Digital Photography – Level 1

The Camera Basics

The basics of Photography

With so many cameras available, figuring out how all the specifications and options translate into your everyday use is complicated. For Level 1 in Photography, we're going to learn how cameras work and make sense of what that means in terms of choosing a camera to buy and how it affects your photographs.

The Parts

Your camera is made up of many parts, but there are a few in particular that we want to look at as they are the most important. We'll go into much more detail in a bit, but here's a basic overview of the parts we're going to look at:

- **The body** is the housing for your camera. While it has little effect on the quality of your photos, it does affect things like ease of use and comfort.

- **The lens** is the eye of the camera, and it's a very complex instrument. Different lenses can provide many different features, so it's important to know the differences between them. In different Levels of this topic we'll discuss how lenses work and how that affects your photographs.

- **The sensor** is basically the digital equivalent of film, in the sense that—like film—the sensor is exposed to light that comes through the lens and it records that exposure. The exposure is then processed and saved to flash memory (generally an SD or Compact Flash card). The caliber and size of the sensor are also very important, as these things significantly impact the quality of your photos.

- **The flash card** is where you save your images, and it's a component most people don't think about too much when buying a camera, aside from choosing an amount of storage that suits their needs. Flash cards range in read and write speeds as well, however, and a slow cards can significantly degrade your camera's performance. We'll take a look at what card classes mean and the minimum speed you need for different purposes.

- **The battery** matters in a camera just like any other electronic device. While this is a simple part to understand, we'll dive into it a little more deeply to figure out actual, practical battery life for cameras and when cameras with less-powerful batteries may be a better option.

The Body

Camera body design affects the user in a couple of ways. First, the size of the body can have a major impact on comfort when being held and used. Small hands will have difficulty with large bodies and, conversely, large hands will have difficulty with small bodies. Before purchasing a camera, it's a good idea to hold it and take a few pictures so you know if you'll find it comfortable to use with any regularity.

Size often impacts the location of buttons, dials, and other parts of the hardware you'll need to touch and press to operate your camera. The positioning on small point-and-shoot cameras tends to be fairly simple, because there are fewer hardware controls, but the moment you step up to a smaller Digital Single Lens Reflex (DSLR) that number increases significantly. On higher-end DSLRs, the extra space tends to ensure your hands will always be able to reach and easily access the most important controls. This is a generalization and you'll want to test them out for yourself. When you do, adjust camera settings and see what all the buttons do in manual mode (so you're aware of their full capabilities). If it feels uncomfortable or awkward to make adjustments you'll make often, you may want to consider a different model.

While most cameras are fairly similar, the little differences in body design can have a significant impact on their ease of use. While you can generally judge a camera's abilities without ever using it, you'll need to test it out yourself to make sure it feels right.

The Lens

Certain types of lenses are better for certain situations, so it's important to know their classifications and differences. The first thing worth noting is the difference between **zoom lenses** and **prime lenses**. Zoom lenses—as you can probably guess—let you zoom in and out. While they have that advantage, they're generally more expensive, heavier, and larger. Prime lenses, on the other hand, do not allow you to zoom, but they're often cheaper, lighter, and smaller. In many cases, prime lenses will provide sharper images than zoom lenses at a lower price. When you start paying thousands of dollars for lenses, lens performance tends to be a little more equal.

The next thing you want to understand is the difference between **wide-angle**, **standard**, **medium**, **macro**, **telephoto**, and **ultra telephoto** lenses. These terms are all based on a lens' focal length, which is a complex definition that's beyond the scope of this lesson. What you need to know is that focal length is measured in millimeters (mm) and you can think of it like the amount of magnification. A low number is like being zoomed really far out, and a high number really far in. Here's what you need to know about each type:

Wide-angle lenses are essentially any lenses with a focal length of up to 35mm. The wider the lens (and lower the focal length), the more the lens can see. Fisheye lenses are extremely wide and often have a rating of around 8-10mm. A regular wide-angle lens is generally around 14-28mm. As you can see from the photo on the left, wide angle lenses capture more stuff in the frame. They also distort space, increasing depth and making it look more spherical. This can be both a wanted and unwanted effect, depending on the circumstances. Some wide-angle lenses include technology that corrects this distortion, but those lenses are almost always significantly more expensive.

