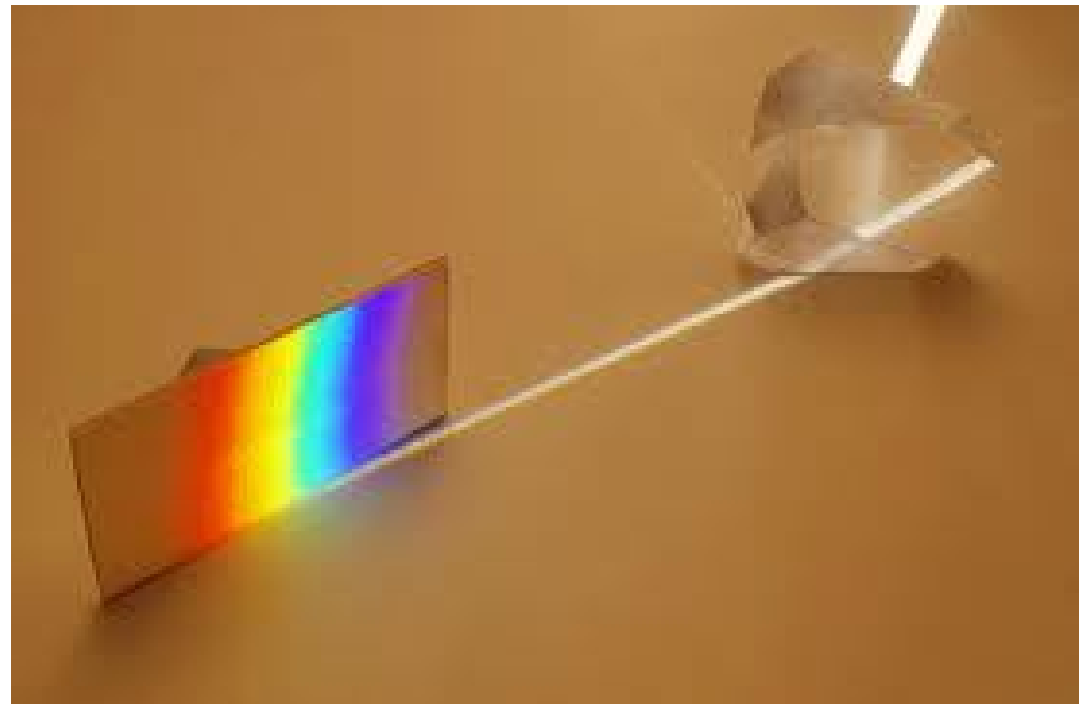
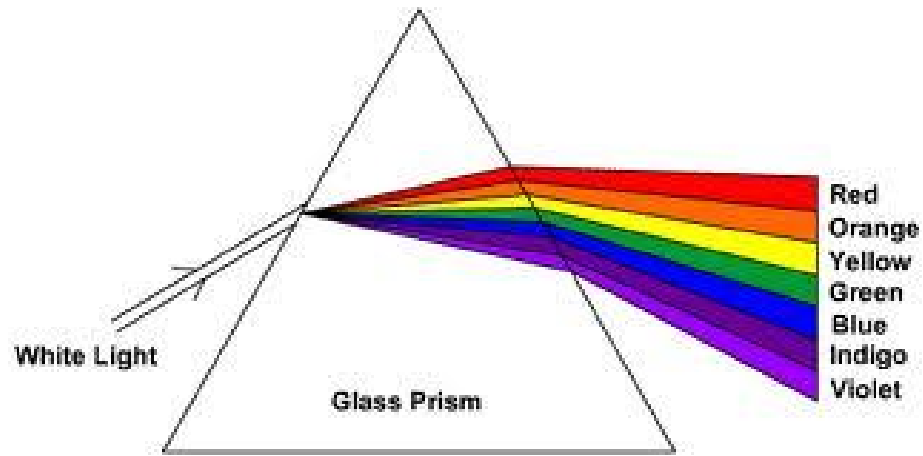
Color	Frequency	Wavelength
violet	668–789 THz	380–450 nm
blue	606–668 THz	450–495 nm
green	526–606 THz	495–570 nm
yellow	508–526 THz	570–590 nm
orange	484–508 THz	590–620 nm
red	400–484 THz	620–750 nm



