

WEEK SIX:- {LIGHT ENERGY}

Basic Science JSS3 Second Term

Week 6

Topic: Light Energy

Overview

1. Reflection

2. Refraction

3. Vision

4. Dispersion and Rainbow.

Objectives

1 Explain the meaning of reflection and refractions

2. Illustrate apparent depth and explain its

dangers to swimmers 3. Describe how we see things

4. Explain the meaning of dispersion and

use it to interpret the rainbow

Introduction

Light is a form of energy. Light energy possesses different properties which make this form of energy very useful to man. Some of these properties include reflection, refraction, apparent depth in liquids, producing vision in the eye and dispersion or capability of being separated into various colours of the rainbow.

The Concept of Reflection of Light

Reflection is one of the properties of light. It occurs whenever a ray of light strikes a plane or polished smooth surface, such as a mirror

Note the following terms which are used to explain the reflection of light:

- The line NO is called the normal to the reflecting surface. It is a perpendicular line at O, the point of incidence.

. IO is the incidence ray

- OR is the reflected ray

- Angle ION is the angle of incidence

- Angle NOR is the angle of reflection

Law of reflection states that the angle of incidence is equal to the angle of reflection.

*Thus $i^\circ = r^\circ$ *

Reflection occurs at smooth, polished or silvered surfaces whether they are plane or curved.

The Concept of Refraction of Light

Refraction is the bending of a light ray when it travels from one medium to another of different densities. When the light travels from a dense medium (e.g. water) to a less dense medium (e.g. air), the emergent light ray is bent away from the normal whereas when the light travels from a less dense medium (e.g. air) to a dense medium (e.g. water or glass)

When light travels from air into water, it slows down, causing it to change direction slightly. This change of direction is called refraction. When light enters a more dense substance (higher refractive index), it 'bends' more towards the normal line.

Note that refraction occurs whenever light passes from one medium to another medium of different densities e.g. air to water, glass to water, etc.

Apparent Depth

The bottom of a bucket or beaker appears to be lifted up making the water in the beaker appear shallower than it actually is. This phenomenon could be dangerous for large and deep pools of water, such as rivers or swimming pools. Apparent depth could be deceptive to children, swimmers and divers who may imagine that the depth of water is small. Such situations had led to the drowning of swimmers and divers.

The Eye and Vision

This is the organ for seeing (sight). With our eyes, we can see things in their varying colours, shapes, sizes, etc. We have two eyes (a pair of eyes) that enable us to have a wide vision.

Parts of the Eye and functions

- Sclera: tough outer white layer of the wall of the eye.
- Cornea: transparent 'window' of the eye, focusing of light on the retina.
- Iris: the coloured sheet of muscle, controls the pupil size so controls the entry of light.
- Pupil: a hole in the iris letting light into the back of the eye.
- Ciliary Body: a ring of muscle controlling
the shape of the lens.
- Suspensory Ligaments: transfer the pull of the ciliary body to the lens.
- Lens: accommodation - the fine adjustment to the focusing of light onto the retina.
- Retina: a light-sensitive layer of rods and cones converting light into nerve impulses.
- Fovea or Yellow Spot: a tiny area of densely packed cones for detailed and coloured vision.



Choroid: a black-pigmented layer preventing internal reflection of light.

- Blind Spot: exit point of the optic nerve cutting through the retina so no rods or cones here.
- Optic Nerve: carries the impulses from the rods and cones to the visual centre of the brain.
- Aqueous Humour: a clear liquid in front of the lens maintaining the shape of the cornea.
- Vitreous Humour: a clear jelly offering support and shape to the back of the eye.

We see an object by the light, which leaves the object and enters the eye. The light enters the eye through the circular opening called the pupils. It strikes the eye lens, which converges it to form an image on the retina.

When the light is too bright, the pupil contracts to make the circular opening smaller, if the light is dull, the pupil opens wider to admit more light. Focusing the image on the retina is achieved by altering the focal length of the eye lens. This is achieved by the contraction or relaxation of the ciliary muscles. The power of the eye to do this is called accommodation.

Dispersion and Rainbow

In this phenomenon, white light is separated into various component colours, which are red, orange, yellow, green, blue, indigo and violet (ROYGBIV). The separation of white light into the various component colours by a glass prism is called dispersion. The coloured patch of light is called a spectrum. A pure spectrum is one in which the colours do not overlap.

Water droplets in the atmosphere behave in a similar way to the prism. That is how the rainbow is formed in the sky by droplets of water, which hang in the atmosphere.

Summary

1. Reflection of light is the travelling back of light when it strikes a smooth surface
2. If the light strikes a rough surface, the reflection is irregular or the light is scattered.
3. When light enters a denser medium, it is refracted towards the normal
4. When light enters a less dense medium, it is refracted away from the normal
5. An object in a pond or a beaker of water appears less deep because the eye looks straight whereas rays from the object are refracted or bent.
6. Some materials are able to disperse or separate light into their components
7. A Rainbow is caused by the separation or dispersion of white light into its components.
8. The colours of the components of lights are represented by the acronym *ROYGBIV*