Standard lenses are generally between 35-50mm and tend to most closely represent space the way the human eye sees it. Wide-angle lenses tend to distort space and add the appearance of more depth. Telephoto lenses flatten space. Standard lenses are the middle ground and produce images that look realistic to most people. A 50mm prime lens is often the cheapest lens you can buy with a level of quality that rivals zoom lenses priced at several hundred dollars more. Standards are the most versatile lenses because they're a good compromise between the more extreme types, but they're often useless when you're in a small space and need to go wide or are far away from your subject and need the magnification power of a telephoto.

Macro Lenses are what you use if you want a real close up image of a flower blooming. They have a very short focal distance so things that appear in the foreground and in the rear of the photo will blur out in the final image. These lenses can be part of a telephoto lens many times sold as a dual purpose lens. On your better macro lenses you can get within inches of your subject and still be able to have a clear, in focus image. The closer your subject is to the camera the smaller your focal distance is.

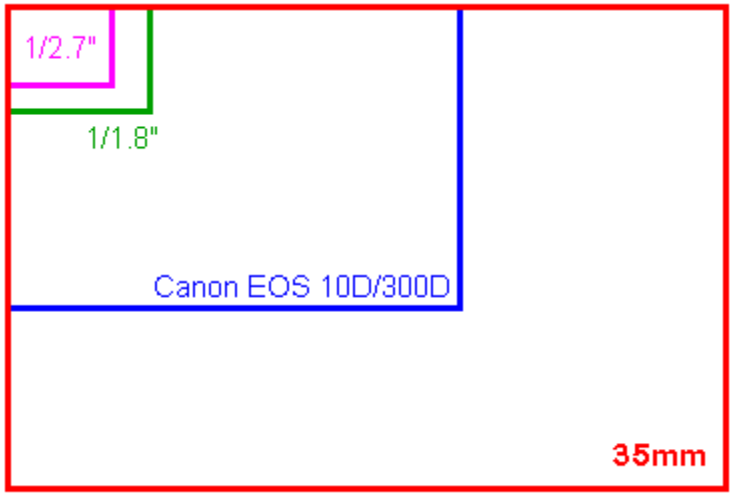
Telephoto lenses are what you want for zooming in really far. Pretty much anything over 100mm is considered a telephoto lens, and anything over 400mm is considered an **ultra telephoto lens**. While telephoto lenses can magnify an image many times over, and are necessary when you can't get close to your subject, they're both heavy, are more subject to motion blur (as a result of camera movement), and do not perform as well in low light. You will find some options that are compact, come with image stabilization (to prevent motion blur), and offer wider apertures (to perform better in low light), but all of these features increase their cost significantly.

The Sensor

The sensor is the part of your camera that captures the light exposure filtered through the lens. For our intents and purposes, we're just going to call this the image. The way the sensor was produced, and how large or small it is, has a pretty big effect on the end result: your photograph.

First of all, the size of the sensors matters. Compact point-and-shoot cameras have very small sensors and the difference in size between them is a smaller factor when choosing a camera.

The chart below shows you the differences in the size of digital sensor as compared to the 35mm sensor or film area.



Relative size of various digital camera sensors

"Name"	Aspect Ratio	Width (mm)	Height (mm)
1/3.6"	4:3	4.0	3.0
1/3.2"	4:3	4.5	3.4
1/3"	4:3	4.8	3.6
1/2.7"	4:3	5.3	4.0
1/2"	4:3	6.4	4.8
1/1.8"	4:3	7.2	5.3
2/3"	4:3	8.8	6.6
1"	4:3	12.8	9.6
4/3"	4:3	18.0	13.5
EOS 10D	3:2	22.0	15.0

When it comes to cameras with interchangeable lenses, which include DSLRs cameras, sensor size has a greater impact. Generally larger sensors provide better low-light performance, greater control over depth of field, and produce higher resolution images with less noise than a smaller sensor.

