1. **Introduction**

   Taking photographs at night is very different than daytime photography. In a typical daytime photo, everything you are photographing is relatively well lit and the camera can easily detect the light, focus on the object and take a reasonably good picture in its automatic mode. Advanced photographers may change settings for specific circumstances (using a sports setting for high speed action for example) but most people can get decent pictures fairly easily.

   The situation is different when attempting outdoor nighttime photography. The camera may have a hard time getting enough light to produce an image. To deal with low light, the camera takes longer exposures and must be held very steady (frequently on a tripod) or the pictures will be blurry. The camera may also increase its sensitivity to light (known as ISO) but pictures taken at high ISOs are grainier and nosier. You also frequently have bright lights and very dark areas in the same picture, which makes nighttime photography difficult.

   Fortunately, there are techniques you can use and camera settings you can adjust to overcome most of these issues. This guide will show you how to use your digital camera to take nighttime pictures around the city and record your observations of the types of lights in different locations.

2. **The Camera**

   Most people have digital cameras, ranging from very basic point and shoot cameras to full featured Digital Single Lens Reflect Cameras (DLSRs). The are hundreds of models available from dozens of manufactures which have a wide variety of features. For this guide, we will focus on the camera you have been given in your kit at the teacher workshop, the GE E1680W. You can download the manual for the camera at http://www.general-imaging.com/us/supportDetail.aspx?id=1772

   The E1680W is a 16 megapixel camera with an 8x optical zoom lens built in. The camera comes with a rechargeable battery and 40MB of internal memory that will hold a couple dozen pictures (depending on resolution). You have also been supplied with an 8GB SDHC card which will hold hundreds of pictures (the camera will accept cards up to 32GB).

The camera has a wide variety of modes and manual settings you can alter to get the best possible picture. This guide will take you through where to find the most commonly used settings and give some general nighttime photography tips and techniques.

a. **Preparing the Camera For First Use**
   Before using the camera for the first time, you must charge the battery. The battery should be charged for at least four hours the first time you use it. The two-prong adapter must be attached to the battery charger as shown in the diagram. Insert the battery as shown and plug into a standard outlet.
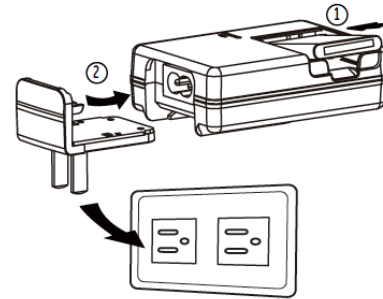
   You also need to insert the SDHC memory card. There is a panel on the bottom of the camera you open by sliding it to the side. Behind the panel is the slot for both the SDHC memory card as well as the battery. Insert the card and batter (once it is finished charging) and close the door.
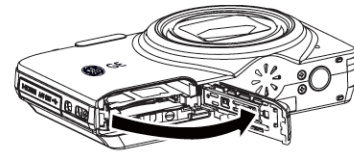
   Turn on the camera by pushing the power button on the top. The first time you use the camera, it will ask you to select the language you desire to use and enter the date and time. Be sure to enter the correct date and time. The camera's clock will attach this information to every picture you take so you can find out when a picture was taken if you forget.

   No matter what model camera you are using, you will need to insert batteries (rechargeable or AA depending on what the camera uses) and a memory card before use. If you are using a different camera, see your instruction manual for camera.

b. **Setting Up the Camera**

   Taking night pictures usually involves longer exposures. Although this camera (and many others) have anti-shake or image stabilization technology built in, it is always better to use a tripod with the camera.

The National Optical Astronomy Observatory's
Dark Skies and Energy Education Program
Photographing Lights and
# Light Pollution Instructions

There are a wide variety of camera tripods available. This camera is fairly light so you do not need a heavy duty tripod. There are a wide variety of tripods. See the instructions that came with your tripod on how to attach the camera.

If you do not have access to a tripod, you can set the camera on a steady surface such as the edge of a picnic table or a bench. Set the camera near the edge of the surface so you do not see the surface in your picture (I have even used the hood or roof of my car in a pinch although it can be hard to get the camera horizontal!)

When using a longer exposure, even the vibration caused by pushing the shutter release button to take the picture can cause the camera to shake enough to blur the picture. Fortunately most cameras come with a self-timer. Using the self timer will give the camera time to stop shaking after you push the button before the picture is taken.

On the GE E1680W, you can access the self-timer by pushing the Flash Button on the back of the camera (#9 in the diagram that looks like a small lightning bolt).

