

White
Balance





What is “White Balance” ?

White Balance (WB) is a camera adjustment to remove, or add, a “colour cast” to your photos.

It is normally used to correct when shooting indoors, in shady conditions, or under extreme lighting.

The adjustment is made in camera, before taking the photo.

Your camera screen can display the effect of the pressing the “WB” button to help you choose the correct setting.



What is a “Colour Cast”?

A colour cast is where the photo appears to be slightly off-colour, as if a colour filter was being used

Typically the casts are orange for indoor lighting, or blue for shade/fluorescent lights



Why do I need to do this ?

Firstly, we need to know that **sources of light are not the same...**



White (Sun) Light is a mix of different colours

Most sources emit a mix of different wavelengths of light. The wavelength of the light determines its colour.

For example, think of a rainbow.....



The key thing to remember is that indoor light is different to sunlight.

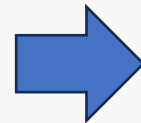
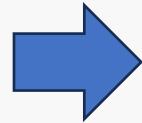
Indoor lights and shade contain light of different wavelengths to bright sunlight.



In humans, our brains compensate for the differences

Our brain is capable of compensating for what we see under these conditions, but **the camera simply records what it detects.**

For example, if we wear tinted glasses, our brain is capable of adjusting the colours. Likewise, if we move from outdoors to indoors, our brains adjust the colours without thinking.

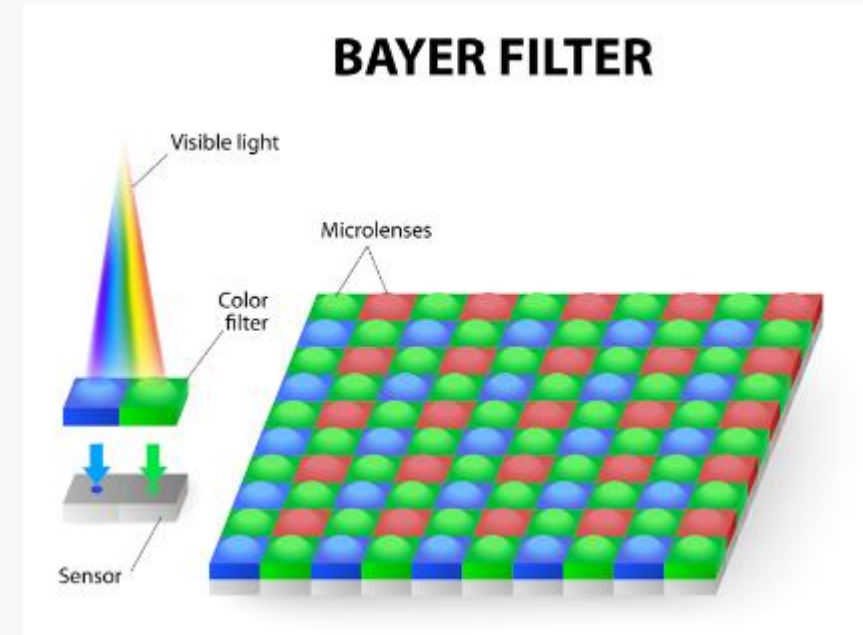


Why would I need to change the White Balance ?

The camera software reads information from its sensor to determine the amount of light present. This controls the exposure (tones).

However, the software also decides what colours are present, based on its readings from the “Bayer filter” and **adjusted for what it believes to be white in the scene.**

So, if the actual light is different to normal sunlight, the camera could incorrectly alter the shades of the colours present.