Colour & Light

- Red, Green and Blue (RGB) are called primary colours.
- White light is a combination of RGB. This is additive property of light.
- Combination of Yellow, Cyan and Magenta makes black. This is called subtractive property of light.
- Other colours are created by subtracting colours from black.
- White is presence of all colours of light.

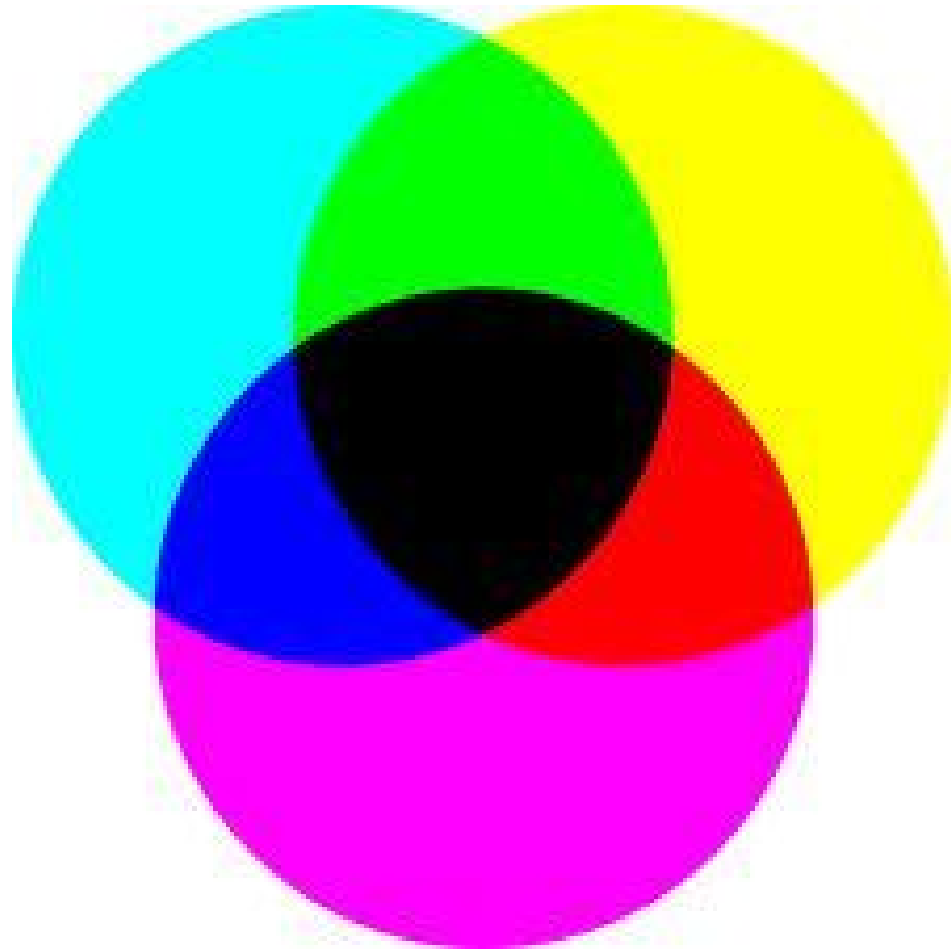
White light on a prism



White

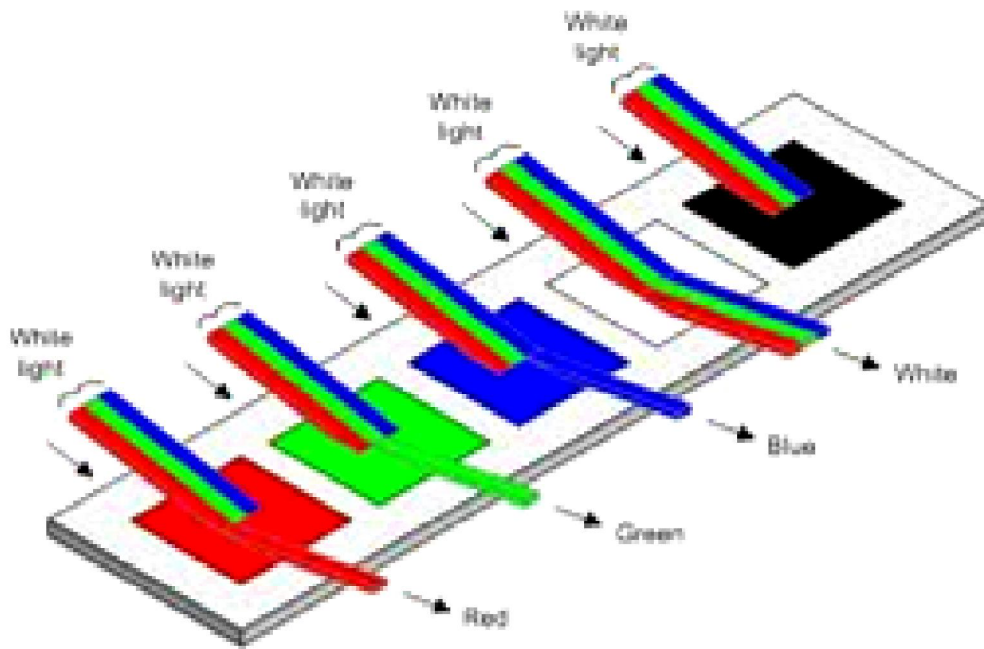


Black



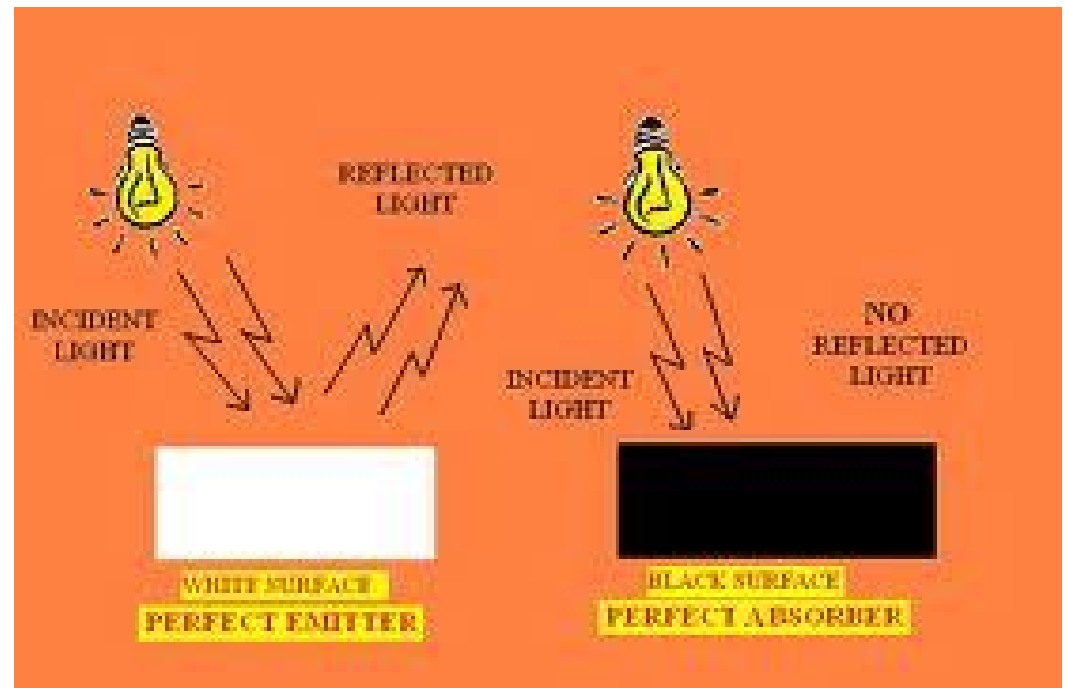
Colour & Light

- When light strikes an object, the light can be reflected or absorbed.
