Light polarization - Classical model

What is a wave?

Wikipedia: "In physics, a wave is a disturbance or oscillation that travels through space and matter, accompanied by a transfer of energy.
Waves travel and transport energy over great distances.
Examples include sound waves, light waves and water waves.
In mechanical waves, the energy is carried by the medium through which the disturbance is propagating.
In addition, sound waves in air are longitudinal waves, meaning that the air molecules are displaced in the direction that the wave is moving.
Light waves are electromagnetic waves, meaning that they do not require a medium to propagate through.
Waves can be reflected, refracted, diffracted, interfered, and have other properties common to all types of waves."

Wikipedia: "Electromagnetic radiation (EMR) is an electromagnetic field (EM field) that propagates through space, carrying electromagnetic radiant energy. It includes radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays."

Wikipedia: "Electromagnetic radiation is produced by electromagnetic phenomena, which are described by Maxwell's equations. Electromagnetic radiation can be described as a stream of photons, which are massless elementary particles that are responsible for all electromagnetic interactions. Individual photons can be described as having frequencies ranging over the electromagnetic spectrum, which includes radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays."

Polarization - Its exactly which direction in this plane?

Polarization is a property of transverse waves, not longitudinal waves.

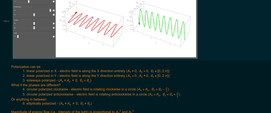
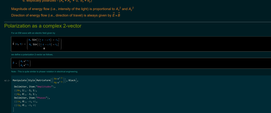
Properties of light

Wikipedia: "Light is a type of electromagnetic radiation that travels in vacuum at speed of light, commonly denoted c. In vacuum, light travels at a speed of about 299,792,458 meters per second (300,000 km/s; 186,000 mi/s; 186 miles per second; 1 ft/ns). In its standard form, light is an electromagnetic wave, which means that it can be described by Maxwell's equations, and can be viewed as a stream of photons, which are massless elementary particles that are responsible for all electromagnetic interactions. Individual photons can be described as having frequencies ranging over the electromagnetic spectrum, which includes radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays."

It is a transverse wave

Waves in Physics: Wave in 3 Dimensions

In other words, in which direction does the electric field (or magnetic field) point?

Visualization - Electric and magnetic fields in an electromagnetic wave in a vacuum

This video shows how the electric and magnetic fields propagate in space.