

How to photograph the Moon – by Albert Tan, Committee Member **©2009 TASOS**

Photographing the moon can be tricky. After a bit of trial and error, you should be able to take nice shots of the moon. Below are some tips.

The right lens





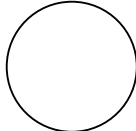
The first thing you need to do is to determine the image size of the moon you want. The moon may look big in the sky but when you take a photo of it through your normal camera lens, the moon image will only fill a tiny portion of the photo. With a standard 50 mm lens, the moon image will just be a dot in your picture. Hence, a lens with a focal length of 300mm and above would be a better choice.

The moon's image diameter (in mm) on a 35 mm format can be determined by dividing the focal length of the lens (in mm) you are using by 109 i.e.

$$\text{Image size (mm)} = \text{Focal length (mm)} / 109$$

Table 1: Focal length vs Moon image diameter

Focal length (mm)	Moon image diameter (mm)	Relative image size on print
50	0.45	.
100	0.92	°
135	1.23	°
200	1.83	°
300	2.75	○

400	3.66	
500	4.58	
800	7.33	
1000	9.17	
2000	18.34	

Keep it steady

Keeping the camera still is essential for getting a sharp image of the moon. You will need a tripod to avoid getting fuzzy images. If you are using a telephoto lens, camera shake will be an issue. The longer the focal length, the more likely your image will be affected by camera shake. To further reduce vibration, you should also either use a shutter release cable or remote control to activate the camera shutter.

Aperture

As the moon is actually a bright object in the sky, you need not use a low f-number. An f-number of between f/11 and f/16 would be enough.

Exposure times

Since the moon is bright, exposure times need not be long. As the moon's movement due to earth's rotation is noticeable with a 400mm or longer focal length lens, using a slow shutter speed will result in a blur moon image. One suggestion is to experiment with different combinations of shutter speeds and f-numbers to get the best result. Below is a guide to correct camera shutter speeds for various moon phases and film speed based on f/16 setting.

Table 2: Shutter speed vs ISO based on f/16 setting






ISO	Full Moon	Gibbous	First/Last quarter	Thick crescent	Thin crescent
					
100	1/60	1/30	1/15	1/8	1/4
200	1/125	1/60	1/30	1/15	1/8
400	1/250	1/125	1/60	1/30	1/15
800	1/500	1/250	1/125	1/60	1/30
1600	1/1000	1/500	1/250	1/125	1/60
3200	1/2000	1/1000	1/500	1/250	1/125

Table 1: Methods of photographing the moon

Equipment	Method	Pros	Cons	Remarks
A) Compact camera	1) Hand-held, aim & shoot.	Easy to operate. Inexpensive equipment.	Small image (not impressive). Blurred images likely.	Not recommended.
	2) Camera mounted on tripod.	Easy to operate. Inexpensive equipment.	Small image.	Not recommended, unless camera lens has long focal length (e.g. above 200mm) / high zoom capabilities
	3) Afocal -Use of camera to take pictures directly off the viewing eyepiece of a telescope (camera handheld or tripod-mounted)	Quite easily done.	Aligning the optical axis of the camera and the eyepiece can be difficult and time consuming. Blur images likely without tripod.	Not recommended.
B) SLR camera	1) Hand-held.	Easy to operate.	Small image (not impressive) if lens focal length is less than 100 mm. Blurred images likely if lens objective focal length more than 100 mm.	Not recommended.
	2) Camera mounted on tripod.	Easy to operate. Moon of fairly good image size if long focal length more than 500mm is used.	Small image (not impressive) if lens focal length is less than 100 mm. Blurred images due to moon movement likely if focal length and exposures are too long.	Balance long exposure versus focal length so as to limit moon movement recorded on the image.
	3) Camera piggyback mounted on telescope with tracking/camera mounted on tracking mount.	Fairly easy to operate.	Need some experimenting with exposures/ISO/f-stop/focal length. Some level of experience required. Setting up tracking mount requires some knowledge.	Recommended for capturing entire moon in a single frame.

Equipment	Method	Pros	Cons	Remarks
C) SLR camera through a telescope <u>without</u> tracking	1) Prime focus.	Large moon image due to long focal length of most telescopes.	Focusing with a telescope more difficult than using camera lens. A challenge to obtain sharp images due to moon movements if long focal length is used.	Recommended for capturing entire moon in a frame. Balance long exposure versus focal length so as to limit moon movement recorded on the image.
	2) Projection with an eyepiece.	Very detailed images of moon possible with high magnification.	Not easy to obtain sharp images due to moon movement and focusing difficulty.	Not recommended.
C) SLR camera through a telescope <u>with</u> tracking	1) Prime focus	Large moon image due to long focal length of most telescopes.	Focusing with a telescope more difficult than using camera lens. Setting up tracking mount and telescope requires some knowledge.	Recommended for capturing entire moon in a single frame.
	2) Projection with an eyepiece	High resolution image of the moon possible.	Elaborate setup involving telescope, eyepieces, SLR camera and tracking equatorial mount. A challenge to obtain sharp images due low image brightness at high magnification.	Recommended for capturing high resolution photos of lunar features (e.g. craters, mountains and valleys)