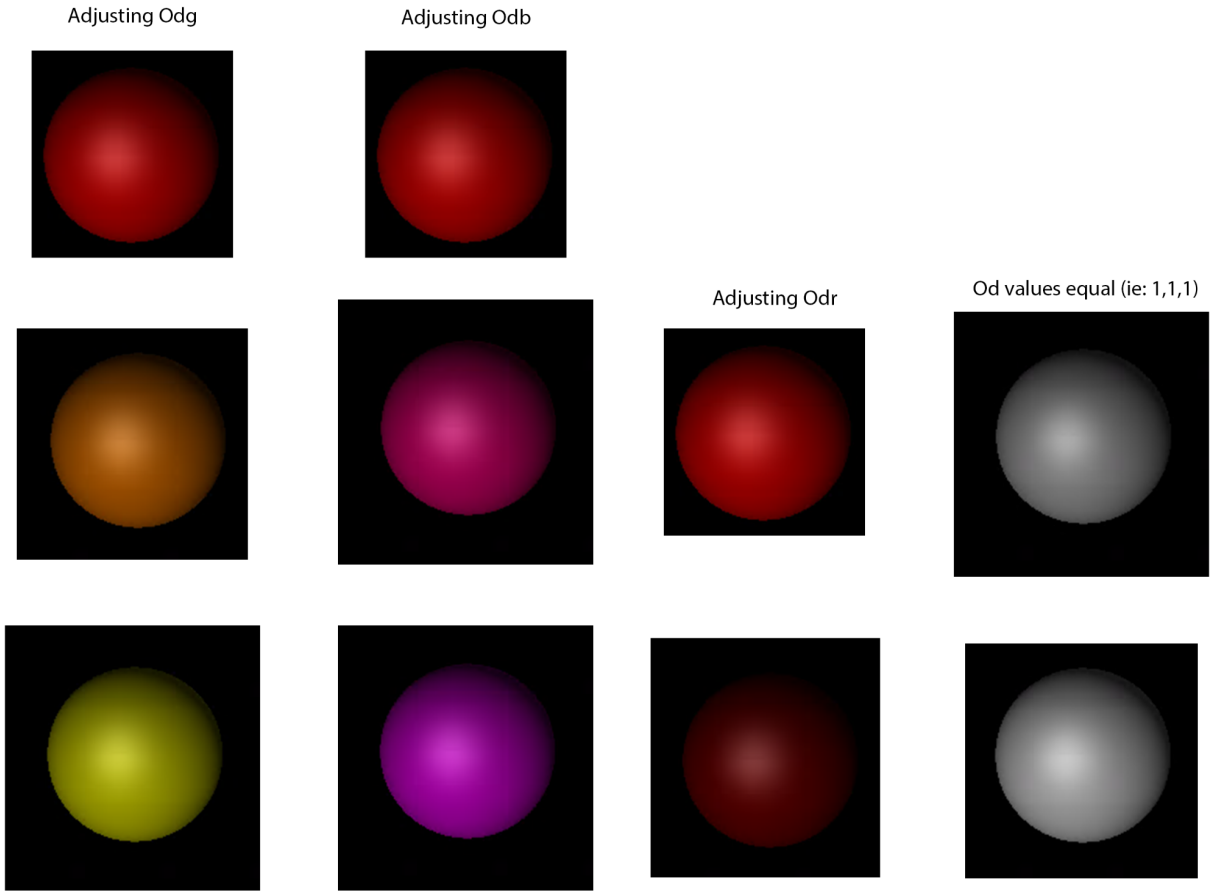
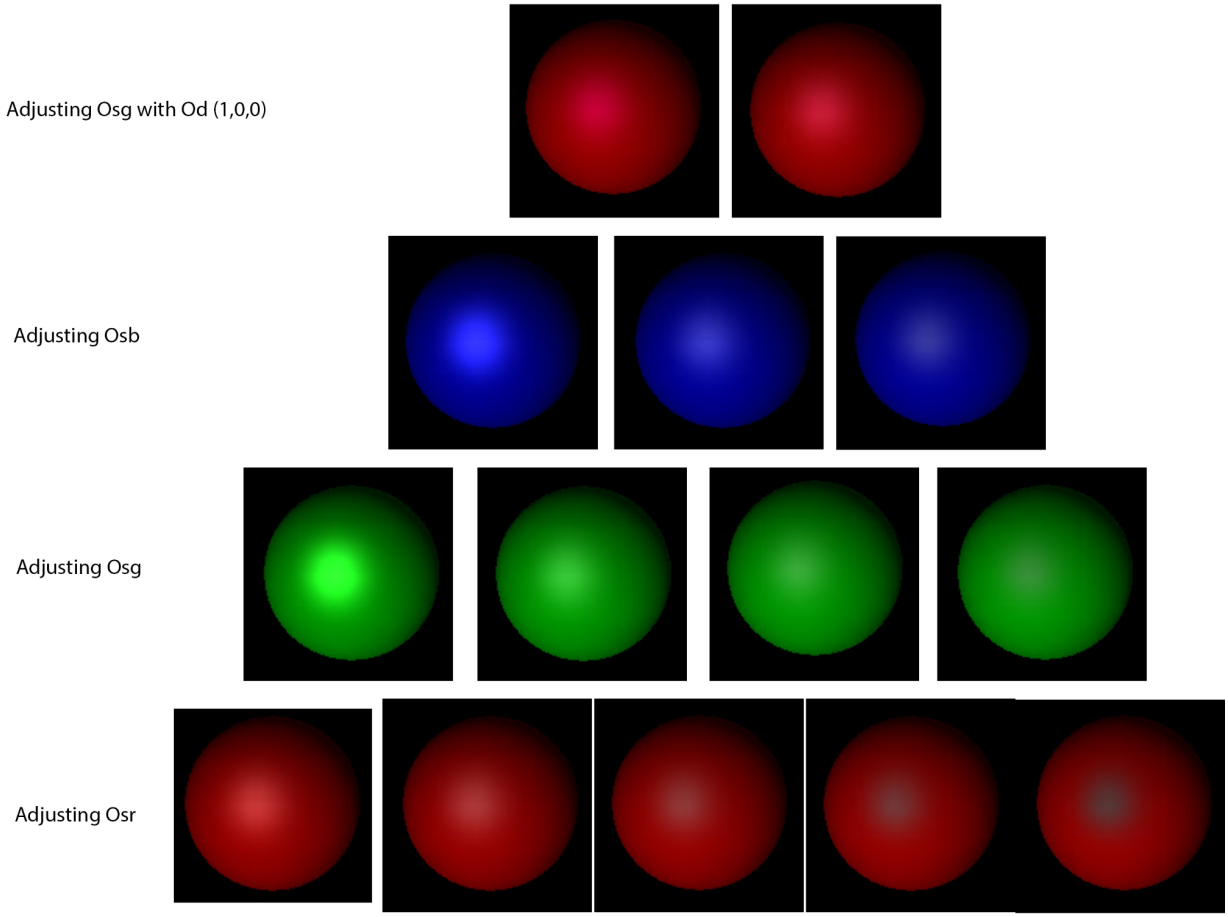
Looking at the image below, the values for a sphere's O_d values. As the values increase for either blue or green, the color changes to match the mixtures of red and green/blue. This is because the base sphere is of O_d values 1, 0, 0. For O_{dr}, the values for red were adjusted causing the sphere to darken and blend more into the background. The last set shows equal values for O_d creating a grayscale sphere. The color lightens when closer to 1 and darker

