

## **PHYS 1200 Physics of Everyday Experience**

### **Review questions and exercises for Lecture 32 (L&O-4)**

1. What is physical optics?
2. What is the diffraction of light?
3. How is the polarization of an electromagnetic wave defined?
4. What is the difference between polarized and unpolarized light?
5. What is the effect of placing a Polaroid sheet in the path of unpolarized light?
6. What is the effect of placing a Polaroid sheet in the path of polarized light?
7. What are constructive and destructive interference?
8. A laser beam passes through a narrow circular aperture. What pattern is observed on a screen downstream of the aperture?
9. What types of waves are subject to the phenomenon of diffraction?
10. How does diffraction affect our ability to distinguish closely spaced objects?
11. What is thin film interference?
12. Why does the surface of a DVD look colorful in white light?

Answers:

1. Physical optics is the branch of optics that deals with effects due to the wave nature of light.
2. Diffraction is the spreading out of light waves after passing through a small opening.
3. The polarization of an electromagnetic wave is defined as the direction in which the electric field oscillates.
4. In polarized light the electric field vibrates in only one direction whereas in unpolarized light the electric field is oriented randomly in all directions around the direction of propagation.
5. Unpolarized light passing through a Polaroid sheet will be polarized in the direction of the axis of the Polaroid sheet
6. The effect of a Polaroid sheet on polarized light depends on the angle between the direction of polarization of the light and the axis of the Polaroid sheet. If the direction of polarization is parallel to the axis of the Polaroid sheet, the light passes through with no change. If the direction of polarization is perpendicular to the axis of the Polaroid sheet, the light does not pass through.
7. Constructive interference occurs when two wave that are in phase are added together. The intensity of the combined wave is the sum of the intensities of the individual waves. Destructive interference occurs when two waves that are not in phase are added together. If the waves are exactly out of phase, the waves cancel out each other.
8. When a laser beam passes through a small circular aperture, diffraction produces a series of concentric rings on the screen.
9. Diffraction is a phenomenon that occurs with all types of waves.
10. Diffraction causes the light entering our eyes to spread out and if the diffraction patterns from 2 objects overlap, they appear as one object.
11. If a thin film is on a surface, there is interference between light reflected from the film and the light reflected by the surface under the film. Since different wavelengths of light are refracted by different amounts, white light is spread out in colors.
12. The surface of a DVD has many narrowly spaced features that act as a diffraction grating which causes white light to be spread out by color.