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LIGHT – Chapter 10 (pp. 380 +) Name Laura Friesen

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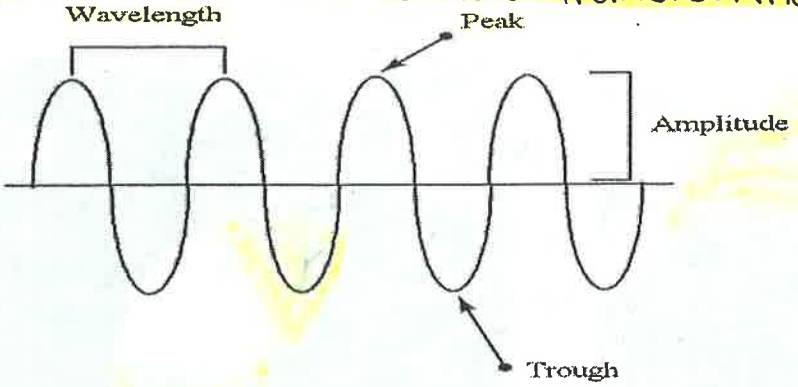
10.1

Define light. Light is a form of energy that travels in waves.

Define wave. A wave is a disturbance that transfers energy from one point to another without transferring matter.



Properties of Waves Define the following terms:

Crest/Peak – The highest point in a wave.

Trough – The lowest point in a wave.

Rest position – The level of the water when there are no waves.

Wavelength – the distance from one place in a wave to the next similar place on the wave. For example, distance from crest to crest.

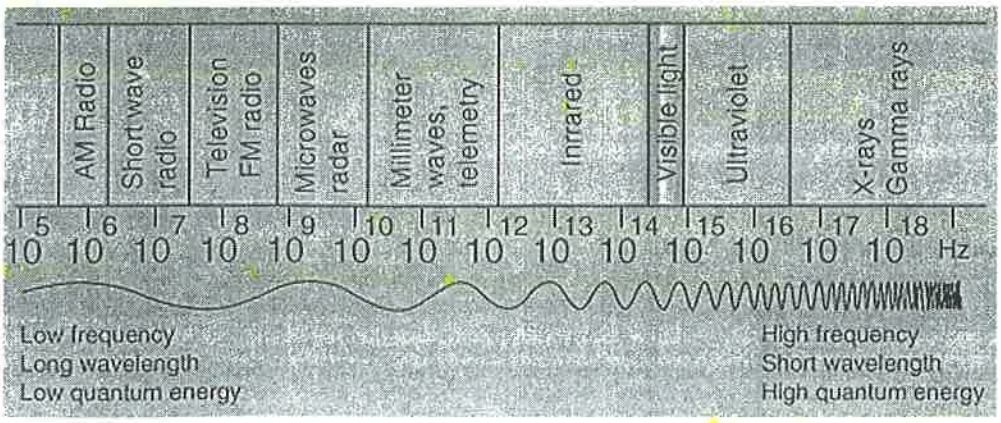
Amplitude – the wave height from the rest position of the wave to the crest or the wave depth from the rest position to the trough. Energy transferred by a wave depends on amplitude.

Frequency – rate of repetition of a wave.

Relationship between frequency and wavelength:

As frequency increases, wavelength decreases. As frequency decreases, wavelength increases.

