Why not just use a higher ISO all the time?

While using a higher ISO setting is often needed to capture images with reduced blur in lower light, it also increases the noise level of the image (In film this is often referred to as "grain"). A lower ISO setting is preferred whenever possible since it helps to reduce this noise or grain.

ISO settings can also be used to help control the shutter speed of a camera while in automatic mode. In order to "freeze" motion in a scene, a camera needs to be able to use a higher shutter speed. By selecting a higher ISO you are allowing the camera to gather more light, this automatically forces the camera to select a higher (faster) shutter speed, which helps to reduce motion blur.

With film, the ISO rating is considered a "speed" rating. ISO 100 would be considered a slow film, while ISO 400 would be considered a faster film. Digital cameras obviously don't use film thus the ISO number corresponds to the image sensor's light sensitivity.

ISO 100:   Great for bright sunny days, at the beach or on the snow. Produces clean images that are great for enlargements.

ISO 200:   Great for overcast daylight pictures (noise levels may increase, but in most cases not noticeably)

ISO 400:   Great for lower lighting conditions (indoors, night time) or when you need to capture faster moving subjects in lower lighting conditions. In many consumer cameras, ISO 400 can make photos look very noisy in dark areas of the picture. The reason a higher speed ISO helps you capture fast moving subjects is because a higher ISO makes the image sensor of the camera more light sensitive. This forces the camera to use a higher shutter speed to compensate for the extra brightness, which in turn helps to "freeze" movement in the captured frame.
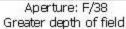

In the above example I set my camera to a fixed shutter speed of 1/200th of a second and the aperture value to f/5.0. I then changed the ISO setting for each photograph to demonstrate how a faster ISO setting can make the camera more light sensitive.

This example demonstrates increased noise (and depth-of-field) in a photograph as you increase the ISO. This example was shot using a Canon EOS-10D which is known to have very **little** noise at higher ISO's when compared to consumer level digital cameras. As you can see, the photograph on the far right has increased noise (grain) but is also a bit more in focus. I focused and zoomed the camera in on a tree (bottom left corner) which was about 80 feet in front of the garage (window). The higher ISO setting allows the image sensor of the camera to be more light sensitive. It also allows the camera to set a smaller aperture which helps it to achieve a greater depth of field. This is why the Window is a bit more in focus in the photo on the right

Aperture: F/38
Greater depth of field

Aperture: F/5.6
Shallow depth of field

Aperture Information

In the dictionary the term Aperture has this definition: "a usually adjustable opening in an optical instrument, such as a camera or telescope, that limits the amount of light passing through a lens...."

All lenses have an opening (Aperture) that allow light to pass through to the camera's image sensor (digital) or film. A larger aperture, (measured in fractions: i.e. f/3.5) allows more light to pass through while a smaller aperture (F/22) allows less light to pass through. The size of the aperture, or its range is determined by the lens itself. If you look around the front of the lens on your camera you might see "f-stop" numbers listed. An example may be: F3.8 - 5.4. These number tell you how large the opening of the lens can get at wide angle (F3.8) and at the telephoto setting (F5.4). In this example "zooming in" will allow less light to pass through compared to shooting the same scene at wide angle.

The smaller the F-stop (fraction) the larger the aperture (opening) of the lens can be. An F-stop of F2.0 lets in more light than a setting of F2.8, etc.. A lens with a maximum F-Stop of F2.8, F2.0, or F1.8 are considered fast. Most consumer priced cameras usually offer a maximum opening size of F3.5 or F3.8 which are fine for normal everyday shooting but not great when trying to reduce motion blur in lower light situations (school plays, indoor sports).

A larger lens opening (brighter lens) offers the following advantages:

- You'll be able to shoot more often with just natural lighting. This helps to reduce harsh shadows and red-eye caused by flash. A flash will still be needed when the scene is too dark, even for the bright lens.

- By allowing more light to pass through, the camera will be able to choose a slightly higher shutter speed which helps to reduce motion blur when shooting in less than ideal lighting conditions.

- A larger aperture (F/5.6 in photo example) helps to reduce "depth-of-field" (the amount of area from front to back that stays in focus) which makes for beautiful portraits (sharp subject, blurred background).

