

WHAT IS LIGHT?



The Zebrafish are emitting light when exposed to ultraviolet light. Salton Sea in California has algae that emit light giving it this glow.

How Light is Produced

All sources of light have atoms that absorb some form of energy, making the atoms 'excited'. These 'excited' atoms can then release energy in the form of light.

Luminous means to produce its own light (e.g. the Sun, a lamp)

Non-luminous means it does not produce its own light (e.g. the Moon, a cookie)

Types of Light: Incandescence

- *The production of light as a result of high temperatures*
- Example: incandescence light bulb, burning candle

Incandescent Light Bulb:

- A light bulb has a tungsten wire that gets very hot and glows brightly when electric current runs through it
- Electric energy 'excites' the atoms that give off heat and light
- Very *inefficient* source of light because more heat is produced than light



Types of Light:

Electric Discharge

- *The process of producing light by passing an electric current through a gas*
- Electricity causes the gas to glow
- 'neon lighting' – not always Neon
 - Different gases give off different colours



Types of Light: Phosphorescence

- *The process of producing light by the absorption of UV light resulting in the emission of visible light over an extended period of time*
- Example: 'glow in the dark' objects
 - Coated with special materials called phosphors



Types of Light: Fluorescence

- *The immediate emission of visible light as a result of the absorption of UV light*
- Fluorescent dyes are often added to detergents to make clothes 'brighter'
- Highlighters contain fluorescent ink
- Non-destructive testing – can identify microfractures in metals



<http://aviationengines.com.au/ndt.html>



Uses of Fluorescence

- Many body fluids contain fluorescent molecules
- Ultraviolet light plus luminol can be used to see them
- Fluorescent material used in documents, money, tickets

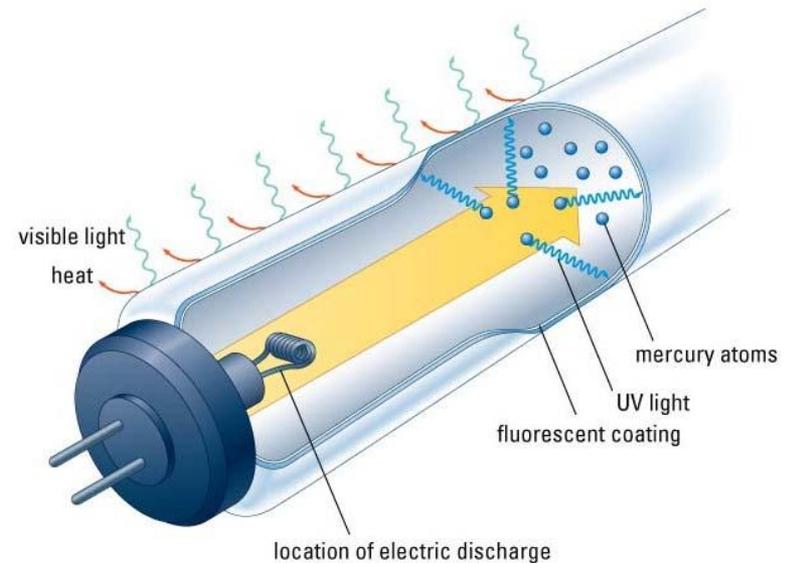


Compact Fluorescent Light Bulbs

Electric Discharge + Fluorescence

- Bulb is filled with mercury vapour
- Inner tube is coated with fluorescent material
- When light is turned on, electric current causes the mercury atoms to emit UV light
 - UV light strikes the fluorescent coating of the tube, resulting in the emission of visible light

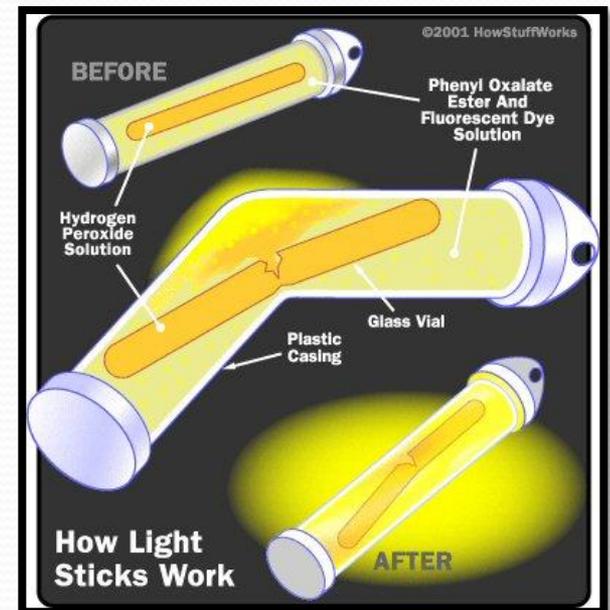
Fluorescent lights are more efficient than incandescent bulbs