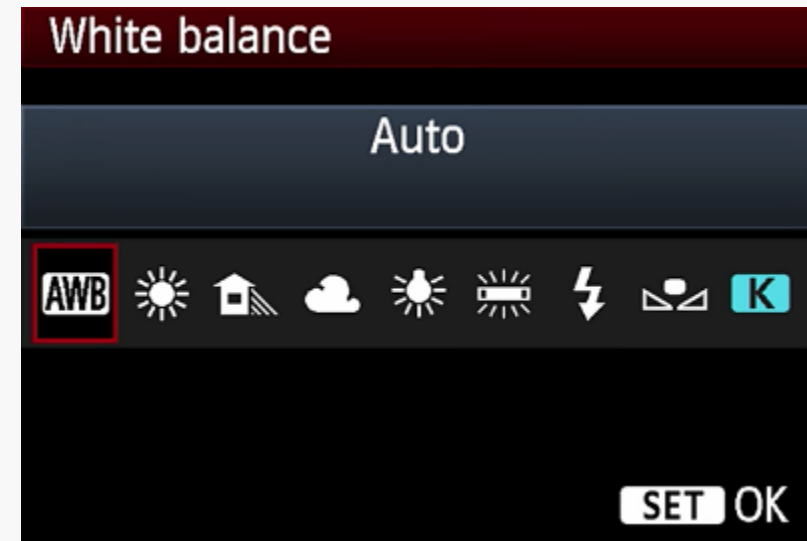
Why is it called White Balance ?

If your camera is set to “Auto White Balance” (AWB), it guesses the setting based on a white object that serves as a reference point.

For example, white clouds in a scene would be used as a white reference point and the rest of the colours would be based on this reference colour.

The setting we adjust tells the camera how to correct its sensor, so that what we recognise as off-white becomes pure white again.

All the other colours are then re-set by the camera from the new reading.



Why is it called White Balance cont'd ?

On some cameras you can set the white balance by taking a photo of a white object (say a piece of paper) or use an “Expodisc”, then tell the camera to use this photo to calibrate itself.

This is considered a more accurate method, but...

- You have to take the 2 photos close together...but remember the light can change !
- If you move position (e.g. go indoors), you have to repeat this step.



Colour Temperature

Different sources of light also have a different “colour temperature”

How can a colour have a temperature ?

Light Type	Color Temperature in Kelvin (K)
Candle Flame	1,000 to 2,000
Household Lighting	2,500 to 3,500
Sunrise and Sunset	3,000 to 4,000
Sunlight and Flash	5,000 to 6,000
Noon Sun and Clear Sky	6,000 to 6,500
Cloudy Sky and Shades	6,500 to 8,000
Heavily Overcast Sky	9,000 to 10,000

Colour Temperature

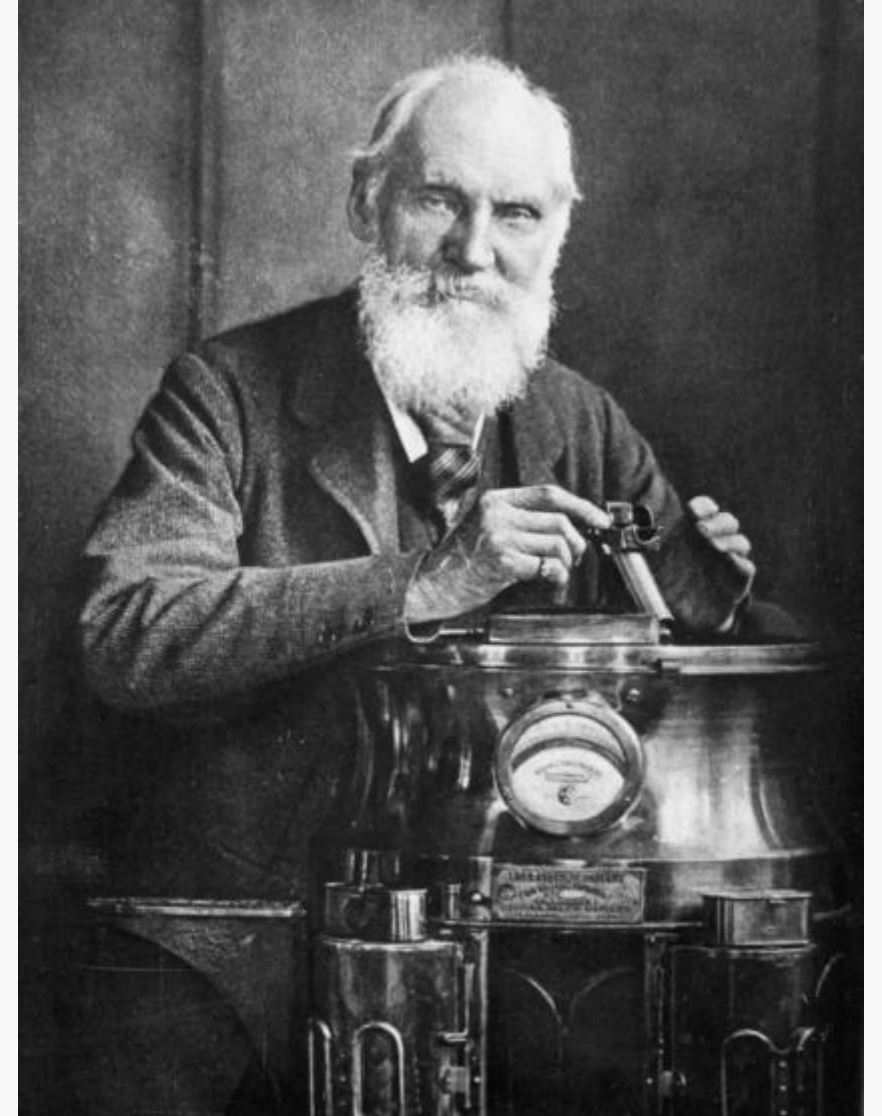
This idea comes from experiments by Lord Kelvin 1848 to calculate “Absolute Zero”.