Aperture: F/5.6   Shutter Speed: 1/400 sec.   ISO: 100

Aperture: F/20   Shutter Speed: 1/125 sec.   ISO: 400

Tabulated exposure values

An exposure meter may not always be available, and using a meter to determine exposure for some scenes with unusual lighting distribution may be difficult. However, natural light, as well as many scenes with artificial lighting, is predictable, so that exposure often can be determined with reasonable accuracy from tabulated values.

Table 2. Exposure values (ISO 100 speed) for various lighting conditions[2]

Lighting Condition	EV_{100}
Daylight	
Light sand or snow in full or slightly hazy sunlight (distinct shadows)[a]	16
Typical scene in full or slightly hazy sunlight (distinct shadows)[a,b]	15
Typical scene in hazy sunlight (soft shadows)	14
Typical scene, cloudy bright (no shadows)	13
Typical scene, heavy overcast	12
Areas in open shade, clear sunlight	12
Outdoor, Natural light	
Rainbows	
Clear sky background	15
Cloudy sky background	14
Sunsets and skylines	
Just before sunset	12–14
At sunset	12
Just after sunset	9–11
The Moon,[c] altitude > 40°	

Full	15
Gibbous	14
Quarter	13
Crescent	12
Moonlight, Moon altitude > 40°	
Full	−3 to −2
Gibbous	−4
Quarter	−6
Aurora borealis and australis	
Bright	−4 to −3
Medium	−6 to −5
Outdoor, Artificial Light	
Neon and other bright signs	9–10
Night sports	9
Fires and burning buildings	9
Bright street scenes	8
Night street scenes and window displays	7–8
Night vehicle traffic	5
Fairs and amusement parks	7
Christmas tree lights	4–5

Floodlit buildings, monuments, and fountains	3–5
Distant views of lighted buildings	2
Indoor, Artificial Light	
Galleries	8–11
Sports events, stage shows, and the like	8–9
Circuses, floodlit	8
Ice shows, floodlit	9
Offices and work areas	7–8
Home interiors	5–7
Christmas tree lights	4–5

a. Values for direct sunlight apply between approximately two hours after sunrise and two hours before sunset, and assume front lighting. As a rough general rule, decrease EV by 1 for side lighting, and decrease EV by 2 for back lighting
b. This is approximately the value given by the sunny 16 rule.
c. These values are appropriate for pictures of the Moon taken at night with a long lens or telescope, and will render the Moon as a medium tone. They will not, in general, be suitable for landscape pictures that include the Moon. In a landscape photograph, the Moon typically is near the horizon, where its luminance changes considerably with altitude. Moreover, a landscape photograph usually must take account of the sky and foreground as well as the Moon. Consequently, it is nearly impossible to give a single correct exposure value for such a situation

Exposure Value Chart

EV	TYPE OF LIGHTING SITUATION
-6	Night, away from city lights, subject under starlight only.
-5	Night, away from city lights, subject under crescent moon.
-4	Night, away from city lights, subject under half moon. Meteors (during showers, with time exposure).
-3	Night, away from city lights, subject under full moon.
-2	Night, away from city lights, snowscape under full moon.
-1	Subjects lit by dim ambient artificial light.
0	Subjects lit by dim ambient artificial light.
1	Distant view of lighted skyline.
2	Lightning (with time exposure). Total eclipse of moon.
3	Fireworks (with time exposure).
4	Candle lit close-ups. Christmas lights, floodlit buildings, fountains, and monuments. Subjects under bright street lamps.
5	Night home interiors, average light. School or church auditoriums. Subjects lit by campfires or bonfires.
6	Brightly lit home interiors at night. Fairs, amusement parks.
7	Bottom of rainforest canopy. Brightly lighted nighttime streets. Indoor sports. Stage shows, circuses.
8	Las Vegas or Times Square at night. Store windows. Campfires, bonfires, burning buildings. Ice shows, football, baseball etc. at night. Interiors with bright florescent lights.
9	Landscapes, city skylines 10 minutes after sunset. Neon lights, spotlighted subjects.
10	Landscapes and skylines immediately after sunset. Crescent moon (long lens).
11	Sunsets. Subjects in open shade.
12	Half moon (long lens). Subject in heavy overcast.
13	Gibbous moon (long lens). Subjects in cloudy-bright light (no shadows).
14	Full moon (long lens). Subjects in weak, hazy sun.
15	Subjects in bright or hazy sun (Sunny f/16 rule).
16	Subjects in bright daylight on sand or snow.
17	Rarely encountered in nature. Some man made lighting.
18	Rarely encountered in nature. Some man made lighting.
19	Rarely encountered in nature. Some man made lighting.
20	Rarely encountered in nature. Some man made lighting.
21	Rarely encountered in nature. Some man made lighting.
22	Extremely bright. Rarely encountered in nature.
23	Extremely bright. Rarely encountered in nature.