Types of Light: Chemiluminescence

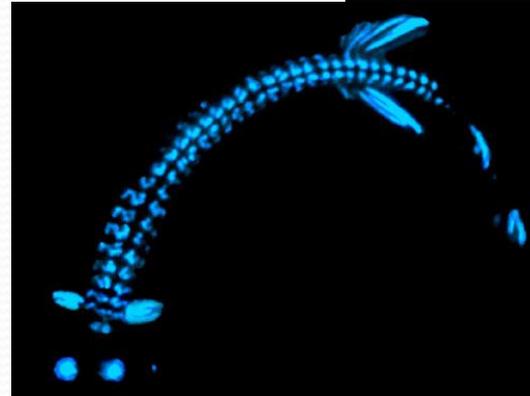
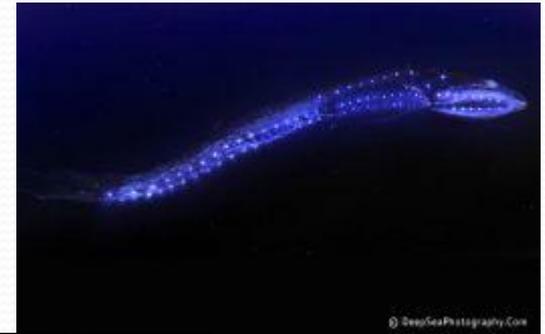
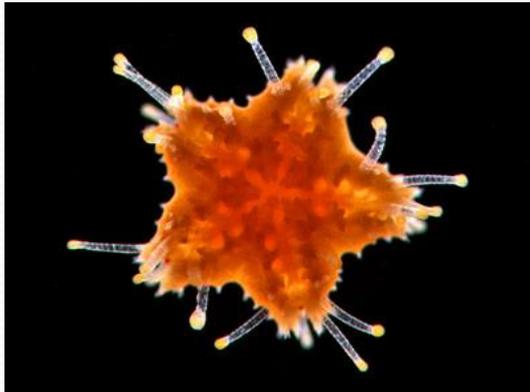
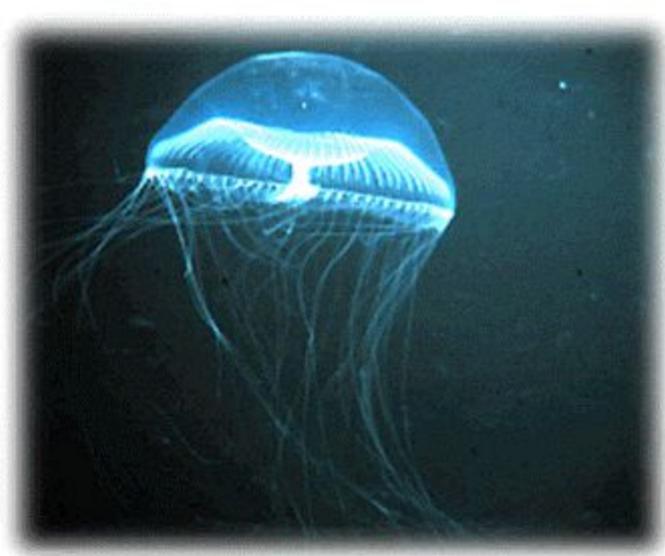
- *The direct production of light as the result of a chemical reaction with little or no heat produced*

Example – glow sticks



Types of Light: Bioluminescence

- *The production of light in living organisms as the result of a chemical reaction*
 - Chemical reactions in living cells
 - Common in marine organisms



Types of Light:

Triboluminescence

- *The production of light from friction as a result of scratching, crushing or rubbing certain crystals*
- WintOGreen Lifesavers
- Does not appear to have any practical application For now



Light-Emitting Diode (LED)

LED → light produced as a result of an electric current flowing through semiconductors (only allows current in one direction)

- eg. of semiconductor → silicon

Compared to incandescent light:

- No filament required
- Not as much heat produced
- More energy efficient
- Not always as “bright”

Summary Activity

- Take a few minutes now to complete the following table:

Type of Light	Key Characteristics	Real Life Examples
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

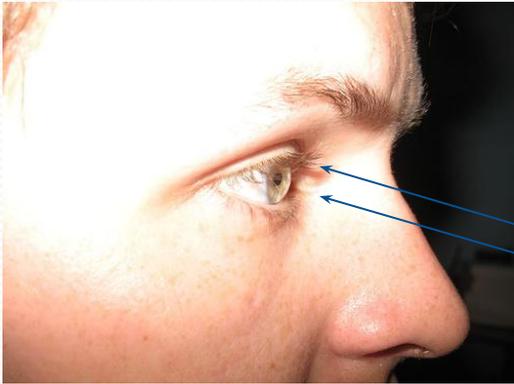
- When you look at an object, you see it because light travels in a straight line from the object to your eyes.
- Scientists use an arrow to trace the path and show the direction that light travels



- The arrow is called a ray

Light can be reflected.....

