

Oct 2, 2015

1. Specular reflection occurs on smooth surfaces where parallel rays are reflected parallel and images are clear.  
A smooth surface is one where the surface imperfections are small compared with the wavelength of the light.

Diffuse reflection occurs from rough surfaces where parallel rays are reflected in a multitude of directions and images are blurry or non-existent.  
A rough surface is one where the surface imperfections are larger than the wavelength of the light.

2. The dull side has not yet been polished so it is rougher & tends to reflect light diffusely. On the polished side the imperfections are smoothed out & filled with wax so that the remaining imperfections are smaller than the wavelength of light.

3. Glossy paper is smoother & tends to reflect images like the light source washing out the specular reflection from the letters on the page. The reflections from porous paper are diffuse & don't form images of the light source.  
The diffuse reflection is also weaker as much of the reflected light is reflected away from the observer's eye.

4. The rough surface diffuses the light as it reflects sending the rays off in a multitude of directions, thus distorting the image.

5. a. Diffuse Reflection

b. Specular reflection

c. Diffuse reflection

d. Specular reflection though not as clear as a mirrored surface.

( $\frac{1}{2}$  diffuse -  $\frac{1}{2}$  specular)

c. Specular reflection

6.  $\lambda = 550 \text{ nm}$  Imperfections;  $50 \text{ nm}$

a. Specular, because the wavelength of the light is large compared to the size of the imperfections.

b. Imperfections;  $2000 \text{ nm}$

Diffuse reflection, because the wavelength is smaller than the surface imperfections.