The majority of DSLRs have a sensor size of about half the size of a frame of 35mm film and generally magnifies all lenses by a factor of 1.6x. This means that using a 35mm lens on a DSLR with a this standard sensor is basically the same as using a 56mm lens on a regular 35mm camera. This is good news for telephoto lenses but bad news for wide angle, as every lens isn't as wide as advertised when placed on this type of DSLR camera.

Some higher-end DSLRs contain full-frame sensors equivalent to the size of a frame of 35mm film. Full-frame sensor DSLRs have the previously mentioned benefits that come with large sensors, but also are not subject to the 1.6x magnification. Basically, a full-frame sensor DSLR is about as close as you're going to get to 35mm film with a digital camera.

While sensor design is very relevant to the image quality, and the only way you're going to be able to judge that quality for certain is to see or produce sample images, you should pay attention to the sensor's megapixel rating. In general, the more megapixels packed into a sensor the more noise you'll find in a given image. This is why you don't necessarily want to choose a camera with a high megapixel rating—especially when a camera has a smaller sensor. For most people, even a 6.3 megapixel camera is sufficient, but anywhere from 8-10 should be more than

sufficient. The point is, don't just buy one camera over the other because it has a higher megapixel count. It may produce noisier, less-desirable results so you should always test first.

The Flash Card

Flash cards come in all different sizes, but they come in different speeds as well. Nowadays you're most likely to end up with an SD or CompactFlash card. The speed of your flash card is important because most cameras nowadays are very fast. You can take many images in rapid succession, but if your card has a slow write speed it can't keep up. For SD cards you'll be best served by a Class 6 card. For CompactFlash, a card rated at 133x should do just fine.

Many DSLRs and compact cameras come with video capabilities, and writing this kind of data requires a fast flash card. Class 6 SD cards will still be enough for most point-and-shoots, but if your video-capable DSLR uses SD cards you'll probably want a Class 10. Class 10 cards are not all created equal, however, and some are marginally faster than Class 6. In most cases any Class 10 should sufficient, and anything with a max write speed of 15MB per second should be more than enough. Of course, it doesn't hurt to get a faster card and some Class 10 SD cards are capable of write speeds twice that fast. CompactFlash cards are often used in higher-end DSLRs because they're capable of faster speeds at a lower cost. A CompactFlash card rated 233x or higher should handle video in most any DSLR just fine, but faster cards will definitely make things run more smoothly.

The Battery

Most DSLRs pack a battery that will last you all day, but compact point-and-shoot don't necessarily come with that luxury. When considering something of the more compact variety, you want to weigh both the longevity of the battery and the cost of a second one. Sometimes you can get a better camera with poor battery life, but the cost of an additional battery isn't very expensive. If you don't mind charging two batteries this can be a good option.

With DSLRs you'll often get a good battery but sometimes that battery will perform better in certain circumstances. DSLRs do not require the use of the LCD screen and you'll generally take pictures through the viewfinder. The battery will last much longer when the LCD screen is not powered, so companies will often provide two ratings for the battery life: one in the number of photos you can take and one in the number of hours the battery will last. The number of hours generally refers to the amount of time the camera can be actively functioning with the LCD screen turned on and the number of photos is simply how many pictures you can expect to take without the aid of the LCD screen. When judging battery life for a particular camera, be sure you know if you plan to use it more with the LCD screen on or off first.

Digital Photography Level 1 Requirements

1 – What the different lenses? And what are they used for?
2 – What are key advantages of a larger camera body?
3 – Why is battery life important?
4 – What is a DSLR?