Light Value Chart

LV Value	Sunny 16 Exposure	Subject
18	+3	- Bright reflections
17	+2	- White or very light colored/toned subject in bright sunlight
16	+1	
15	0	- Subject is medium colored/toned in bright sunlight
14	-1	- Slightly overcast
13	-2	- Overcast
12	-3	- Heavy overcast
11	-4	- Sunset - Open shade
10	-5	- Landscapes just after sunset or before sunrise
9	-6	- Landscapes 10 minutes after sunset or before sunrise - Neon and lighted signs at night - Stage shows with bright lighting
8	-7	- Times Square at night - Store windows at night - Fires at night - Stadium lighting - Interior with sunlight coming through window - Interior with many florescent lights
7	-8	- Bright street at night - Stage shows with average lighting - Daytime interior with skylight
6	-9	- Fairs and amusement parks at night - Daytime interior with windows and no direct sunlight
5	-10	Night interior with bright lighting
4	-11	- Floodlighted buildings, monuments, fountains - Holiday lighting at night (indoor or outdoor) - Night interior with average lighting - Candlelighted close-ups
3	-12	- Street at night

2	-13	x
1	-14	
0	-15	- Dim interior
-1	-16	
-2	-17	x
-3	-18	- Rural landscape illuminated by a full moon
-4	-19	x
-5	-20	
-6	-21	- Rural landscape illuminated by starlight

Exposure Factor Relationship Chart B

	ISO 25	ISO 50	ISO 100	ISO 200	ISO 400	ISO 800	ISO 1600	ISO 3200	f/1.4	f/2.0	f/2.8	f/4	f/5.6	f/8	f/11	f/16	f/22	f/32	
					FILM SPEED (ISO/ASA NUMBER)								**APERTURE OF LENS (f/STOP)**						
	1	0	-1	-2	-3	-4	-5	-6	4 sec	8 sec	15 sec	30 sec	1 min	2 min	4 min	8 min	16 min	32 min	
	2	1	0	-1	-2	-3	-4	-5	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min	4 min	8 min	16 min	
	3	2	1	0	-1	-2	-3	-4	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min	4 min	8 min	
	4	3	2	1	0	-1	-2	-3	1/2 sec	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min	4 min	
	5	4	3	2	1	0	-1	-2	1/4 sec	1/2 sec	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min	
E	6	5	4	3	2	1	0	-1	1/8 sec	1/4 sec	1/2 sec	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	S
V	7	6	5	4	3	2	1	0	1/15 sec	1/8 sec	1/4 sec	1/2 sec	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	H
	8	7	6	5	4	3	2	1	1/30 sec	1/15 sec	1/8 sec	1/4 sec	1/2 sec	1 sec	2 sec	4 sec	8 sec	15 sec	U
N	9	8	7	6	5	4	3	2	1/60 sec	1/30 sec	1/15 sec	1/8 sec	1/4 sec	1/2 sec	1 sec	2 sec	4 sec	8 sec	T
U	10	9	8	7	6	5	4	3	1/125 sec	1/60 sec	1/30 sec	1/15 sec	1/8 sec	1/4 sec	1/2 sec	1 sec	2 sec	4 sec	T
M	11	10	9	8	7	6	5	4	1/250 sec	1/125 sec	1/60 sec	1/30 sec	1/15 sec	1/8 sec	1/4 sec	1/2 sec	1 sec	2 sec	E
B	12	11	10	9	8	7	6	5	1/500 sec	1/250 sec	1/125 sec	1/60 sec	1/30 sec	1/15 sec	1/8 sec	1/4 sec	1/2 sec	1 sec	R
E	13	12	11	10	9	8	7	6	1/1000 sec	1/500 sec	1/250 sec	1/125 sec	1/60 sec	1/30 sec	1/15 sec	1/8 sec	1/4 sec	1/2 sec	
R	14	13	12	11	10	9	8	7	1/2000 sec	1/1000 sec	1/500 sec	1/250 sec	1/125 sec	1/60 sec	1/30 sec	1/15 sec	1/8 sec	1/4 sec	S
S	15	14	13	12	11	10	9	8	1/4000 sec	1/2000 sec	1/1000 sec	1/500 sec	1/250 sec	1/125 sec	1/60 sec	1/30 sec	1/15 sec	1/8 sec	P
	16	15	14	13	12	11	10	9	1/8000 sec	1/4000 sec	1/2000 sec	1/1000 sec	1/500 sec	1/250 sec	1/125 sec	1/60 sec	1/30 sec	1/15 sec	E
	17	16	15	14	13	12	11	10	1/15000 sec	1/8000 sec	1/4000 sec	1/2000 sec	1/1000 sec	1/500 sec	1/250 sec	1/125 sec	1/60 sec	1/30 sec	E
	18	17	16	15	14	13	12	11	1/30000 sec	1/15000 sec	1/8000 sec	1/4000 sec	1/2000 sec	1/1000 sec	1/500 sec	1/250 sec	1/125 sec	1/60 sec	D
	19	18	17	16	15	14	13	12	1/60000 sec	1/30000 sec	1/15000 sec	1/8000 sec	1/4000 sec	1/2000 sec	1/1000 sec	1/500 sec	1/250 sec	1/125 sec	S
	20	19	18	17	16	15	14	13	1/125000 sec	1/60000 sec	1/30000 sec	1/15000 sec	1/8000 sec	1/4000 sec	1/2000 sec	1/1000 sec	1/500 sec	1/250 sec	
	21	20	19	18	17	16	15	14	1/250000 sec	1/125000 sec	1/60000 sec	1/30000 sec	1/15000 sec	1/8000 sec	1/4000 sec	1/2000 sec	1/1000 sec	1/500 sec	
	22	21	20	19	18	17	16	15	1/500000 sec	1/250000 sec	1/125000 sec	1/60000 sec	1/30000 sec	1/15000 sec	1/8000 sec	1/4000 sec	1/2000 sec	1/1000 sec	
	23	22	21	20	19	18	17	16	1/1000000 sec	1/500000 sec	1/250000 sec	1/125000 sec	1/60000 sec	1/30000 sec	1/15000sec	1/8000 sec	1/4000 sec	1/2000 sec	