A menu will appear on the LCD screen. You will see several options. Press the down arrow to move to the bottom row. Use the right arrow to move over to the icon that looks like a small clock. Press Ok. You can then select a 10 second delay, 2 second delay or timer off. Select at least a two second delay. (If you have a DLSR, you may be able to use a wired or wireless shutter release so you do not have to touch the camera to take a picture. In this case, you would not need to use the timer).
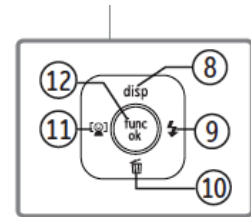
You can also turn the flash off. Select the flash icon (the lightning bolt) and select the flash off. You will want the flash off for your night shots (you can read about the other flash modes in your manual). You want to have the flash off when shooting nighttime lights…remember, you don't want to add light to the scene!

Just remember to go back and undo these settings when you do not need them!

3. Shooting at Night

There are a wide variety of techniques you can use to shoot at night. There is no one best method as lighting conditions vary a great deal and camera settings that work in a mall parking lot might not be suited to a dimly lit country road. Additionally, every type of camera responds differently to the same conditions. The Night Scene mode on the GE E1680W might give a great shot while the same mode on a Kodak Easy Share camera might not under the same conditions. The following sections outline some of the most common techniques you can try. You may have to try a couple of them to get a good shot. With experience, you will quickly learn which one works best under which conditions.

a. Auto Scene Mode

The camera has a variety of scene modes it can use. Auto scene mode lets the camera choose what it thinks is the best one for the particular shot you are taking. Auto Scene Mode frequently produces good results but it can be confused by challenging lighting conditions. You should turn the flash off when using the Auto Scene Mode to photograph nighttime lightings as described in section 2.b.

To select Auto Scene Mode, press the Mode button(#6) on the back of the camera. Select the ASCN mode and press "OK". Press the button the shutter button halfway down. The camera will focus and select a mode. An icon will be displayed showing which mode the camera selected. The chart at the right tells you the symbols for each mode. At night, it will usually select Night Landscape Mode (although in a very well lit area it may select landscape mode). Push the shutter release button all the way down to take the picture. Remember, the camera should be on a tripod or other stable surface!
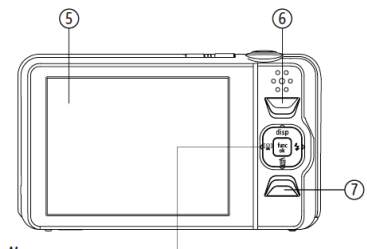
Icon	Mode name	Icon	Mode name
	Landscape Mode		Night Landscape Mode
	Portrait Mode		Macro Mode
	Night Portrait		Auto Mode
	Backlit Portrait		

b. Night Scene Mode

You can force the camera to take a picture using the night scene mode rather than letting the camera select the mode. This technique is useful in several

Icon	Mode Name	Icon	Mode Name
	Sport		Indoor
	Snow		Fireworks
	Museum		Night Landscape
	Children		Leaf
	Sunset		Glass
	Landscape		Night Portrait
	Beach		Text
	Gathering		ID
	Fish eye		Travel shooting
	Photo frame		Sketch

situations. For example, if a foreground object tricks the camera into selecting Night Portrait in Auto Scene Mode, you can switch the camera to Night Landscape Mode.

You will need to use the Manual Scene Mode. Access this feature by pressing the Mode (#6) button on the back of the camera as before. Use the Left/Right button to enter scene mode. You will have a choice of 20 different scene modes to choose from. The symbols and what they mean are in the table at the right. Night Landscape if the mode you will use most often for this project but you can experiment with the other modes as well.

c. **Using Advanced Functions**

Using advanced functions allows you to control the picture taking process more than the auto modes (although not quite as much as a full manual mode on a DLSR). Not all point and shoot cameras let you access these modes and you will have to check your manual if you are using a camera other than the GE E1680W.

Most of the advanced functions can only be accessed when the camera is in manual mode. To access Manual Mode, press the Mode button on the back of the camera as you did before and select the manual icon.