Physicists were aware the volume of a gas expanded as temperature rises and fell as temperature cooled.

Absolute zero is a very cold state at which everything is frozen solid, even gases.

Kelvin calculated Absolute Zero to -273°C or “0K”

The new temperature scale named “Kelvin” (K) in his honour.



Colour Temperature cont'd

Lord Kelvin performed an experiment with a carbon & tungsten filament.

When cold, it was a dark black object. He reasoned that no light was being absorbed, so he assigned this colour a “cold” temperature.

When it was heated, it changed colour, from red hot -> yellow - >white/blue

Think of heating coal, or a piece of steel



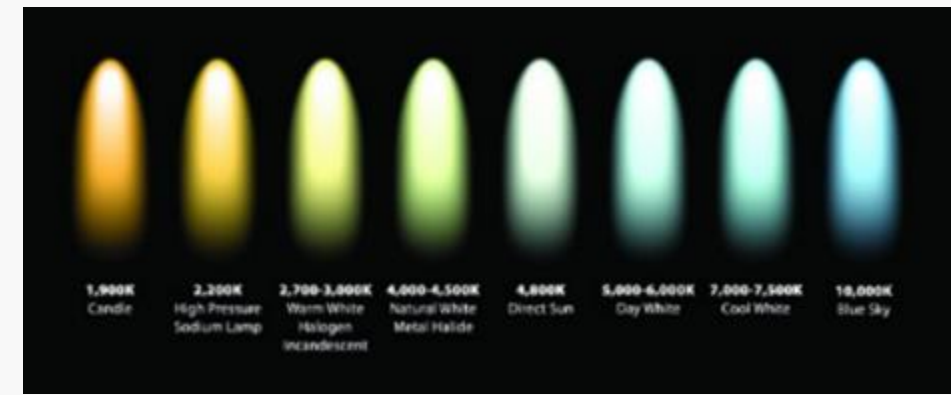
Colour Temperature cont'd

Lord Kelvin measured the actual temperatures when the filament changed colour, from black -> red -> orange -> yellow -> white.

We use the same Kelvin temperature range for colours – **we pretend the colour is the temperature it would need to reach, to radiate out that colour.**

LED bulbs now quote the Kelvin scale, to tell you what shade of white they will produce.

The range starts from cold black (absolute) zero and ranges from red, orange, yellow up to the hottest blue/white – across many thousands of degrees.



