Problems on optics

1. In young's experiment, wavelength of redlight is $7.8\,x\,10^{-8}$ cm and that of blue light is $5.2\,x\,10^{-8}cm$. Value of n for which (n+1)th blue bright ine coincides with nth red fringe is [hint: $n_b\lambda_b = n_r\lambda_r ; n_b - n_r = 1$] **2**
2. A light of wavelngth 6328angstroms is incident normally on a slit of width 0.2mm angular width of the central maximum on the screen will be
   [hint: wsinθ = nλ] **2θ = 0.36^0**
3. Two mirrors are kept at 60degrees to each other and a body is placed at middle. The total no. Of images formed is **5**
4. path difference between two wave fronts emitted from coherent sources is 2.1 micron. Phase difference between the wave fronts at that point is 7.692π. Wave length of light emitted by sources wil be **5460 A^0**
5. In young's double sit experiment distance between slit is d/3 and distance between screen and sit is 3D, then the fringe width is $\frac{9\lambda D}{d}$
6. light of wavelength 5000angstroms is incident normally on a slit. First minimum of diffraction patterin is formed at a distance of 5mm from the central maximum. If slit width is 0.2mm, then distance between slit and screen will be **2m**
7. A double slit experiment produces interference fringes for sodium light. The fringes are 0.4 angstroms apart in air. The angular fringe seperation if the entire arrangement is immersed in water
   [hint: $\frac{\beta_a}{\beta_w} = \frac{\lambda_a}{\lambda_w} = \mu_w$] **0.3A^0**
8. Two coherent sources of intensity ratio α interfere. In the interference pattern $\frac{I_{max} - I_{min}}{I_{max} + I_{min}}$ is equal to [hint: $\frac{I_1}{I_2} = \frac{a_1^2}{a_2^2} = \alpha$] $\frac{2\sqrt{\alpha}}{1-\alpha}$
9. A far sighted person cannot see objects placed closed to 50cm. Find the power of the lens needed to see the objects at 20cm.
   [hint: $\frac{1}{f} = \frac{1}{u} - \frac{1}{v}$] **3D**
10. A person can see clearly only upto 3 metre. Prescribe a lens for his spectacles so that he can see clearly upto 12m.(The person is short sighted)
    The person should use concave lens of power 0.25D
11. A small candle 2.5cm in size is placed 27cm infront of a concave mirror of radius of curvature 36cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? Describe nature and size of the image.
    54Cm; -5cm ; real and inverted;
12. A 4.5cm needle is placed 12cm away from a convex mirror of foca length 15cm. Give the location, nature and size of the image.
    -6.7cm; 2.5cm ; errect and virtual
13. A tank is filled with water to a height of 12.5cm. The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be 9.4cm. What is the refractive index of water? If water is replaced by a liquid of refractive index 1.63 upto the same height, by what

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distance would the microscope have to be moved to focus on the needle agian.
1.73cm

14. A beam of light converges to a point P. Now a lens is placed in the path of the convergent beam 12cm from P. At what point does the beam converge if the lens is (a) a convex lens of focal length 20cm and (b) a concave lens of focal length 16cm?
(a) 7.5cm (b) 4.8cm
15. A screen is placed 90cm from an object. The image of the object on the scrren is formed by a convex lens at two different locations seperated by 20cm. Determine the focal length of the lens? [hint: u+v = 90; u-v = 20]
21.4cm
16. The radii of curvature of two surgaces of a double concave lenses are 20cm and 40cm respectively and refractive index of the material is 1.6. calculate the powe of the lens.
-4.5D
17. A double convex lens has faces of radii 18cm and 20cm. When an object is 24cm from the ens a real image is formed 32cm from the lens. Determine (a) focal length (b) the refractive index of the lens material **13.7cm; 1.69**
18. Mercury green light has a wavelength 5.5×10^{-5}cm. Deduce (a) frequency in Mhz (b) period in microsecond?
19. In a young's double slit experiment, the slits are 0.2mm apart and the screen is 1.5m away. It is observed that the distance between the central bright fringe and fourth dark fringe is 1.8cm. Calculate the wavelength of light used. $6.86\,x\,10^{-7}\,m$
20. Red light of wavelength 6500angstroms from a distant sources falls on a slit 0.5mm wide. Calculate the distance between the two dark bands on each side of centra bright band of the diffraction pattern observed on a screen placed 1.8m from the slit **4.68mm**
21. Two wavelengths of sodium light 590nm, 596nm are used, in turn, to study the diffraction taking place at a singe slit of aperture 2×10^{-6}m. The distance between the positions of first maximum of the diffraction pattern obtained in the two cases. **6.75mm**