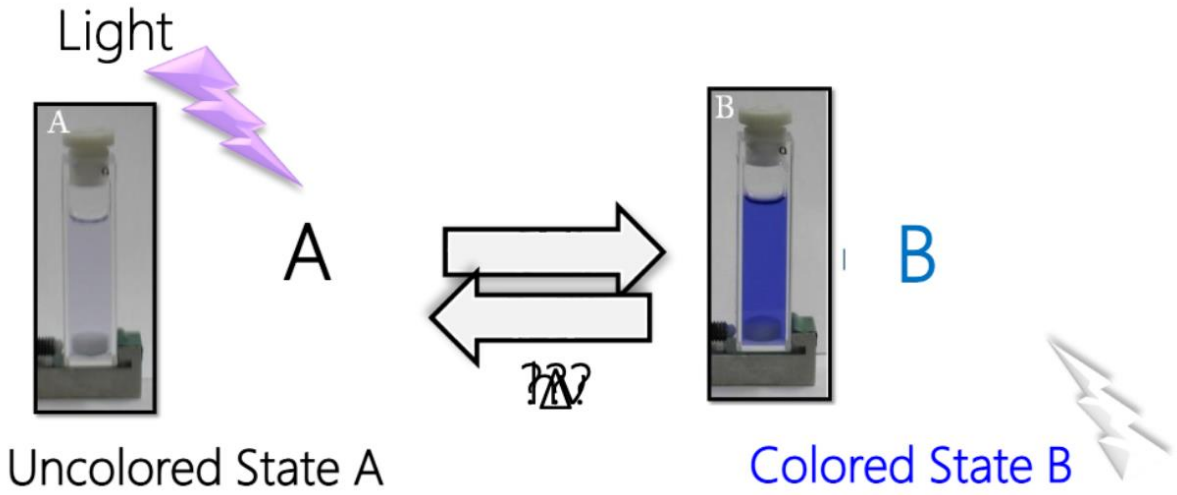
Photochromism Experiment



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Appropriate for students aged over 12

Length

Preparation and introduction: 20 minutes

Implementation: 20 minutes

Closing: 20 minutes

Hypothesis

Photochromism shows different absorption spectra because of different materials. Understanding the reversible transformation of a chemical species (photo switch) between two forms by the absorption of electromagnetic radiation (photoisomerization), where the two forms have different absorption spectra.

Key vocabulary

Photochromism, light absorption, fluorescence.

Objectives

- ✓ *Understanding the theory of light absorption*
- ✓ *Understanding the theory of fluorescence*
- ✓ *Understanding the theory of photochromism*
- ✓ *Validating light absorption, fluorescence, and photochromism from the spiropyran molecules*
- ✓ *Understanding the application of photochromism*

Equipment and material

No	Material/equipment	Quantity	Role in the experiment
1	Pocket UV lamp (400 nm) – LED	2	Light source
2	Tonic water	500 mL	Materials
3	Ethanol	500 mL	Materials
4	Acetone	500 mL	Materials
5	AcOEt	500 mL	Materials
6	Spiropyran molecule (6-NO2-BIPS)	0.1 g	Materials
7	Tubes	4	Containing materials
8	Timer	2	Timing

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Introduction

Photochemistry is the study of chemical processes that occur because of the absorption of light. The study of photochemical systems that use sunlight to drive important chemical reactions is of great practical significance. The experiment is set to promote understanding of concepts of light absorption, fluorescence, and photochromism. Photochromism, dealing with photochemical reactions which are thermally or photochemically reversible, is a part of photochemistry. It has received considerable attention ever since its discovery in 1876 and still is an active field of research mainly because of its actual and potential applications and its paramount importance in biological phenomena.

By implementing the photochemistry experiments in this plan, students can build a bridge between the application and theory of photochromism.

Experiment instructions

General

- Take care of UV lights and guide students on the correct usage.
- A dark environment is recommended.
- The laser from the mobile phone can be used if the UV lamp does not work.
- Use glass for acetone storage, not plastic.
- Demonstration of light absorption and fluorescence with tonic water and laser light, and then let students try other samples/solvents
- Show absorption and fluorescence spectrum after students' experiments and then discuss photochromism

Steps to follow

1	Preparation of the experiment	Begin the class by explaining the purpose of the experiment and the materials that will be used.
2	Sample preparation	Prepare different samples/solvents into tubes.
3	Illuminating sample/solvent	Use a pocket UV lamp on one sample/solvent.
4	Comparison between different samples/solvents	Use a pocket UV lamp on different samples/solvents and record the colour 5changes. Time for the photochromism on different samples/solvents.
5	Summary	Record results and write a summary of the experience with students.

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Safety measures

No	Risk	Safety measure
1	UV light	Guidance on correction usage is necessary
2	Acetone placement	Do not put acetone in plastic, use glass instead

Evaluation

- Each student/group writes a report of the Lab Experience, including Hypothesis, Method and Observations.
- Alternatively, they can prepare a talk/PowerPoint presentation about their experience to introduce the topic to other students or the teacher.

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