Colour Temperatures in the Kelvin Scale

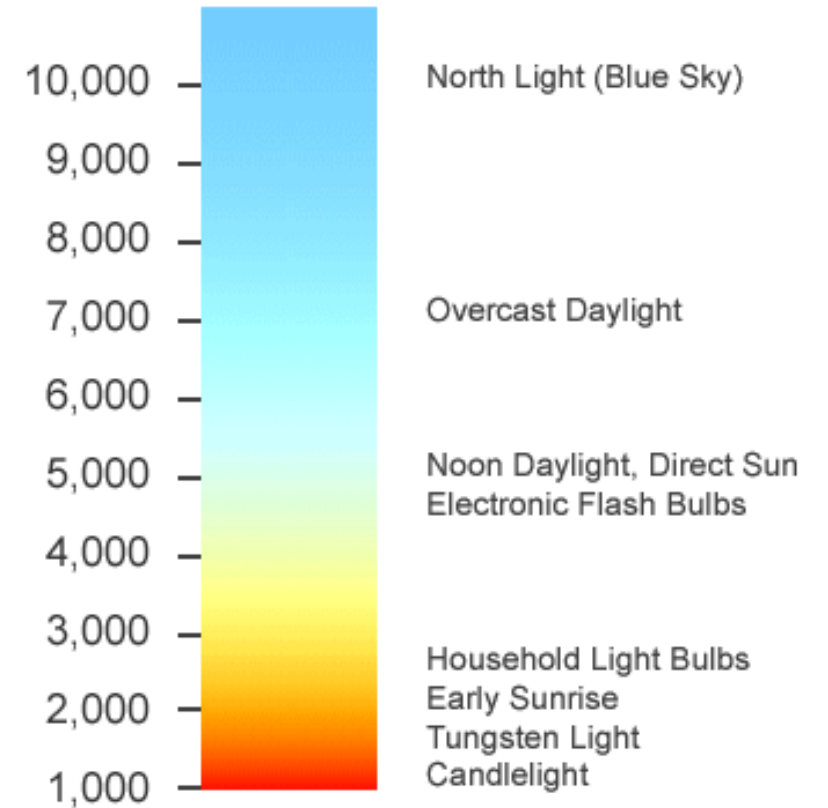


Image courtesy of www.mediacollege.com

Temperatures of different items

Cigarette	400-700C
Candle	1000C
Campfire	1000-1200C
Bunsen Burner	1300-1600C
Oxy-Acetylene Torch	3500C



Bit more physics...

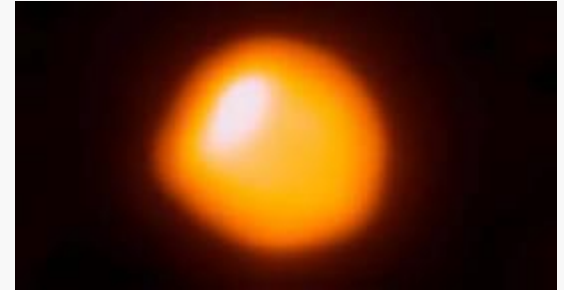
the Wavelength of light emitted

The wavelength of light emitted (and hence the colour) is inversely proportional to the temperature of the object.

So, as temperature of an object rises, the wavelength of light decreases.

So its colour changes from the infra-red, through visible light, to ultra-violet.

This is called “Wien’s Law”.



Hang on - do people emit light ?

Yes – but in the Infra-Red range !

Anyone watch “Police Camera Action” ?



But isn't blue colder than red ?

Our **psychological** feel for colour is the opposite to the Physics !

Red = warm, blue = cold

We were/are influenced by natural world – what we could feel.

