

- 1.) If a bare bulb gives off 1700 lumens, and you are given that only 30% of the light from the bulb gets to the floor of the room, then what is the resultant illumination level (illuminance) on the floor of a 10' x 10' room?

$$E = F / A$$

$$F = 1700 \text{ lumens} \times .30$$

$$A = 10' \times 10' = 100 \text{ ft}^2$$

$$E = F / A = (1700 \times .3) / 100 = 5.1 \text{ footcandles (or lumens/square foot)}$$

To convert to lux, multiply by 10.764 lux/fc.

$$E = 5.1 \text{ fc} \times 10.764 = 54.8964 \text{ or about } 55 \text{ lux}$$

- 2.) Will that bulb be a source of glare? Explain. (Imagine looking directly at the bulb. Would the contrast get smaller if the bulb hung down into the middle of the space? Would the *contrast* be greater or smaller if the walls were painted black?)

A single bare bulb is usually a source of glare. If it is right next to the ceiling, it might not be too bad, because the ceiling will be pretty bright all around it. The further the bulb hangs down from the ceiling, the worse it gets, because the ceiling gets darker and the bulb is in contrast to the wall behind it. The contrast (and the resultant glare) get much worse if the walls are painted black.

- 3.) There are three 2400 lumen fluorescent tubes in a 4' x 4' fixture. Assume that because of the reflectors, 80% of that light gets to the diffuser. The actual plastic diffuser surface is 4' x 4' and the transmissivity is 75%. What is the brightness (or luminance) of the diffuser surface?

Find E at the upper surface of the diffuser. (This is similar to problem #1.)

$$E = F / A = (3 \times 2400 \text{ lumens} \times .8) / 4' \times 4' = 360 \text{ fc}$$

Find the light leaving the underside of the diffuser (and the resultant brightness or luminance.)

$$L = E \times \tau = 360 \text{ fc} \times .75 = 270 \text{ fL (footLamberts or lumens/square foot)}$$

- 4.) Which would cause more *glare*, one such fixture on a black ceiling, or a complete grid of them, 8' on center, on a white ceiling? Which would provide more *illumination*? Explain. (Is glare related to illuminance?)

One lone fixture on a black ceiling will cause glare, because there is extreme contrast. Many fixtures on a white ceiling will be much more even within the field of view. Many fixtures will also provide more illumination. Glare is not necessarily the result of too much illumination, but rather too much contrast.

- 5.) Which would be a better light for viewing a painting, direct sunlight coming in from the South, or indirect light, coming in from the North? Which would be more dramatic for a sculpture? Why?

Indirect light, coming from the North, is much better for viewing a painting. It casts no shadows and has no "hot spots" (reflections of the sun, itself). Direct light would be more dramatic for a sculpture, because there would be sharp shadows, popping out the three dimensional nature of the form. There should still be some fill light, or the contrast might be slightly high, but this is not a major problem. In fact, this is one reason that you often find sculpture gardens in museums and never find painting gardens. Even paintings which were done outdoors (eg Monet's gardens or lily ponds, etc.) are usually displayed indoors with diffuse lighting, if possible.)