Line Spectra and the Atomic Model

The Electromagnetic Spectrum

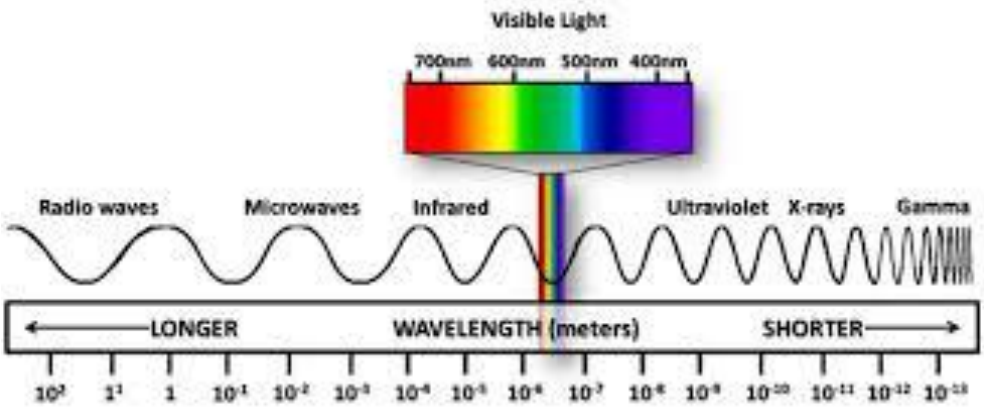
(Page 16-18 of the textbook)

Electromagnetic energy is commonly known as _____. It is thought to move in the form of _____. Types of electromagnetic energy include:

1. _____
2. _____
3. _____
4. _____

All forms of light travel as the same _____, which is _____ m/s.

There are two differing characteristics of light waves: frequency and wavelength. Frequency is defined as _____. More specifically, the frequency of a light wave is the _____ _____. A wave has maximum and minimum values called _____ and _____. The _____ is known as wavelength (λ), which is measured in _____. Frequency and wavelength are inversely related. When the distance between _____ of a light wave is _____ (the wave has a short wavelength), the time that the wave takes to pass a point is _____, which means that the wave has a _____. Alternatively, when a light wave has a _____, fewer cycles pass a point in a given time and the wave has a _____. A _____ _____ wave has more energy than a _____ wave.



The _____ consists of light waves of different frequencies. On the far left are radio waves with _____. Therefore they have _____ wavelengths and _____ energy. This means that they _____ pose a risk to humans. X-rays, on the other hand, are _____ waves. They appear on the right side of the spectrum. Exposure to _____ waves over a prolonged period of time can be _____ to human health.

Humans can only detect some types of light waves. For example, you can detect _____ waves as heat. However, you cannot detect _____ without a receiver, even though they pass through your body.

The special band of light that is visible to the _____ is known as the _____. These waves fall within the range of _____ nm to _____ nm. Each wavelength of _____ is seen as a different _____. For example, a rainbow contains all the colours in the visible spectrum and is an example of a _____, an _____ sequence of colours.

Different types of _____ emit different _____ of light. Different types of _____ also emit characteristic _____. Unlike a continuous spectrum, a _____ consists of _____ _____ rather than a rainbow. _____ the line spectrum of a _____ is one way to distinguish between _____ of matter. An _____ line spectrum is _____ to a human's _____. In other words, it's unique. Line spectra can be observed by using a _____. It is an instrument that separates _____ into its component _____ using a _____ or _____ grating.

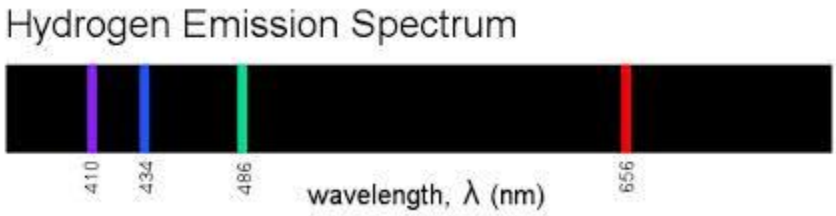
Answer questions #1-5 on page 18.

The Bohr Model of the Hydrogen Atom

(Page 21-22 of the textbook)

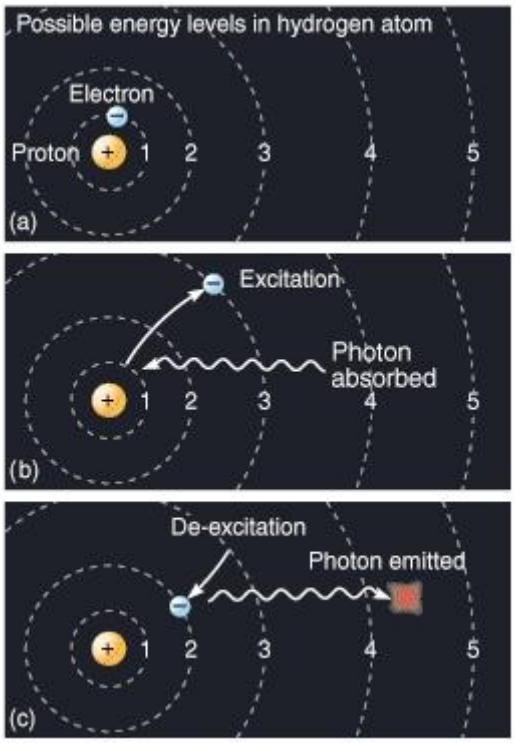
Rutherford's model of the atom did not explain why _____ orbiting a _____ do not _____ into the nucleus. The law of _____ states that as an _____ orbits the _____, it should emit _____ in the form of _____ _____. As the _____ run out of _____ it should _____ into the atom's _____. But matter is very _____ and this does not occur.

This brings us back to line spectra. In 1913, _____ explained why line spectra were produced and also why electrons _____ into the atom's nucleus. Bohr's theory was based on the line spectrum of _____ because of its simplicity – it possesses only _____ electron. Bohr suggested that electrons _____ around the nucleus in _____, similar to the planets revolving around the Sun. In this model, electrons are restricted to certain _____, and the energy of electrons is _____, which means that electrons possess a _____ _____ of energy at each _____. Electrons cannot possess energies that are in between specific levels.



When a hydrogen atom's electron _____ that has a _____, the electron jumps to a _____ energy level. An electron that occupies a higher _____ is said to be in an _____. When the hydrogen atom's electron _____ back to its original position, it _____ the _____ amount of energy it _____ in order to reach the higher _____. According to Bohr, the lines in the _____ for hydrogen are a result of the _____ when the hydrogen atom's electron _____ from a _____ energy level to a _____ energy level. At the lowest possible energy level, an electron is said to be in its _____. Electrons in their ground state _____ any light energy.

This model worked very well for explaining the line spectrum of hydrogen, but it did not work as well for other elements. However, it was a breakthrough because it introduced the idea that electrons _____ the nucleus in fixed _____. He also found that each energy level could hold a _____ number of electrons. The first energy level can hold _____ electrons, the second energy level can hold _____ electrons, and the third energy level can hold _____ electrons (but is stable with _____ electrons.



Answer questions #1,2,4,5 on page 22