- Coloured surfaces will absorb all colours of light except their own which will be reflected.
- A pure white surface will reflect all colours of light.
- A black surface will absorb all colours of light.
- The perceived colour of an object is thus dependent upon the light source under which the object is viewed.
- In order to see a colour, that colour must be present in both the object and the light source.
- If a colour is missing from either the object or the light source, that colour will not be seen in that object.
- Eg. Colour chart seen in Sodium lamps and in sunlight.



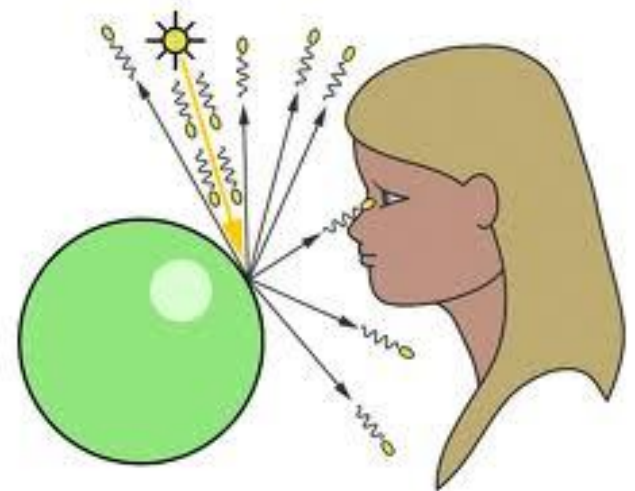
Shining white light on different colored paints

Why do insects are attracted towards white light?



Colour & Vision

- Light waves themselves are not visible.
- We do not see waves as they travel through space.
- We see only the reflection or emission of light from a surface.



Colour & Lighting designer

- Metrics to
 - Predict the probable effect which a lamp will have on the colour
 - Visual warmth or coolness of the lighted environment.
- They are
 - Colour Temperature
 - Colour rendering Index
 - Spectral power distribution