Fire is hot and red/orange, so associate red = hotter

Water can be cold, fingers blue with cold = colder

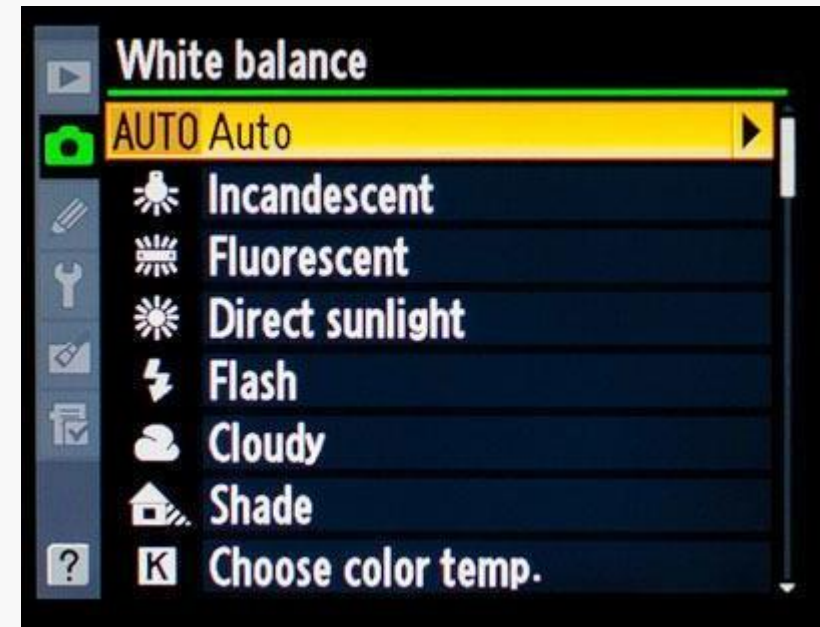


So back to White Balance....

So we are about to take a picture and we notice in the viewfinder/screen that the colour looks a bit off.....

We press the White Balance (WB) button...

What settings can we use ?












Camera WB Settings

Each camera will have different options available.
Some of the options will have different names.

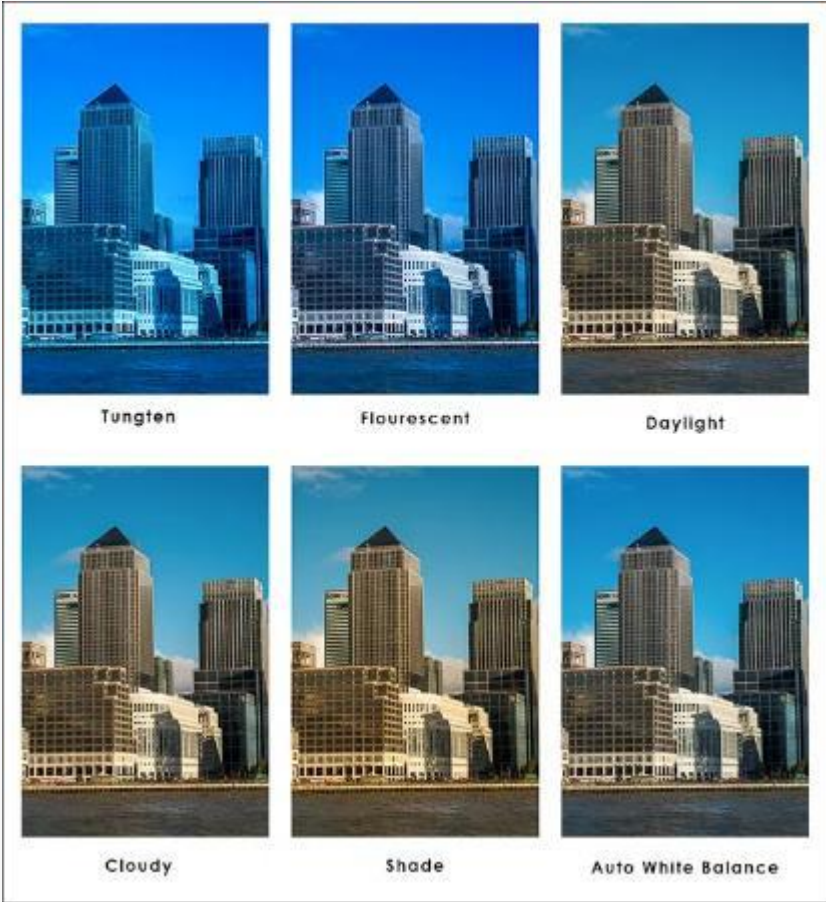
You select the option which matches the conditions you are shooting under.

For example, if it's a cloudy day, choose the cloudy option

The camera adjusts for the conditions by changing the colour temperature in the **opposite** direction. So on a cloudy day, it will “warm up” the colours.