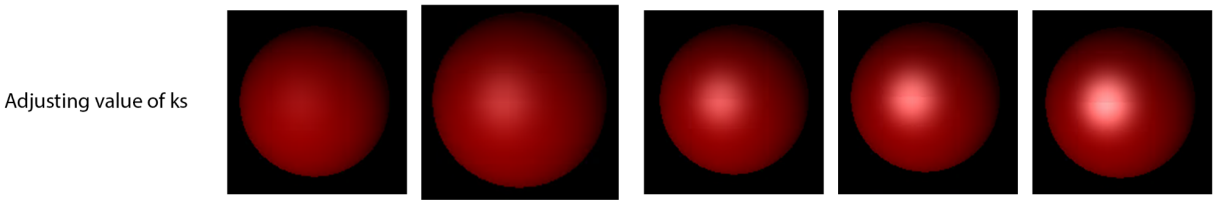


when closer to 0.

When adjusting the O_s values, the color (red, green, blue) needs to be present within the sphere for there to be any effect (as seen with the two spheres at the top of the next image. When adjusting each O_s value, it can be seen that the color of the specular is adjusted and works with the k_s value for how apparent the specular can be seen.

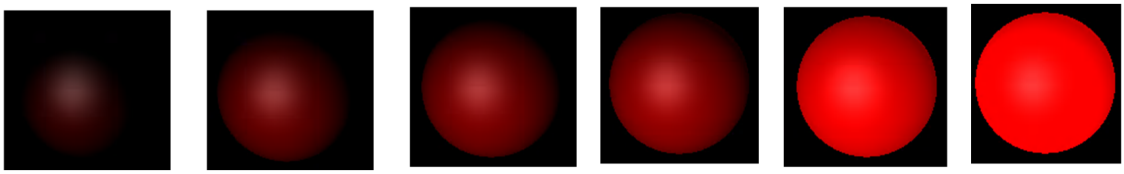


The image below is the adjustments of the k_s value. When the value is closer to 0, the shininess of the specular is non-existent whereas the opposite end of the spectrum creates a very shiny sphere.



When adjusting the k_a values, it can be seen how much of the sphere is being illuminated. To be specific, the value is used to help reflect light uniformly over the surface based on the rays arriving indirectly. Overall, a value closer to 0 creates a very darkened sphere whereas the other end creates a luminescent sphere.

Adjusting value of ka

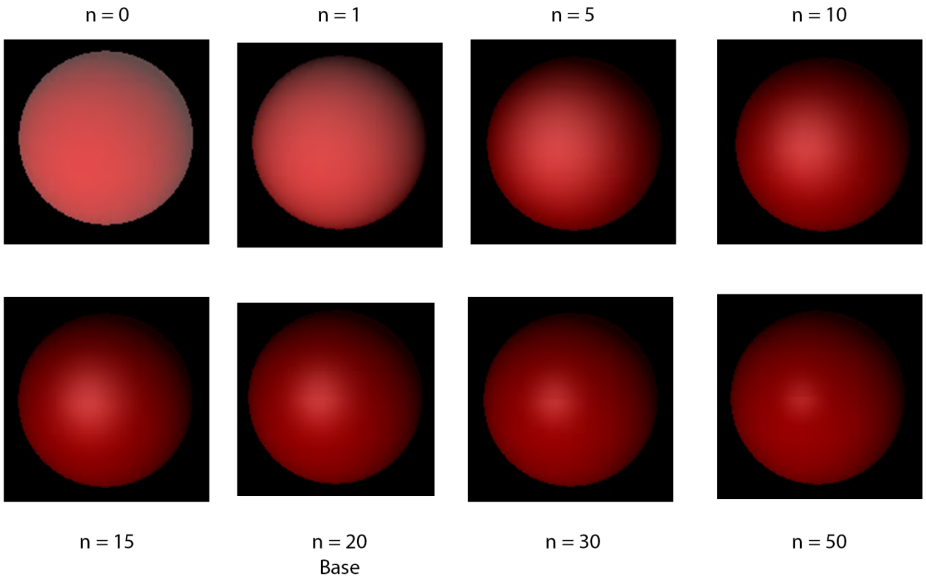


When adjusting the k_d values, it can be seen that the light being reflected is adjusted similar to that of the k_a values. Instead of working with indirect light, k_d reflects light that directly comes to the sphere and diffuses it over the surface. This is what would be called matte.

Adjusting value of kd

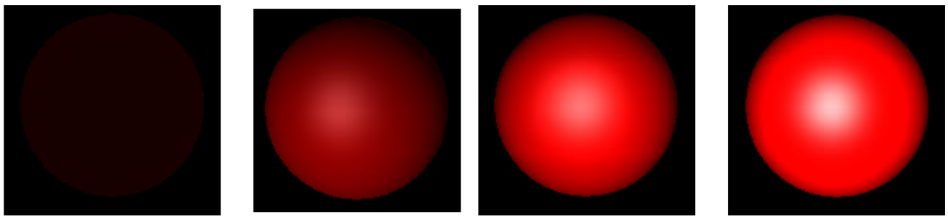
When adjusting the value of n, we look at how much falloff we want for the intensity of the specular (shininess). When the value of n is large, then the highlight is very focused on the sphere. Whereas when the value is small, the specular is broadly spread across the surface.

Adjusting value of n



Lastly the light source values were adjusted by changing the number of light sources and whether the source is directional or a point. When adding/removing light sources, it can be seen that the sphere becomes more illuminated which increases the base color and specular area. For the difference between the point and directional light, the images don't highlight the main differences between the different sources. It should be known that the distance between an object and a directional source is infinite while a point light source has a set distance. Based on the images provided, it can be seen that a point light source can easily illuminate the sphere. For the directional light source, it could be hypothesized that the light source is in a different direction causing the sphere to be less illuminated.

Adjusting number of light sources



Directional vs Point Light Source