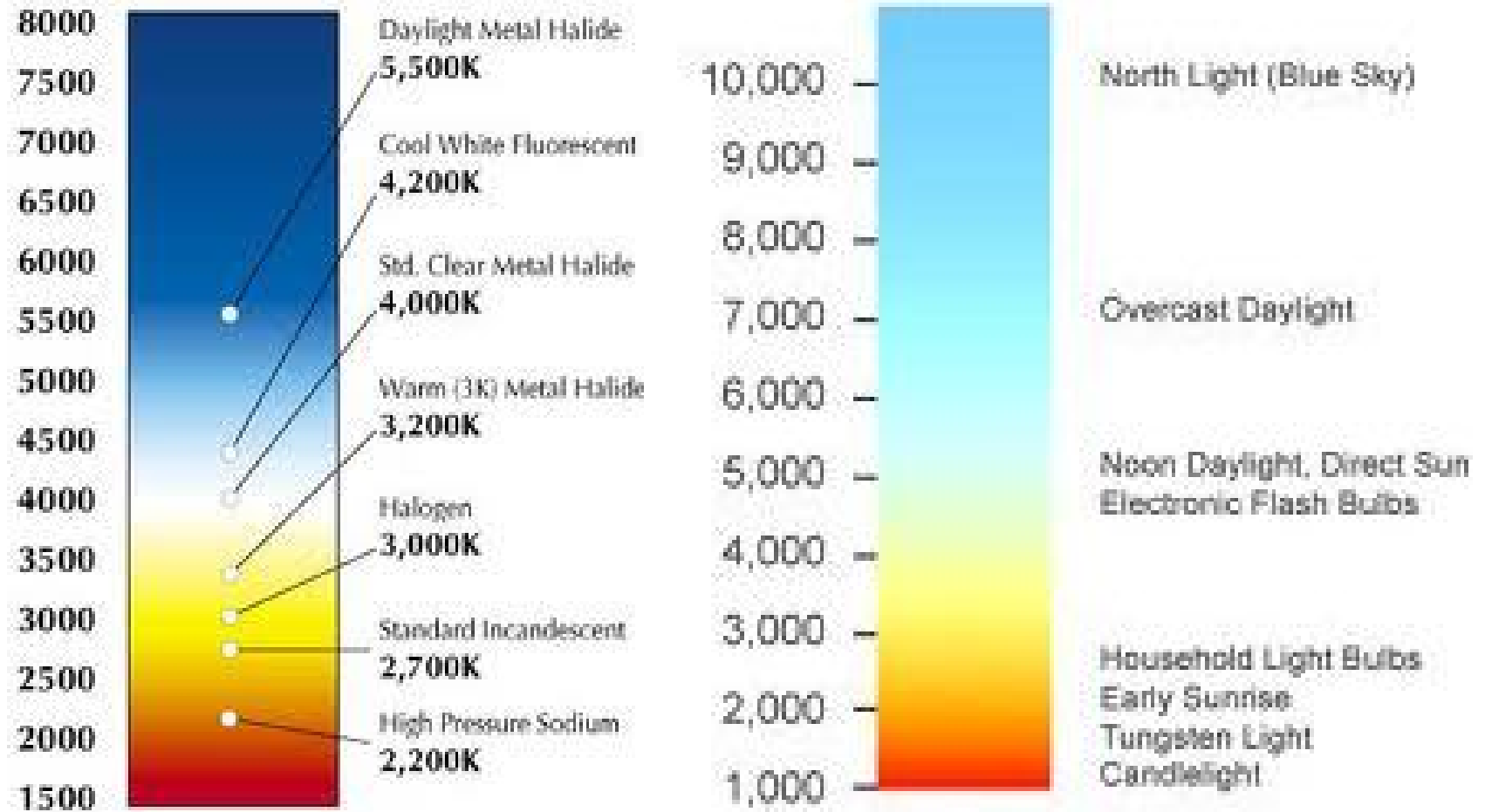
Colour Temperature

- The color temperature of a light source is the temperature of an ideal black body radiator that radiates light of comparable hue to that of the light source.
- Visual colour of a light source can be described by its colour temperature.
 - Eg. Bar of Steel – From Dark gray – dull red – bright cherry – orange – yellow – Finally bluish white.
- Blackbody radiator – absorbs all of the energy which strikes it and re-radiates that energy.
- Only incandescent lamp possesses this characteristics.
- For fluorescent lamps the term is called Apparent colour temperature or Correlated colour temperature.

Colour Temperature

- Less than 3500 K – Warm
- 3500 K – 4000 K – Neutral
- 4000 K – 6000 K – Cool
- Over 6000 K – Cold

Colour Temperature



Colour rendering index

- Shift in colour of an object when viewed under the lamp to the colour when viewed under a reference lamp of same colour temperature.
- Test lamp is compared to the reference lamp at eight standardized colours and a correlation is drawn b/w the two lamps.
- Test lamp with a perfect correlation would have a CRI of 100.
- CRI drops as the differences widen b/w the two lamps.
- Does not indicate the magnitude of differences and also the direction of colour shift.

Spectral Power Distribution

- Pictorial representation of quantities of light produced by a lamp as a function of wavelength.
- Published by the lamp manufacturers.
- Shows the amount of colours present in it.
- Lamps which have strong components of desired colours can render those colours in a good manner.
- Eg. Colour blindness people

Spectral Power Distribution

- TRI-Stimulus Eye sensitivity curves.
- Three types of colour receptors called cones.