 AWB	Auto White Balance
	Custom
	Kelvin
	Tungsten
	Fluorescent
	Daylight
	Flash
	Cloudy
	Shade

Examples

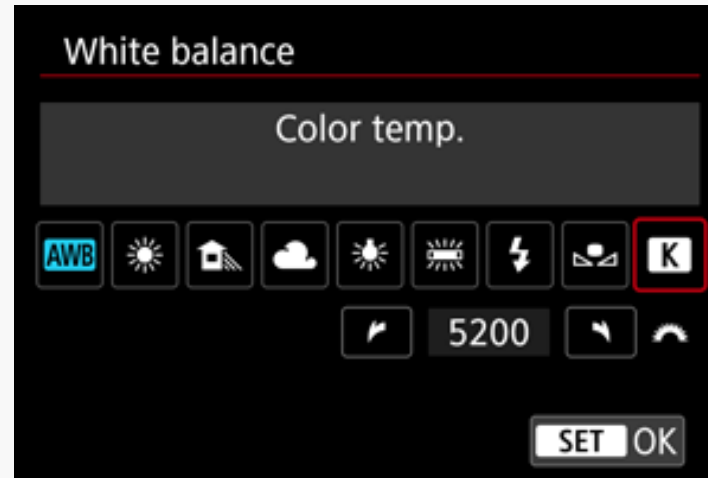


Adjusting WB by entering a temperature

On some cameras and phones, you can enter the WB value in Kelvins (K).

This provides much more flexibility and a greater range of settings.

You enter the value for the conditions you see.



Candle Light= 2,000K

Sunrise or sunset= 2,000-3,000 K

Tungsten Light (house lightbulbs, for example)=2,500 K – 3,000 K

Flourescent Light (gym lights, for example)= 3,900 K

Daylight= 5,500 K

Flash= 5,500 K

Cloudy=6,500 K – 7,500 K

Shade= 7,500 K-8,500 K

Adjusting WB on iPhone

On iPhone, the easiest way is to use the built-in filters, or to put something white into the scene and then lock the exposure...

iPhone change settings to “Vivid” as an example....

<https://www.youtube.com/watch?v=wyOOTMnmkg4&list=WL&index=9>

iPhone White Balance “Hack” using white object....

<https://www.youtube.com/watch?v=XT5XHgFKwc8&list=WL&index=7>

Open the Camera on your iPhone.

Make sure the Camera is in Photo or Portrait mode.

Tap the Camera Controls button, or swipe up from the camera modes at the bottom of the screen.

Tap Filter, then swipe left or right to preview the options.

Tap the Shutter button to take your shot.

To stop using a filter, select Original.

Tap the Close button to close the menu.

You can also remove, or change a photo’s filter in the Photos app.

Adjusting WB on an Android phone

To adjust the white balance on an Android phone, open your camera app.

Look for a "Pro," "Manual," or "Advanced" mode and switch to it.

Find the WB icon, which may look like a balance scale or have the letters "WB".

Tap the WB icon and choose from presets (like "Sunny," "Cloudy," "Fluorescent") or manually adjust the colour temperature slider to make your whites look neutral.

NB -the exact location of the WB setting varies by manufacturer.

Google Pixel Phone change settings.....

<https://www.youtube.com/watch?v=lixze8vjL-U>

Xiaomi Phone change settings.....

<https://www.youtube.com/watch?v=1fgFkJQ0EIo>

Deliberately altering the White Balance

If you've ever played around with the built-in filters on your phone, perhaps changing the image to sepia or B&W, then you're already altering the settings to get a new creative look, or style, for your image.

In the same way, you can alter the white balance, even when you don't need to ! 😊

Or even alter it in the wrong direction !!! 😁

For example, set it to “shade” or “cloudy” to add warmth.
Set it to sunrise, or incandescent, to add coolness.





Using creatively – adding warmth



Using creatively – adding cold

Using creatively – adding cold or warmth !



