Electromagnetic waves are a form of radiation that travel though the universe.ii. Atomic Absorption Spectrum When a beam of white light is passed through a gaseous sample of an element, the element takes in certain wavelengths while the rest of wavelengths travel through it. The spectrum of this radiation is called an atomic absorption spectrum.s FACULTY OF ENGINEERING – MTI UNIVERSITY 4 DR. ABDEL MAGIED DIAB EMP 131 CHAPTER (1) EARLY QUANTUM THEORY MODERN PHYSICS The colors of the visible spectrum are violet, indigo, blue, green, orange, yellow and red and their wavelengths vary from 400 nm to 750 nm. In addition to the visible region of the spectrum, there are 7 other regions.FACULTY OF ENGINEERING – MTI UNIVERSITY 5 DR. ABDEL MAGIED DIAB EMP 131 CHAPTER (1) EARLY QUANTUM THEORY MODERN PHYSICS Atomic spectrum can likewise be observed when elements in the gaseous state are heated at high temperature or subjected to an electric discharge.i. Atomic emission spectrum ii. Atomic absorption spectrum i. Atomic Emission Spectrum When solids are volatilized or elements in their gaseous states are heated to high temperature or subjected to an electrical discharge, radiation of specific wavelengths are emitted.Electromagnetic radiation, in classical physics, the flow of energy at the universal speed of light through free space or through a material medium in the form of the electric and magnetic fields that make up electromagnetic waves such as radio waves, visible light, and gamma rays.FACULTY OF ENGINEERING – MTI UNIVERSITY 2 DR. ABDEL MAGIED DIAB EMP 131 CHAPTER (1) EARLY QUANTUM THEORY MODERN PHYSICS A wave is a moving disturbance that transports energy from one place to another but does not necessarily transport matter.Notice that the points on the strings (matter) do not move horizontally FACULTY OF ENGINEERING – MTI UNIVERSITY 3 DR. ABDEL MAGIED DIAB EMP 131 CHAPTER (1) EARLY QUANTUM THEORY MODERN PHYSICS Figure 1.(b) The crests and troughs are shown as waves when viewed from above o wave front the continuous line or surface at the start of a wave as it travels in time o crest the upper part of a wave o trough the lower part of a wave o wavelength ? Both electricity and magnetism can be static (respectively, what holds a balloon to the wall or a refrigerator magnet to metal), but when they change or move together, they make waves.In such a wave, time-varying electric and magnetic fields are mutually linked with each other at right angles and perpendicular to the direction of motion.Electromagnetic energy travels in waves and spans a broad spectrum from very long radio waves to very short gamma rays.Ultraviolet, X-rays, ?-rays and cosmic rays are towards the lower wavelength end of the spectrum and they have the photons with higher energies.Hence, a visual display or dispersion of the components of white light, when it is passed through a prism is called a spectrum.o Types of Spectra The spectrum of EM waves is of two types: a) Continuous spectrum b) Line spectrum a) Continuous spectrum In this kind of spectrum, the boundary line in between the colours cannot be marked.NASA's scientific instruments use the full range of the electromagnetic spectrum to study the Earth, the solar system, and the universe beyond.On the other side of the visible region, there lie infrared, microwave and radio-frequency regions.b) Atomic or Line Spectrum When an element or its compound is volatilized on a flame and the light released is seen through a spectrometer.Similarly, the spectrum of hydrogen consists of a number of lines of different colours having different distances from each other.An electromagnetic wave can also be described in terms of its energy--in units of measure called electron volts (eV).Moving along the spectrum from long to short wavelengths, energy increases as the wavelength shortens.For example, the line spectrum of sodium consists of 2 yellow coloured lines separated by a definite distance.Magnetic and electric fields of an electromagnetic wave are perpendicular to each other and to the direction of the wave.An electromagnetic wave is characterized by its intensity and the frequency ?The human eye can detect only a small portion of this spectrum called visible light.More Intensity or energy means shorter wavelength or higher frequencies.It is obtained from the light released by the sun or incandescent (electrical light) solids.The wavelengths of the radiation that have actually been absorbed by the element look like dark lines and the background are bright.1.1 red arrows) couples with a magnetic field (Fig.1.1 blue arrows).of the time variation of the electric and magnetic fields.A radio detects a different portion of the spectrum, and an x-ray machine uses yet another portion.When you tune your radio, watch TV, send a text message, or pop popcorn in a microwave oven, you are using electromagnetic energy.A periodic wave is a wave that repeats itself at regular intervals.illustrates one way to generate a mechanical wave.In Figure 1.2(a), the per- son's hand exerts a vertical force on the string, creating a wave pulse.(a) Wave pulse and (b) periodic waves along a string Suppose that the person is shaking the string such that the string is moving in a periodic fashion in the vertical direction.the distance between one positive amplitude and the next o phase the offset of the wave from a reference point.Two points on a wave that are at the same place in a wave cycle (for example, two successive crests) are said to have the same phase.o The period, T, of a wave is the time required for one wave cycle to pass a particular point, and o the frequency, f, is the number of wave cycles that pass a particular point per unit of time.The SI unit of frequency is the hertz, Hz. One hertz is equal to one cycle per second.n 1 f= = t T o The speed of a periodic wave is related to its frequency and wavelength.An electron volt is the amount of kinetic energy needed to move an electron through one volt potential.The very best example of a continuous spectrum is rainbow.The spectrum of this radiation contained bright lines against a dark background.They are formed when an electric field (Fig.The simplest wave is a periodic wave.Since the force and the resulting pulse act along the length of the string, the force does work on the string.In Figure 1.2 (b), as the hand continues to move, the wave becomes periodic.The colours diffuse into each other.It is the characteristic of matter in bulk.This kind of spectrum is called a line spectrum or atomic spectrum.This is characteristic of an atom.There are two ways in which an atomic spectrum can be seen.This means that the wave pulse carries energy along the string, from the hand to the wall.Figure 2 shows a snapshot of the wave as it begins to move to the right.More energy is needed to make the rope have more waves.One colour merges into another without any dark space.We see unique lines separated by dark areas.You depend on this energy every hour of every day.Without it, the world you know could not exist.Figure 1.2.Figure 1.2 (a) The wave moves to the right.