Aperture and focal length

The two terms to make sure you understand when choosing a photographic lens for an SLR are the maximum aperture and the focal length. The focal length indicates the angle of view (sometimes called the field of view), while the maximum aperture limits the fastest shutter speed usable, as well as the depth of field.

Lenses are marked with their aperture and focal length. If you understand what these markings means you can choose the correct lens for the effect you want to achieve. Let's look at an example:

18-105mm f/3.5-5.6

What does this mean?

18-105mm is the focal length of the lens. This tells us that it will ‘zoom’ from 18mm, a wide angle shot, to 105mm a telephoto shot (a magnified shot). Look at the example shots below to see the effect on the picture.

f/3.5-5/6 is the maximum aperture of the lens. Why are there two ‘f’ numbers? Well the aperture varies as you change the focal length. So if you are ‘zoomed’ out to 18mm this lens will give you a maximum aperture of f3.5, if you are zoomed into 105mm it will only give you a maximum aperture of f5.6. This would mean it is classed as quite a slow lens (see further on in the notes for an explanation about fast and slow lenses).

Let's look at another example:

50mm f/1.4

What does this mean?

50mm is the focal length but in this case it is fixed meaning you cannot zoom and therefore the field of view is always the same. This is often called a prime lens.

f/1.4 is again the maximum aperture of the lens. There is only one number this time as the lens cannot ‘zoom’ so the maximum is always f/1.4. This would be classed as fast lens (see further on in the notes for an explanation about fast and slow lenses)

Examples of fields of view and how it's affected by focal length
10mm lens
Usually a specialist lens known as a wide angle. A wide angle lens lets you get more into the frame but distorts perspective – which can be a nice effect. (You can go even wider into what is called a ‘fish eye’ lens). Good for emphasising scale.

20mm lens
Still classed as wide angle but often within the range of a ‘kit’ lens. I.e. a zoom lens often sold as part of a kit of parts with an SLR. So for example the Nikon D5300 is generally sold with a kit lens of 18-55mm, the D7200 with an 18-105mm so both could take this shot.

30mm
50/55mm

Considered the same as the human eye – all ‘kit’ lenses will cover this range

70mm

Classed as telephoto, i.e. things are magnified

100mm

Again telephoto but magnified more. Lenses that cover a range of focal lengths are classed as ‘zooms’. A typical zoom might be 100-300mm. There are lenses that will go to 1000mm and above but these are big and expensive. 1000mm+ lenses are the type of lens sports photographers and paparazzi might use.
‘Fast’ and ‘Slow’ lenses

You will sometimes hear lenses described as ‘fast’ or ‘slow’ lenses. Here’s why…

A fast lens lets you take a shot using a higher shutter speed as it will allow you a large aperture (thereby letting more light in). So for instance a 10mm f/1.4 lens would be considered very fast and allow you to take shots in low light. This large aperture would also give you very shallow depth of field.

A slow lens on the other hand has quite a small maximum aperture letting less light in meaning a slower shutter speed for a given exposure. So for instance a 200mm f/5.6 lens would be considered slow but with considerable magnification.

Lenses get more expensive the faster they are for a given focal length. So a budget 100mm lens might give you a maximum aperture of f/5.6. A professional lens might give you f/3.4 on the same focal length. How’s this done? The lens quality is greater so more light gets through and the lens is a bigger diameter (again letting more light in). But this means the cost of the lens is higher.

Depth of field and lens choice

To achieve a shallow depth of field with selective focus you need a large aperture as you know. So what lens should you choose? Well if you were working close to the subject (say for portraiture) you would generally use a prime lens with a maximum aperture in the region of f/1.4 or f/1.6.

The tricky thing with this sort of very large aperture is focusing. Getting the point you want in focus on a very shallow depth of field is hard. On lower cost DSLRs you have to do this manually. On the D7200 however you can use auto focus, but your focus point needs to be very carefully targeted.
Shot at f1.4 in close up using Nikon D60 (focused manually). Very shallow depth of field so hard to focus particularly when the dog keeps moving!

Filters

There are many types of filters available for SLRs but two of the most useful are UV and Polarizing.

UV filters prevent ultraviolet (UV) light from coming through to the CCD and reduce haze. A UV filter in normal photography is transparent to visible light so they don’t change the exposure therefore they can be left on the lens (as protection) for nearly all shots.

Polarizing filters can be used in both color and black and white photography. A good example for their use is to make partially cloudy skies more dramatic by increasing the contrast between the clouds and the sky.

Without polarizing filter  
With polarizing filter

The shots above are not altered in Photoshop – its all down to the polarizing filter. Atmospheric haze and reflected sunlight are also reduced, and in color photographs overall color saturation is increased.

Polarizers are often used to deal with situations involving reflections, such as those involving water or glass, including pictures taken through glass windows.
Without polarizing filter  With polarizing filter

More on filters here: http://en.wikipedia.org/wiki/Polarizing_filter - Polarizer

Available lenses in the DAC

The following lenses are available for your use. All of these will fit Nikon SLRs.

- Sigma 10-20mm f/4-5.6 zoom (Wide angle)
- Nikkor 20mm f/2.8 (Fast, wide angle prime lens)
- Nikkor 50mm f/1.4 (Very fast prime lens)
- Nikkor 18-55mm f/3.5-5.6 VR Zoom
- Nikkor 18-105mm f/3.5-5.6 VR Zoom/telephoto
- Sigma 105mm f2.8 Macro
- Sigma 28-300mm f/3.5-6.3 Zoom/telephoto
- Sigma 150-500mm f/5-6.3 Zoom/telephoto

Note: VR stands for ‘Vibration Reduction’ meaning you can shoot at a slightly slower shutter speeds without worrying as much about camera vibration.

Further reading
Description of a camera lens here
http://en.wikipedia.org/wiki/Photographic_lens
Advice on types of lenses here:
http://www.photographers.co.uk/html/camera-lens.cfm
Video on how lenses are made (in this case for high end movie cameras)
http://uk.youtube.com/watch?v=X7_wL0ZZi6k

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