

## Materials Decathlon - Challenge n°6 - 40'

### CIRCULAR POLARIZATION

On the desk you have a pile of numbered grey plastic squares, namely polarizing filters. But they are not all alike: some of them are linear polarizers, some are circular ones.

- Sort into two different piles the two types of polarizer.  
You are free to test in any possible way provided that the tests are NOT destructive!
  - Suggestion1:** watch a PC<sup>1</sup> screen while rotating the filters, for each filter repeat the rotation after having flipped it (= exchanging upper and lower face).
  - Suggestion 2:** put the filters on a mirror or other highly reflective surface. For each filter repeat after flipping upper and lower face.

**Q1.** Which numbers correspond to **linear** polarizers and which ones to **circular**? Fill in the table in the answer sheet and explain which tests you did and what you observed.

- Take two circular polarizers, put them back to back and rotate them together in front of the PC screen. What do you notice?
- Keep one of those two polarizers and repeat step 2 with all the other circular polarizers: do you notice any differences?

**Q2.** Are the circular polarizers all alike? If not how many types can you distinguish? How?

- Q3.** Are circular polarizers really polarizers? That is to say: is the light coming out of a circular polarizer oscillating on a specific plane (polarization plane)?

To answer this question run the following test:

- Put a circular polarizers on top of a linear one and both of them in front of a polarized light source (such as a PC screen). Rotate the linear one till you find a position producing a complete light extinction (dark!), that means that the light reaching your eye was linearly polarized (due to the linear filter).
  - Now invert the position of the two polarizers: circular directly in front of the PC screen and linear on top of it. Rotate the linear polarizer once again. Can you find a position producing extinction now? And if you flip the circular polarizer? What can you deduce about the light transmitted by the circular polarizer?
- Put sellotape on a microscope glass longitudinally (= along the main length) and put the linear polarizer perpendicularly on top. Rotate them together in front of the PC screen and next to them rotate also a circular polarizer till you see the same colour in both systems. From this point on rotate them together with similar angles: which colour do they produce? Is it different?

**Q4.** The circular polarizer is therefore equivalent to ... (What?). But with some differences: which ones?  
[Suggestion: see step 4.]



**OUTPUT WANTED :**

**Answer to Q1-Q4 + at least 2 pictures of apparatus and/or detail**

<sup>1</sup> If you don't have a pc use a smartphone screen **BUT be careful!** Differently from laptops some are linearly polarized, some are not!

**Answer sheet**

GROUP N° \_\_\_\_\_

**Ch.6 --- CIRCULAR POLARIZATION****Q1**

Linear polarizers N°	Circularpolarizers N°

**Q2****Q3****Q4****PICTURES** [Sent by Whatsapp to your group – See general instruction to share pictures or files]

- **Picture 1 description:**
  
  
  
  
  
  
  
  
  
  
- **Picture 2 description:**



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