

Department of Physics

(Shri Lal Bahadur Shastri Degree College, Gonda)

(Affiliated to Maa Pateswari University, Balrampur)



An Invited Talk

Under MoU

Between

**Department of Physics, M.L.K.P.G. College, Balrampur
and**

Department of Physics, S. L. B. S. Degree College, Gonda

Organized

By Department of Physics

Shri Lal Bahadur Shastri Degree College, Gonda

On

Basic Spectroscopy

April 10, 2026



[Seminar Report]

SHRI LAL BAHADUR SHASTRI DEGREE COLLEGE, GONDA

श्री लाल बहादुर शास्त्री डिग्री कॉलेज, गोंडा

(An Affiliated College of Maa Pateswari University, Balrampur, (U.P.))

Department of Physics

An Invite Lecture Under MoU

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Department of Physics, M.L.K.P.G. College, Balrampur
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(April 10, 2026)

On

Basic Spectroscopy

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Department of Physics
(Shri Lal Bahadur Shastri Degree College, Gonda)

Invite Lecture

By

Dr. Alok Shukla
(Department of Physics)
(M.L.K.P.G. College, Balrampur, U.P.)
(01:00 PM to 02:30 PM)

High Tea
(02:30 PM to 03:00 PM)

Venue

Conference Hall (Science Campus) Department of
Physics, S. L. B. S. Degree College, Gonda

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On

“Basic Spectroscopy”

The objectives of this invited talk were to study the basic knowledge related to the above topics. The other purpose is to developed interest in physics for final year under graduate students and Post graduate Students of Shri Lal Bahadur Shastri Degree College, Gonda. This invited talk report is based on experimental/Research techniques as per expertise of speakers. Existing reports related to atomic and molecular spectroscopy. It offers deep knowledge about the Atomic, Molecular, Electronic spectroscopy and find out the scope for improvement of research in sciences. The lecture attempts to understand the important role of Atomic and molecular spectroscopy Physics in development of new generation technology for students, staff and teachers in our country. This work is original and could be further extended.

Introduction Spectroscopy is a branch of science concerned with the spectra of electromagnetic radiation as a function of its wavelength or frequency, as measured by spectrographic equipment and other techniques, in order to obtain information concerning the structure and properties of matter. Spectral measurement devices are referred to as spectrometers, spectrophotometers, spectrographs or spectral analyzers. Most spectroscopic analysis in the laboratory starts with a sample to be analyzed. A light source is sent through a monochromator to spatially separate the colors before passing a selected frequency band through the sample, then the output is captured by a photodiode. For astronomical purposes, the telescope must be equipped with the light dispersion device. There are various versions of this basic setup that may be employed. Speaker asked to students What is Spectroscopy?

The sun is our most important natural light source. Light can also be generated artificially, traditionally with fire, but since the 19th century also been with incandescent lamps; later, other types were developed, such as sulfur plasma lamps and LEDs (light-emitting diodes).

So what is spectroscopy? **Spectroscopy** is the study of the absorption and emission of light and other radiation by matter. It involves the splitting of light (or more precisely, electromagnetic radiation) into its constituent wavelengths (a spectrum), which is done in much the same way as a prism splits light into a rainbow of colors.

The term ‘**spectroscopy**‘ defines a large number of techniques that use radiation to obtain information on the structure and properties of matter. The basic principle shared by all **spectroscopic** techniques is to shine a beam of electromagnetic radiation onto a sample and observe how it responds to such a stimulus.

Below you can find some examples where spectroscopy is used to reveal specific information.

What is spectroscopy, anyway?

Astronomers have figured out a lot of very, very specific details about the universe.

We know, for example, that 91.2% of the atoms in the Sun are hydrogen. We know there is water vapor in the atmosphere of WASP-39 b, a distant planet 700 light-years away. We know that the gas at the center of galaxy M82 is 80,000,000 degrees Celsius (150 million degrees Fahrenheit). And that the Whirlpool Galaxy is moving away from us at a rate of 460 kilometers (285 miles) every second.

Astronomy articles are filled with exact compositions, temperatures, and speeds of things that are too far to visit, impractical to probe, and in some cases impossible to observe directly. How is it possible to get such detailed measurements like these?

The answer is *spectroscopy*.

- Spectroscopy is a scientific method of studying objects and materials based on detailed patterns of colors (wavelengths).
- Spectroscopy is used to figure out what things are made of, how hot they are, how dense they are, and how fast they are moving in space.
- Spectroscopy works because light and matter interact with each other in very specific and predictable ways.

- Different materials give off and interact with different colors of light in different ways, depending on properties like temperature, composition, and motion.
- Along with imaging (i.e., photography), spectroscopy is one of the most common and useful techniques in astronomy. While images provide information about the size, shape, and structure of matter in space, spectra provide key details such as temperature, composition, and motion.
- Spectroscopy is also used in a wide variety of fields outside astronomy, including materials science, Earth science, medicine, forensics, national security, and food safety.
- Spectroscopy allows us to identify gases in planetary atmospheres and minerals on planetary surfaces; figure out what stars are made of and how fast they are rotating; detect and characterize planets orbiting distant stars; measure the temperature and speed of gases in the center of an active galaxy; infer the presence of black holes and dark matter; unravel interactions between colliding galaxies; and help calculate the expansion rate and age of the universe.

It is hard to imagine research without spectroscopy in various fields. Our experts show some video on experimental equipment's of spectroscopy in our conference hall.

CONCLUSION: This Lecture is highly knowledgeable, inspiring and motivate for Under graduate and post graduate students. Other subject teachers (Chemistry, Zoology etc) and staff was aware about the uses of spectroscopy. Students was gaining more theoretical and instrumental pictorial knowledge of atomic and molecular spectroscopy in physical science. Overall, this lecture was completely adopt there objectives.



Photo1. Lecture by Dr. Alok Shukla & Students in Conference Hall.



Photo2. Introductory Speech of Dr Alok Shukla.



Photo 3. High Tea after Invited talk of Students.