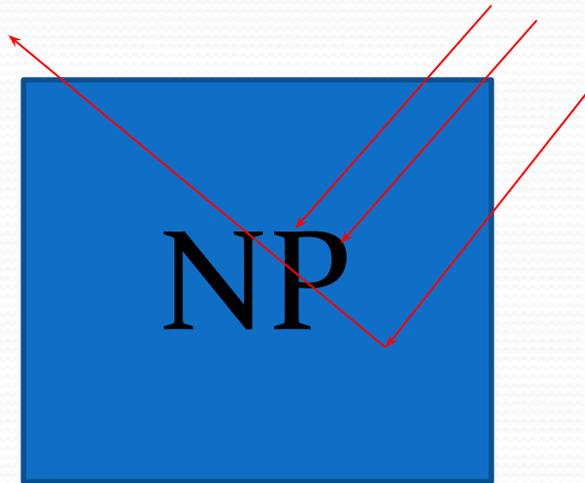
- Reflection is the process in which light “bounces off” a surface and **changes direction**



Light rays travel from a source, the lamp, and reflects from the paper to your eyes.

Light can be absorbed.....

- Absorption is the process in which light energy remains in an object and is **converted into heat**.



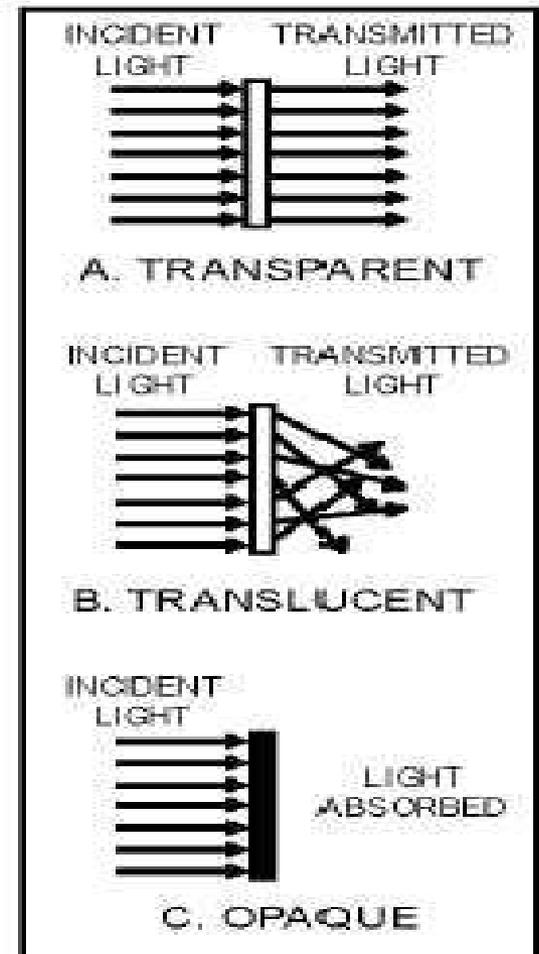
Black print on a page absorbs all light and therefore no light reaches the eye. Your brain interprets the absence of light as black

Light can be transmitted.....

- Transmission is the process in which light penetrates an object and **keeps travelling**, allowing you to see the objects on the other side.
- Clear glass and plastic transmit light
- White paper transmits some light and reflects or absorbs the rest

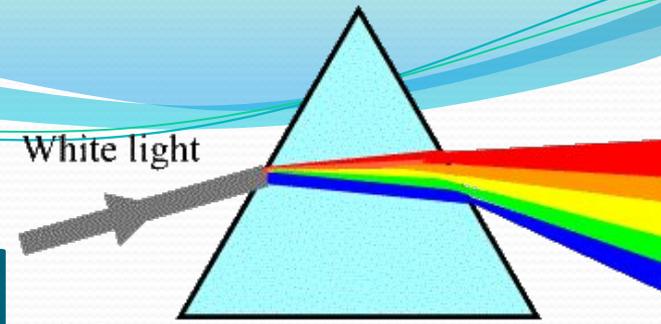
Light can be transmitted.....

- **Transparent:** Light is transmitted without any change in direction.
Example: clear glass
- **Translucent:** Light can pass but is scattered in many different directions. You cannot see a clear image on the other side.
Example: waxed paper
- **Opaque:** No light passes therefore all light is either reflected or absorbed.
Example: Wood

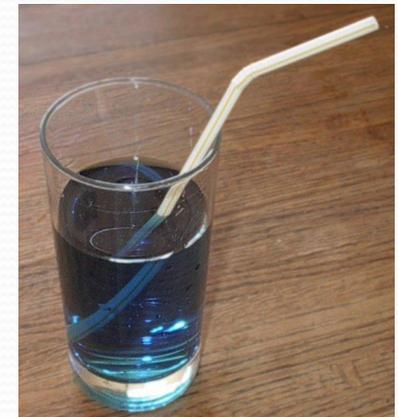


Light can be refracted...

White light



- Light rays appear to “bend” when travelling from one to another medium
- Examples include:
 - Refraction through a prism (Dispersion)
 - Corrective glasses
 - Fish appear at a different position in aquarium



Light can be diffracted...

- Diffraction is:
 - the apparent **bending** of waves around *small* obstacles and
 - the **spreading** out of waves past *small* openings