The Electromagnetic Spectrum

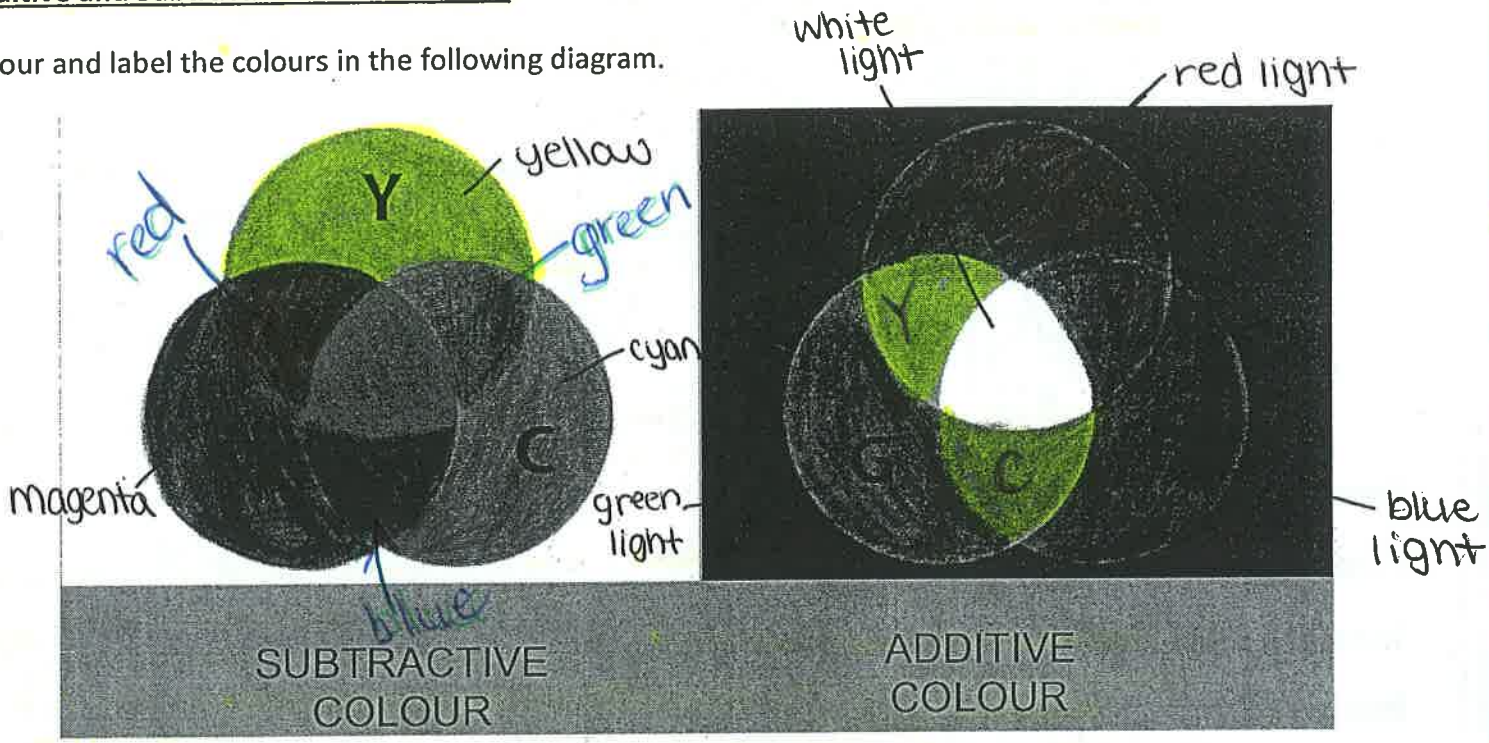


Define the following:

Electromagnetic radiation – wave pattern made of electric and magnetic fields that can travel through empty space.
Electromagnetic spectrum – entire range of electromagnetic radiation extends from the shortest gamma rays to the longest radio waves and includes light.
Visible Spectrum – the range of different colours of light.

Additive and Subtractive Colour Theories

Colour and label the colours in the following diagram.



Explain the difference between additive colour theory and subtractive colour theory.

According to the subtractive colour theory of light, coloured matter selectively absorbs different colours or wavelengths of light. The colours that are absorbed are "subtracted" from the reflected light that is seen by the eye. The additive colour theory of light states that white light is composed of different colours (wavelengths) of light. It is possible to produce white light by combining only three colours; red, green and blue (primary colours). The primary and secondary colours of light for the subtractive theory are opposite to the colours of the additive theory. Cyan, magenta and yellow are the primary subtractive colours, while red, green and blue are the secondary subtractive colours.

10.2 Producing Visible Light

Define bioluminescence and name three examples.

The ability of a plant or animal to produce light is called bioluminescence. Three examples are the black seadragon, angler fish and fireflies.

What is bioluminescence used for?

Bioluminescence is used for animals (i.e. fish) that live deep in the ocean and have to create their own light because no sunlight can reach that far down. They use their light to find prey, scare off predators, attract mates or for camouflage.

Sources of Light

Define and give one example of the following sources of light:

Incandescent – light that is produced by an object, such as metal, that is at a very high temperature. ex.) incandescent light bulb

Fluorescent – light emitted by some substances when exposed to electromagnetic radiation. ex.) fluorescent light bulb

Phosphorescent – ability to store the energy from a source of light and then emit it slowly over a long period. ex.) glow-in-the-dark toy

Chemiluminescence – light produced from a chemical reaction without a rise in temperature. ex.) light produced in glow sticks

Triboluminescence – producing light from friction. ex.) breaking apart sugar crystals

Electric discharge – method for producing light in which an electric current passes through air or another gas (neon). ex.) lightning

Light-Emitting Diode (LED)

Define the following and name examples of where each is used:

Electroluminescence – process of transforming electrical energy directly into light energy ex.) automobile dashboards, illuminating LCD panels.

Light-emitting diode – electroluminescent light source made out of a material called a semiconductor. ex.) electronic billboards, traffic lights, handheld displays

Organic light-emitting display – light source made of several extremely thin layers of organic molecules that use an electric current to produce light. ex.) medical equipment.

Plasma display – each colour is a tiny fluorescent light in which an electrical signal causes a gas (i.e. neon) to release ultraviolet radiation. ex.) large-screen TV

Liquid crystal display – a white light, such as a fluorescent light or light-emitting diode, shines behind a liquid crystal ex.) cellphones, iPods, laptops, digital watches

10.3 Light and Matter

Define and give an example for each of the following:

Transparent – transmit light freely; transparent materials absorb and reflect very little light. ex.) clear glass, clear plastic

Translucent – transmit some light, but not enough to see through material clearly. ex.) frosted window pane

Opaque – objects absorb and reflect light, but do not transmit it. ex.) rocks, brick

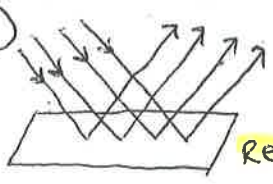
Light Reflection

Define and draw a sketch for each of the following:

a.) Regular reflection – light rays strike a smooth surface and reflect in the same direction; staying parallel to one another.

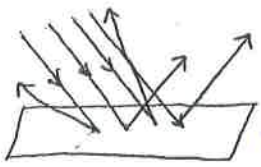
b.) Diffuse reflection – light rays reflect off a rough or uneven surface; they do not remain parallel but are scattered in different directions.

a.)



Regular reflection

b.)



Diffuse reflection