

1. What is Optical Engineering good for? (Free Question)
 - To design an optical system with available optical components to meet the market demand.
2. You told about optical system. Which optical system you want to talk about?
 - Telescope
3. Then draw a telescope.
 - I draw a Kepler Telescope. I drew it wrong first. Then he leaded me to the correct drawing.
4. What is the intermediate object height?
 - $H = \alpha_o * f_o$
5. What is the magnification?
 - $M = \alpha_i / \alpha_o$
6. What is the magnification in terms of focal lengths?
 - $M = f_o / f_e$
7. Derive it.
8. So it means if we increase f_o and decrease f_e we get better magnification. Can we increase f_o as much as we wish?
 - I think 'no'. Because then the length of the telescope will be too big.
9. What is the length of a typical telescope?
 - 0.5m (At this point I was having trouble)
10. No. Sometimes the telescope is longer than this. What is the length of a Hubble Telescope?
 - I exactly don't know the length but I know the diameter. It is around 2.5m.
11. Consider the focal length you've said. What is the F/#?
 - 1/5.
12. Is it feasible?
 - No. I've not heard about anything of having F/# like this.
13. What is the typical F/#?
 - I've heard about 16, 8, 4, 2 etc.
14. Now consider the length of Hubble Telescope as 10m. So what is the F/#?
 - 4.
15. Yes. So this is the F/# of Hubble Telescope and the length is 10m. For which purpose you use telescope?
 - To see distant objects.
16. Like what?

- Like a bird or something like this.
17. Suppose the bird legs are on the optical axis of the telescope and the head is a little bit upper. How will you see the bird?
- The legs will be on the optical axis but the position of head will be flipped.
18. Is it possible to get 1000 magnification of the telescope?
- No. (After having a lot of trouble I said it)
19. Why?
- Because the magnification of telescope can also be expressed by the ratio of objective lens diameter to eyepiece diameter. For this huge magnification the eyepiece diameter must be very small which could be less than the average pupil diameter of eye.
20. What is the average pupil diameter of eye?
- 3 mm.
21. Suppose you have an option to choose one telescope between 10X 50 and 10X 30. Which one will you choose?
- 10X 50
22. Why?
- Because 10X 50 has an eyepiece diameter of 5 mm and 10X 30 has 3 mm of eyepiece diameter. So the first one is better when the light is low. Because then the pupil diameter increases.
23. Do you know the name of Spectrometer?
- Yes.
24. Draw one.
- I drew a spectrometer with concave mirrors.
25. What is the resolution of this spectrometer?
- $\Theta_{\min} = (1.22 \cdot \lambda) / D$
26. What is the D here?
- The diameter of Collimator (first concave mirror)
27. Theoretically this is the diameter of the grating as well. On which parameter the number of different colors in the intensity pattern depends?
- The diffraction angle.
28. How do we get diffraction angle?
- $g \cdot \sin \Theta = m \cdot \lambda$
29. m can be approximated as 1 and applying paraxial approximation the equation can be simplified to $\Theta = \lambda / g$. What is the should be the minimum

distance between the bright fringes of the red color and the blue color to resolve them?

- $\Delta x = f * [(\lambda_B - \lambda_R)/g]$. Here f is the focal length of the focusing mirror. (After facing a lot of trouble I could lead to the equation. May at this point he has made up his mind to give me the grade what I've got)

30. So how many colors you can see in the grating?

- At this point I got confused and asked for repeating the question. (I still don't know the answer though it was very easy. Ha ha ha)

31. I think we can end the exam here.