

Fluorescence

Task and equipment

Information for teachers

Additional information

One sees that a specific energy is required in order to excite fluorescence and that the red LED obviously can not provide that energy.

In the fields where "no fluorescence" has been entered, the plate appears dark even when viewed from the front in the direction of the LED.

Note:

The name fluorescence is derived from the fluorescing material fluorite (fluorspar, calcium fluoride, CaF_2). (The name of the element fluorine is also associated with this mineral.) Both fluorescence and phosphorescence are forms of luminescence (cold light).

Fluorescence is characterised by rapidly ceasing (usually within a millionth of a second) after the end of the irradiation. In the case of phosphorescence, however, a continued glow occurs lasting from a fraction of a second to several hours.

For carrying out this experiment the room should be rather dark, particularly for the part where the spectrum is viewed through the grating.

It is important not to look directly from the front into the light cone. If you have a problem seeing a colour there is the further option of slightly increasing the distance between the fluorescent screen and the tube and viewing the colour of the light spot on the screen. In this case only that part is reflected which does not contribute to the fluorescence.

Fluorescence

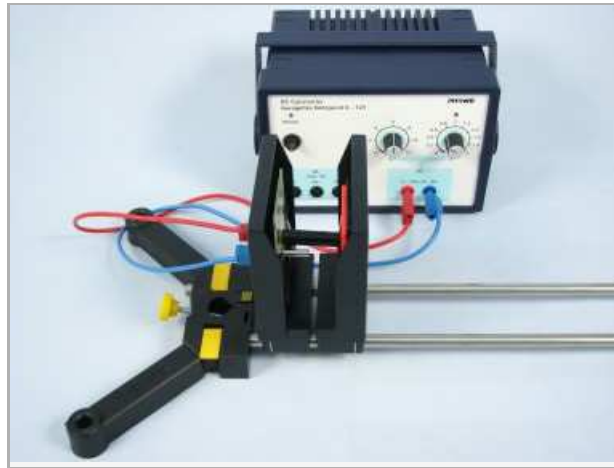
Task and equipment

Task

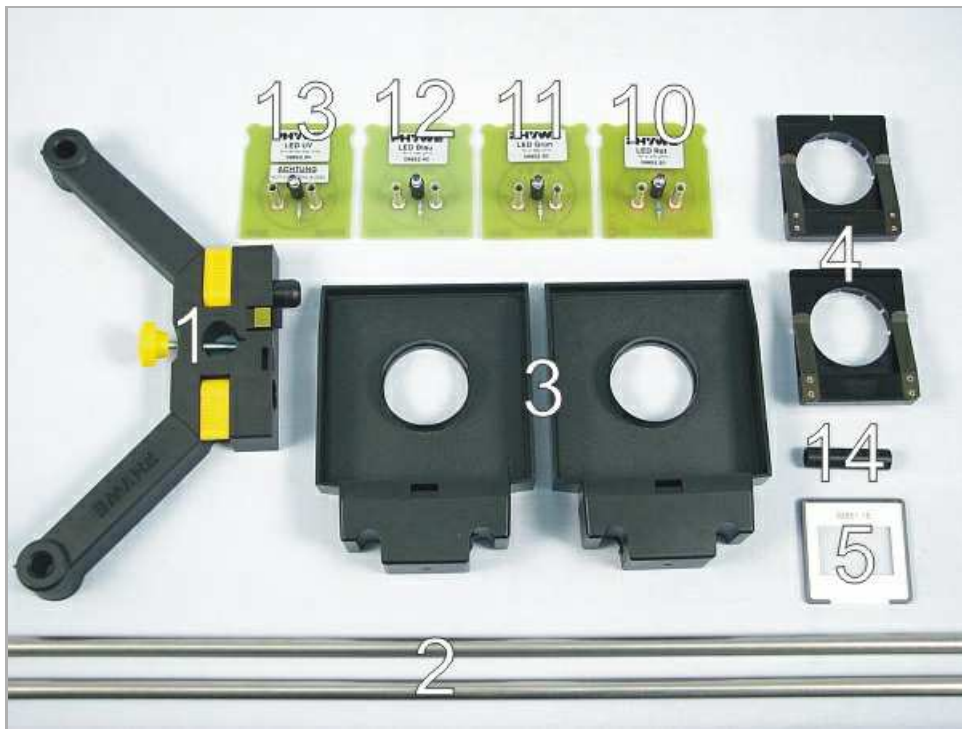
When does a material fluorescence?

Fluorescence is the property of some substances to radiate light at a lower energy after having absorbed light of a particular energy.

In this experiment the conditions for fluorescence are to be determined and rules found regarding when fluorescence can occur.



