

## COLOUR MIXING AND COLOUR THEORY

**The colours used in the colour wheel to get the brightest colours possible, with reliable pigments that don't fade.**

- Cadmium Yellow Pale or Cadmium Yellow (PY 37 or PY 35) This is a middle yellow or slightly "orange" yellow.
- Cadmium Lemon Yellow (PY 35) [or Cadmium Lemon Yellow (Hue) made with PY3]. This is a "greenish" yellow. Hansa Yellow (PY 3) is a weaker colour, and less lightfast than PY 35. It is a "greenish" yellow.
- Cadmium Red Light or Cadmium Red (PR 108). This is a slightly "orange" red. It can be made less "orange" and more towards a middle red. Naphthol Scarlet (PR188) can be used as a substitute, although it is less lightfast.
- Permanent Rose. This is a "purple-pink" red. It is important to purchase a colour made with the pigment number PV19. Other similar colours without this pigment are less reliable. Sometimes this colour is called Quinacridone Red.
- Ultramarine Blue (or French Ultramarine) (PB 29). This is a "purple" blue.
- Cobalt Blue (PB 28) [or Cobalt Blue (Hue) made with PB 29 mixed with PB 15]. This is a middle blue. Cobalt Blue (Hue) will be close to, but not quite the same colour, as true Cobalt Blue.
- Cerulean Blue (PB 35 or 36) [or Cerulean Blue (Hue) made with PB 15 mixed with white]. This is a "green" blue.
- Phthalo Green. A strong blue green. When mixed with Cadmium Lemon Yellow it gives the brightest green possible. Sometimes it is given different names. Look for PG 7, or PG 36 on the label. PG 36 is slightly more yellow than PG 7.
- Ivory Black (PBk 9), Lamp Black (PBk 6), Carbon Black (PBk 7) and Mars Black (PBk 11) are all reliable colours.

**Other colours of interest:** Cadmium Orange (PO 20) is a very bright orange. It is a brighter orange than that made by mixing. Phthalo Blue (PB 15) is a strong vivid "green" blue, although sometimes manufactured to be a middle blue. It is slightly less lightfast than the other blues mentioned here; Cadmium Red Deep (PR 108) is a middle red; Cobalt Turquoise (PB 36) and Cobalt Teal (PB 50 or PB 28); Ultramarine Violet or Red (PV 15), Manganese Violet (PV 16) and Cobalt Violet (PV 14) are all good purple/mauve colours. The colour labelled "Quinacridone Violet" (PV 19) gives a good magenta colour, but it may darken in strong light; Viridian (PG 18) is similar to Phthalo Green and is a reliable traditional colour; Manganese Black (PBk 14).  
**Browns:** Raw Umber (PBr 7 or PBr 6) is a slightly greenish brown. Burnt Umber (PBr 7 or PBr 6) is a slightly reddish brown. Indian Red (PR 101) is a reddish brown. Burnt Sienna (PBr 7) is an orange-brown and Mars Violet (PRr 101) is a purplish brown. Yellow Ochre (PY 43 or PY 42) is a yellow brown. Raw Sienna (PBr 7) is a dark yellow brown. Light Red, Mars Red and Venetian Red are all similar to Indian Red. All browns can be also mixed from yellow, red and blue.

### Making Shadow Colours:

**Yellow:** add both Yellow Ochre and Raw Umber, or add purple (red and blue), or add black and red

**Red:** add black, or a reddish brown such as Burnt Umber, or add green (yellow and blue)

**Blue:** add black, or add orange (yellow and red), or add Burnt Sienna or Burnt Umber.

**Green:** add black, or Raw Umber, or Raw Umber and Yellow Ochre, or add red. Mixing Yellow (or Yellow Ochre) with Ultramarine Blue gives a duller (more olive) green than mixing Cerulean Blue and Cadmium Lemon Yellow. Cobalt blue and Cadmium Yellow Pale give a middle green.

**Purple:** add black, or add Yellow Ochre, or add yellow. Using Cerulean Blue (or Cobalt Blue) mixed with Cadmium Red gives duller purple than using Ultramarine Blue mixed with Permanent Rose.

**Orange:** add black, or add Burnt Sienna or Burnt Umber, or add blue. Mixing Permanent Rose with yellow gives a duller orange than mixing Cadmium Red and yellow. .

**Note:** All the colours can be manufactured within a spectrum of colour. For example Cobalt Blue can be made more "green" or more "purple", depending on the manufacturer and the brand. Each colour has a particular number which indicates the exact chemical composition of the pigments. The ingredients of some particular colours can make the paints quite expensive, so in the student ranges of colours substitute pigments are used, and the name of the colour has the word "Hue" after it on the label. For example real Cadmium Yellow is quite expensive to manufacture. It's best to try to buy colours with only one colour number on the tube, indicating that it is the pure colour, but this is not always possible with "Hue" colours. Some colours are naturally more transparent, and some are naturally opaque. If a colour seems very weak or dull when you use it, try another brand's version of that colour. Colour weakness indicates the overuse of translucent fillers in the paint. Fillers add bulk to the paint, but reduce the tinting strength of the colour.

If you add white to the shadow version of a colour, you can make a duller version of the original colour, which is not as dark as the shadow colour, i.e. To dull a bright colour, you can mix the shadow colour, and then lighten it with white if necessary. Titanium white is often manufactured to be slightly "blue", so when it is added to orange or orange/red colours, then a small amount of yellow also needs to be added to the mixture. The same also applies when adding white to green or blue/green. Zinc White is a more transparent white, and Titanium White is an opaque white. Zinc White is brittle, and can crack. Flake White (or Cremnitz White) was the traditional white used by artists in the past, for centuries, and it has many good properties. Many artists still prefer it nowadays to Titanium White. It is, however, highly toxic, and should be handled with care. The Cadmium colours are also toxic, and should be handled with care. Wash your hands thoroughly after use. Many blacks are also made slightly "blue" so this can push a colour slightly more towards blue when it is added, so a small amount of orange (red and yellow) can counteract this colour shift.

When purchasing oil colours, it important to purchase colours that have the Colour Index Name (or Colour Index Number) of the pigment used in the paint, indicated on the tube. Otherwise, the information should be detailed in the paint manufacturer's literature, or at their web site. If this information is not available, then it is recommended to not purchase paints from that range of colours. Having the Colour Name on the tube is not sufficient to know what you are buying. The Colour Index Name (eg. PB 28), or Number (eg. 77346) is necessary. Ideally the tube should also be labelled with the Chemical Description of the Pigment. Only paints containing pigments listed on the ASTM Suitable Pigments List should be purchased. If the Colour Index Name on a tube of paint is not on the ASTM Suitable Pigments List, then it is unreliable and will probably eventually fade. It is recommended that oil colours made with linseed oil be purchased. Whites, however, are best made with safflower, or sunflower, or walnut oil. Titanium Whites made with linseed oil tend to go a bit yellow. It is recommended to try to purchase colours with an ASTM rating of I or II only (preferably ASTM I). All colours mentioned here have an ASTM rating of I for oil colours, except Hansa Yellow (PY 3) and Naphthol Scarlet (PR 188), with an ASTM rating of II.