Using creatively – in a black and white image



Editing White Balance on PC

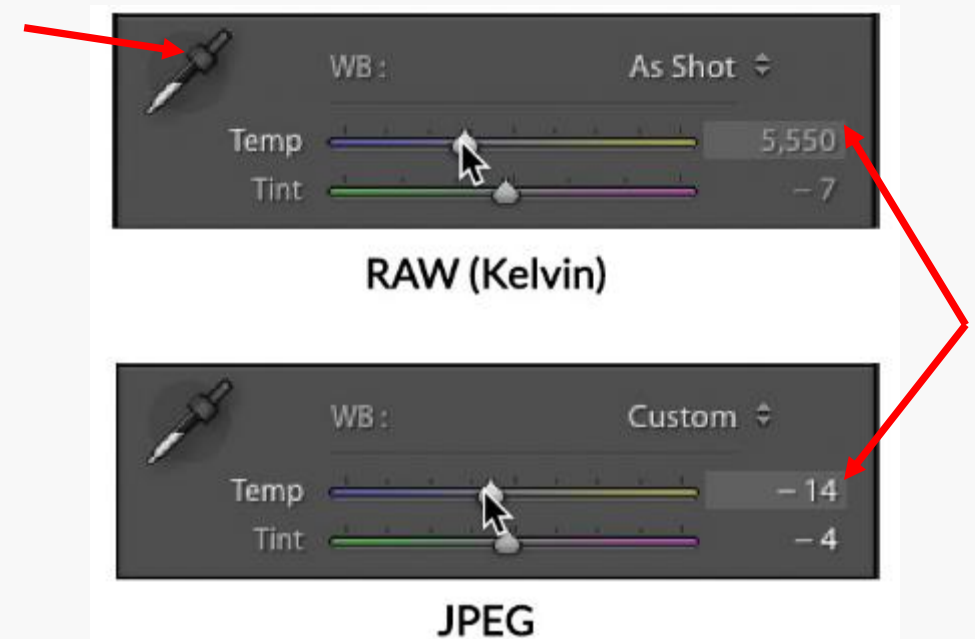
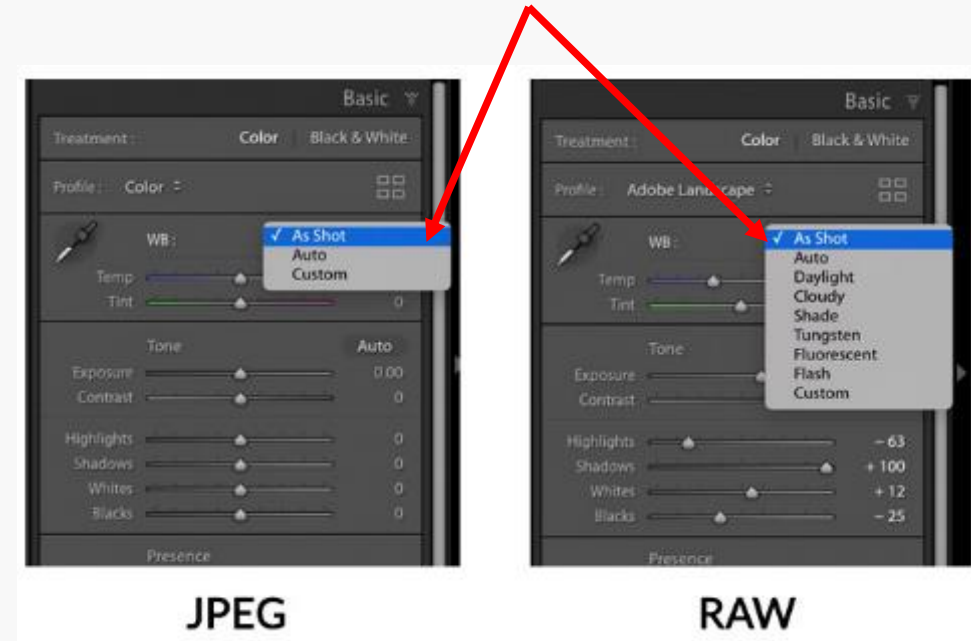
In Photoshop & Lightroom, there are more in-built options for RAW files than JPEG.

You can also enter the Kelvin value for RAW files, but can only adjust the colour balance for JPEGs.

You can also use the “dropper” to indicate a white area and the software will automatically adjust the white balance.

Whereas the in-camera WB setting affects the whole image, in your editor, you can also create **masks** to alter the settings in only a part of the image.

This gives you much more creative control.



Summary

- Digital Cameras are not as good as humans at compensating for different light conditions.
- We can assist the camera by altering the white balance setting.
- We choose the setting closest to the current conditions.
- This can make photos “warmer” or “colder”.
- We can choose to use these effects creatively.