To access the advanced functions, press the Func/OK button (#12).   Press the down button to enter the advanced functions and the right/left buttons to select the function you want to change.
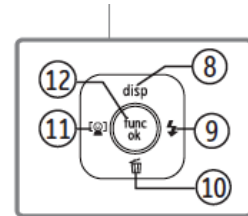
  i. **ISO**
      The most useful function to edit at this point is the ISO. ISO refers to how sensitive the camera will be to dim light. A higher ISO increases the camera's sensitivity to dim light. However, a higher ISO also results in a grainier image with more noise from the CCD sensor in the camera so there is a tradeoff. The E1680W can be set to an ISO as high as 3200. Experiment to see how the image changes at higher ISO speeds and select the highest one that still gives an acceptable image quality.

ii. **White Balance**
White Balance is another setting that can be changed in this setting. Most of the time you will leave White Balance on the Auto setting. However, you may find it useful to set White Balance for incandescent or fluorescent lights if you find yourself in a setting dominated by one particular type of light.

iii. **Autofocus**
There are a couple of autofocus and exposure settings you might find useful that can be used in almost any mode. To access these features, press the Menu Button (#7). Use the left/right button to scroll across the top menu and the up/down button to scroll the vertical menus.
There are a lot of features here but we will focus on a couple of the more commonly used ones (refer to your manual for the rest).

One feature is the AF (auto focus) Assist Beam. The AF Assist Beam should be left on. This will fire a burst of light from the flash to help the camera focus in low light situations.

iv. **Exposure Metering**
Exposure Metering is another important feature to understand. The camera attempts to measure the amount of light in the shot to determine the appropriate exposure time. Spot Metering will look just at the center of the frame and use that to determine the appropriate exposure time. Center weighted looks at the center of the image and the feathers the exposure toward the edges (the center of the image is the most important part). The manual does not describe the effect of the Artificial Intelligence Autoexposure but it may be worth trying.

v. **Continuous Shot Mode**
Another interesting feature in this section is the continuous shot mode. The most interesting feature for this project is the time lapse feature. You can capture a series of pictures at predefined intervals (say one every minute) and make a time lapse to show changes in lighting throughout the night (perhaps as the Moon rises or sets or as businesses close and turn out their lights).

vi. **Date/Time Imprint**
This menu is also where you can find the date and time imprint feature. You should make sure this feature is turned on. Each picture will have a date and time embedded in the file (not on the picture) that you can read with photo editing software in case you need to know when a picture was taken.

vii. **Slow Shutter Mode**
For very dimly lit scenes, you may need to keep the shutter open for a longer period of time. The Slow Shutter mode should be used in these situations. In Slow Shutter mode, the shutter will stay open as long as you hold down the shutter release button. The longer you hold the button, the longer the shutter stays open and the more light the camera collects.

viii. **Exposure Compensation**
Finally, if you shots are consistently coming out overexposed or underexposed, you can adjust the exposure compensation. Access exposure compensation by pressing the flash button (#9). Press the down arrow to access the Basic Menu and the right arrow to get to the Exposure Compensation Setting. Click OK and then use the right and left arrows to adjust the exposure compensation. To make your pictures brighter, select positive values (up to +2) and to make your pictures dimmer, select negative values (down to -2). Note that each full step doubles the exposure (+1 is double the exposure of 0, +2 is double the exposure of +1).
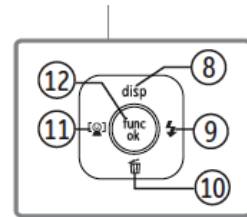
ix. **Panorama Mode**
If you have a very wide field you wish to campture, the camera will take a series of pictures and stitch them together into a panorama automatically. Press the mode button and select the Panorama mode.

Use the left/right buttons to tell the camera whether you want to move the camera to your left or right as you capture your panorama. Press the shutter release and the camera will take the first picture. More the camera in the direction as indicated by the arrows on the screen. The camera will take up to 8 pictures and stitch them together in a panoramic image for you.

4. **Video Mode**
   You may decide the best way to capture your data is by taking a video. Videos on this camera are limited to 29 minutes or whenever your memory card fills up or battery runs out, whichever comes first!

   To make a movie, press the Mode button on the back of the camera. Use the right/left button to select movie and press OK. To start taking a movie, simply push the shutter release button. Push the button second time when you are done to stop the movie. Sound will be recorded via the built in microphone.

   There are two settings you can change in movie mode.

   a. **Exposure Metering**
      Just when you take pictures, you can set exposure metering to spot, center or Artificial Intelligence Auto Exposure. The functions are the same as described previously.

   b. **Continuous Autofocus**
      You can have the camera autofocus continuously if you are trying to follow an object that is changing distances. You can turn the continuous autofocus off if it is not needed to conserve battery life.

5. **Transferring Pictures and Videos**

   You can transfer pictures between the camera and the computer one of two ways. First, you can connect your camera to the computer directly using the enclosed USB cable. Second, if your computer is equipped with a card reader, you can remove the SDHC card from your camera and plug it directly into your computer.

   If you are currently using some type of photo software such as iPhoto or Lightroom, you can use that software to import and work with your photos. If you do not have an image processing program, you can use the CD ROM that came with your camera and install the included image processing software.

   Happy shooting!