











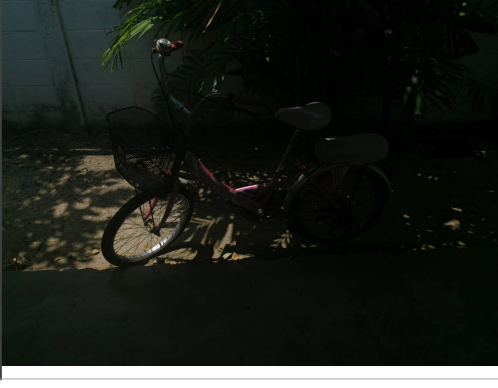



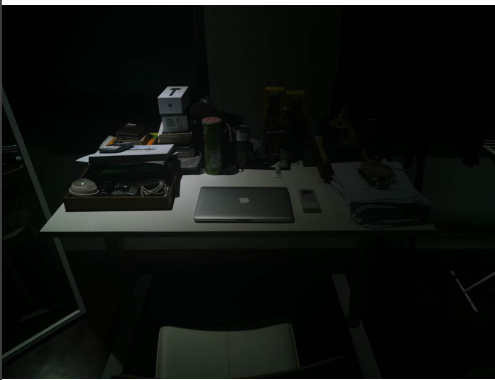

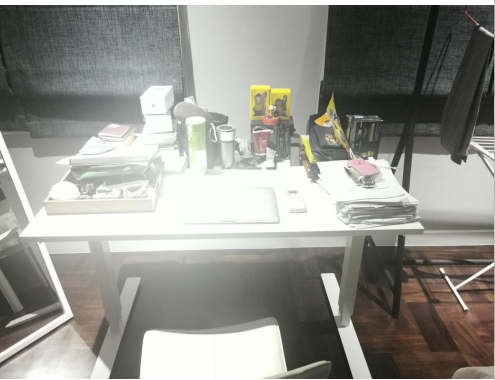
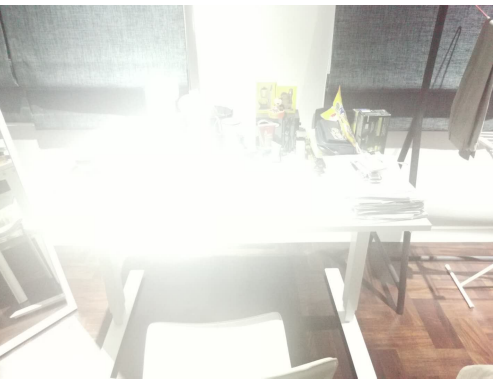

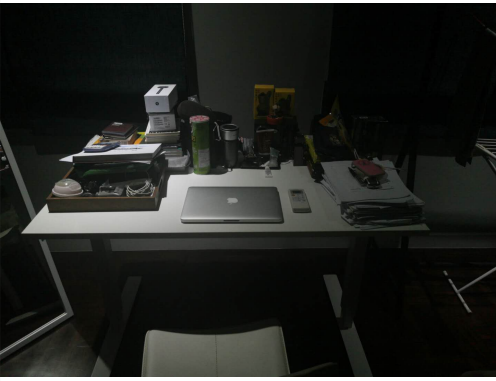
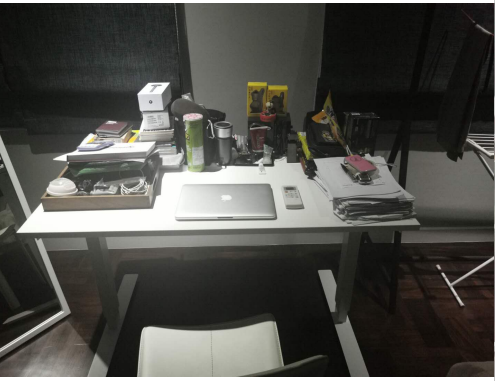


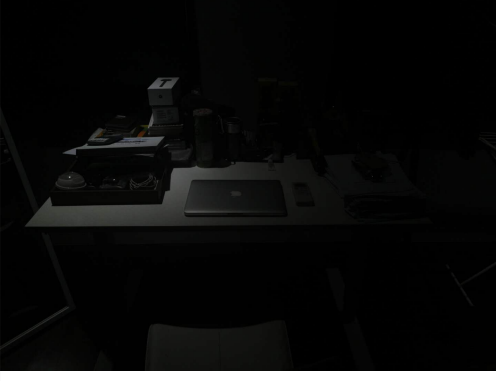
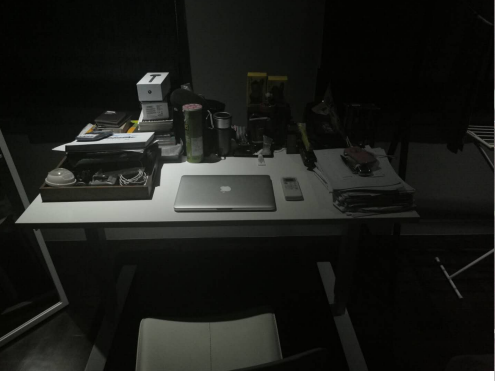
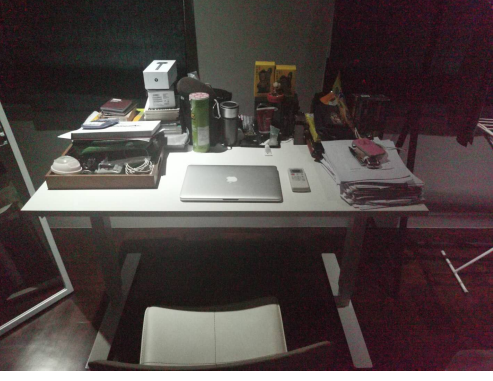


Light picture				
EXPOSURE TIME(ET)\ISO	50	400	1600	6400
1/60				
1/250				
1/1000				
1/4000				

Question3: In the photos from the dark scene, do you notice that high image noise when ISO is too high and motion blur when ET is too high. Explain the phenomenon using the knowledge of Digital Image Pipeline?

Answer: In the digital camera, after the sensor received a continuous light signal, the camera have to convert it to a digital signal. Here ISO come in to play, ISO is a magnitude of amplification of the signal. ISO 100 is when there is X1 amplification and 6400 when X64 amplification. This not only amplified the signal but also noise. Therefore, we are more likely to see the noise when using high ISO. To illustrate, take a look at imageD4000_6400 and imageD250_400(Dark image at ISO6400, Exposure time 1/4000s and ISO 400, Exposure time 1/250s). This 2 image should look similar in theory (from the assumption that only the product $E\Delta t$ is important, increase ISO by 16times and decrease Exposure by 16times will not change the result). However, we can see that with the ISO 6400 there are much more noiser. The phenomenon of Motion blur when shooting with long Exposure time is because sensor expose to the light for longtime as the object moves as exposure time is long. Therefore, the sensor can capture the movement of the object, resulting in blur picture.

Dark picture

EXPOSURE TIME(ET)\ISO	50	400	1600	6400
1/60				
1/250				
1/1000				
1/4000	