Equipment



Student's Sheet

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Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	2
3	Slide mount without angle scale	09851-02	2
4	Diaphragm holder, attachable	11604-09	2
5	Grating, 500 lines/mm, in slide frame, glassless	09851-16	1
6	Plate, fluorescent, red	09851-19	1
7	Plate, fluorescent, green	09851-21	1
8	Plate, fluorescent, yellow	09851-20	1
9	Plate, fluorescent, blue	09851-22	1
10	LED - red, with series resistor and 4 mm plugs	09852-20	1
11	LED - green, with series resistor and 4 mm plugs	09852-30	1
12	LED - blue, with series resistor and 4 mm plugs	09852-40	1
13	LED - UV, with series resistor and 4 mm plugs	09852-50	1
14	Stray light tube for LED, Di = 8 mm, l = 40 mm	09852-01	1
Additional material			
15	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
	Connecting cord, 32 A, 750 mm, red	07362-01	1
	Connecting cord, 32 A, 750 mm, blue	07362-04	1

Set-up and procedure

Set-up

- Setup as shown in figure 1 to 7.
- Fit the stray light tube over the LED. The fluorescing plate makes contact with the tube and the LED.
- Warning: The side with the aperture holder points in the direction of the LED!



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7

- Connect the LED to the power supply (6V).
- Warning: Observe the correct polarity!



Fig. 8

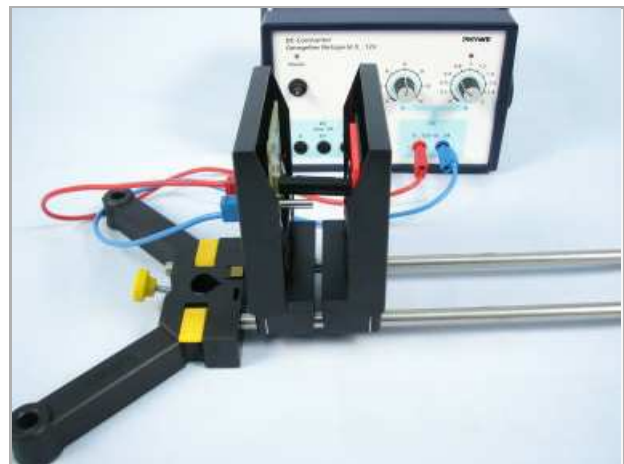
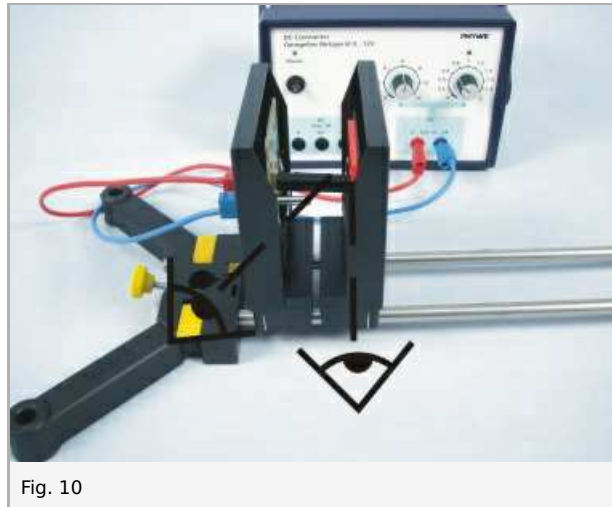


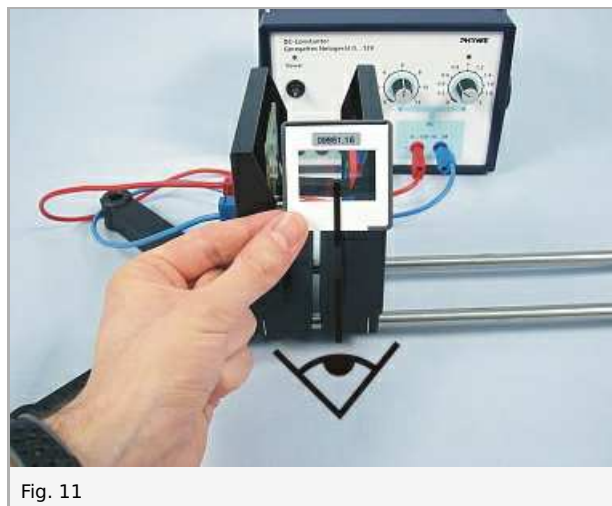
Fig. 9

Procedure

- Switch on the LED and observe the fluorescent screen from the side (the edge) and from an angle from the front. Do not look directly into the light cone!
- Record the observed colours in table 1.



- For a more detailed investigation hold the grating closely in front of the eye and observe the fluorescent light. Observe the distribution of intensity for the individual spectral colours.



- Replace the plates and LEDs in sequence and record the results.



Student's Sheet

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Report: Fluorescence

Result - Table 1

Complete the table below.

		09851.19 red				09851.20 yellow				09851.21 green		
		from the side		from the front		from the side		from the front		from the side		from the
L	red	no fluorescence	1	red	1	no fluorescence	1	red	1	no fluorescence	1	red
E	green	reddish	1	yellow/green	1	reddish	1	yellow/green	1	yellow	1	green
D	blue	red	1	yellow	1	red	1	yellow	1	yellow	1	green
s	UV	red	1	yellow	1	red	1	yellow	1	yellow	1	green

Evaluation - Question 1

Describe the impression you gain when viewing through the grating.

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Evaluation - Question 2

Compare the results in the table and formulate a condition for when fluorescence can be observed and when not. Consider the energy E of the light, which is determined by its wavelength or its frequency f . ($E = hf$)

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