Exposure Value Chart

Exposure Value Numbers (Use the Correct ISO Column)					Exposure Settings									
100	200	400	800	1600	f/1	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16	f/22
x	x	x	x	18	x	x	x	x	x	x	x	x	x	8000
			18	17									8000	4000
x	x	18	17	16	x	x	x	x	x	x	x	8000	4000	2000
	18	17	16	15							8000	4000	2000	1000
18	17	16	15	14	x	x	x	x	x	8000	4000	2000	1000	500
17	16	15	14	13					8000	4000	2000	1000	500	250
16	15	14	13	12				8000	4000	2000	1000	500	250	125
15	14	13	12	11			8000	4000	2000	1000	500	250	125	60
14	13	12	11	10		8000	4000	2000	1000	500	250	125	60	30
13	12	11	10	9	8000	4000	2000	1000	500	250	125	60	30	15
12	11	10	9	8	4000	2000	1000	500	250	125	60	30	15	8
11	10	9	8	7	2000	1000	500	250	125	60	30	15	8	4
10	9	8	7	6	1000	500	250	125	60	30	15	8	4	2
9	8	7	6	5	500	250	125	60	30	15	8	4	2	1"
8	7	6	5	4	250	125	60	30	15	8	4	2	1"	2"
7	6	5	4	3	125	60	30	15	8	4	2	1"	2"	4"
6	5	4	3	2	60	30	15	8	4	2	1"	2"	4"	8"
5	4	3	2	1	30	15	8	4	2	1"	2"	4"	8"	15"
4	3	2	1	0	15	8	4	2	1"	2"	4"	8"	15"	30"
3	2	1	0	-1	8	4	2	1"	2"	4"	8"	15"	30"	
2	1	0	-1	-2	4	2	1"	2"	4"	8"	15"	30"		
1	0	-1	-2	-3	2	1"	2"	4"	8"	15"	30"			
0	-1	-2	-3	-4	1"	2"	4"	8"	15"	30"				
-1	-2	-3	-4	-5	2"	4"	8"	15"	30"					
-2	-3	-4	-5	-6	4"	8"	15"	30"						
-3	-4	-5	-6		8"	15"	30"							

-5	-6					30"									
-6						60"									