Activity 1: read the text below.

WHAT IS LIGHT?

Light is part of the **electromagnetic spectrum**, which includes visible light, microwaves, radio waves, X-rays, and Gamma-rays. In the late 1600s, important questions were raised, asking whether light id made up of particles or waves.

Sir Isaac **Newton** held the theory that was made up of **tiny particles**. In 1678, the Dutch physicist Christiaan **Huygens** proposed that light was made up of **waves** that vibrated up and down **perpendicular** to the direction of travel of the light, and therefore formulated a way of visualising wave propagation. This became known as ***Huygens' principle***. Huygens' theory was the first successful theory of light wave motion in three dimensions. Huygens suggested that the peaks of light waves form surfaces like the layers of an onion. In a vacuum, or other uniform medium, the light waves are **spherical**, and these wave surfaces advance or spread out as they travel at the speed of light. This theory explains why light shining through a pinhole or a slit will spread out rather than going in a straight line.

Newton's theory came first, but Huygens' theory better described early experiments. Huygens' principle enables one to **predict** where a given **wavefront** will be in the future, if you have the knowledge of where the given wavefront is at the present time.

At any time, some of the experiments conducted on light theory for both the wave theory and the particle theory, had some unexplained phenomenon, Newton could not explain the phenomenon of light interference and this favour of the wave theory over Newton's particle theory. This difficulty was due to the unexplained phenomenon of light **polarization** – scientists were familiar with the idea that wave motion was parallel to the direction of travel of a wave, not perpendicular to the direction of travel, as is the case of light.

Activity 2: state if the sentences are true or false.

a) The electromagnetic spectrum does not include microwaves
b) According to Newton's theory, light is made of waves
c) Christiaan Huygens was German
d) Using Huygens' principle, the position of given wavefront can be predicted

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Activity 3: drag and drop the words.

a) Resolve
b) Newton
c) Explained
d) Shining
e) Most
f) Light
g) Waves
h) Line
i) Theories
j) Particles
k) Spreads

_____and Huygens elaborated the _____ important light _____ . According to the first, _____ is made of tiny _____, according to the secondi t is composed of _____ . Huygens' theory _____ some questions that Newton's couldn't _____ . The second theory explained why light _____ through a pinhole _____ out rather than proceeding in a straight _____ .

Activity 4: match question and answer: join with arrows.

QUESTIONS

A. What is the main difference between Newton's and Huygens' theories?

B. What is Huygens' principle?

C. According to Huygens how can we describe light motion?

ANSWERS

1) It is a way of visualising wave propagation based on the hypothesis that light is made up of waves vibrating up and down perpendicular to the direction of travel of the light

2) According to Newton, light was made up of tiny particles, whilst Huygens believed that light was made up of waves.

3) Light waves are spherical and vibrate up and down perpendicular to the direction of motion. In a uniform medium they travel at the speed of light

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