



# Fabric characteristics and UVR protection—A practical investigation

## Preamble

This practical investigation provides an opportunity to explore the influence of fabric characteristics on UVR protection.

## Part A: Investigation

**Working in pairs, conduct the experiments below and record your answers in the tables provided:**

- Experiment 1: Does the fibre affect UVR penetration?
- Experiment 2: Does the weave affect UVR penetration?
- Experiment 3: Does the colour affect UVR penetration?
- Experiment 4: Does the time of exposure affect UVR penetration?

## Equipment and materials required per student pair

- 30 UV colour-changing beads (they can be re-used after each experiment for the next experiment)
- Control sample: 10 extra beads in a clear plastic bag (e.g. a small plastic food bag)
- Three twist ties
- A light-proof box for samples (e.g., a cardboard box with a close-fitting lid)
- Timer (e.g. watch, stopwatch, phone).

### Experiment 1 (different fibres):

- At least three squares of fabric approximately 15 cm square, all the same colour and weave and approximately the same weight, but of different fibres, for example, cotton, polyester, viscose. Label samples with names of fibres.

### Experiment 2 (different weaves):

- At least three squares of fabric, approximately 15 cm square, all the same fibre (suggest cotton) and colour, but with different weaves (closely and tightly woven) or knits. Label samples with names of weaves/knits.

### Experiment 3 (different colours):

- At least three squares of fabric approximately 15 cm square, all the same fibre and weave but in different colours—one dark, one white/light and one medium coloured.

### Experiment 4 (exposure time)

- Three squares of the same medium-coloured fabric approximately 15 cm square.

### Method

#### Experiment 1: Effect of fibre on UVR penetration

**Step 1** Indoors and away from direct sunlight, put 10 UV colour-changing beads on to each of the three fabric squares of different fibres and secure each with a twist tie.

**Step 2** Put the fabric bundles and the control sample (10 extra beads in a clear plastic bag) into the light-proof box.

**Step 3** Take the box of samples outside into the direct sunlight.

**Step 4** Take one fabric bundle out of the box and place into the direct sunlight. Start your timer.

After 2 minutes, undo the twist tie and observe the colour of the beads. Take a photograph if possible. Record your observations in the Results section.

(Useful words/phrases: almost white; small change in colour, medium change; bright colours)

**Step 5** Repeat with remaining fabric bundles, leaving them in the sun for 2 minutes each.

**Step 6** Repeat for the control sample in the plastic bag, leaving it for 2 minutes in the sun.

**Step 7** Record your results in the Results section

#### Experiment 2: Effect of weave on UVR penetration

**Step 1** Repeat the method for Experiment 1 but use the fabrics of different weaves. You can re-use the UV beads from Experiment 1 but make sure they have returned to white before putting them in the new fabric samples.

(Useful words/phrases: almost white; small change in colour, medium change; bright colours.)

#### Experiment 3: Effect of colour on UVR protection

**Step 1** Repeat the method for Experiment 1 but use the fabrics of different colours. You can re-use the UV beads from Experiment 2 but make sure they have returned to white before putting them in the new fabric samples.

#### Experiment 4: Effect of time of exposure on UV protection

**Step 1** Repeat the method for Experiment 1, steps 1–3. You can re-use the UV beads from Experiment 3 but make sure they have returned to white before putting them in the new fabric samples.

**Step 2** Take all three fabric bundles (but not the control) out of the box and place into direct sunlight. Start your timer.

**Step 3** After 1 minute, untie the twist tie of one bundle and observe the colour of the beads. Take a photograph if possible. Record your observations in the Results section.

**Step 4** After 2 minutes, untie another bundle and observe the colour and record observations.

**Step 5** After 5 minutes, untie the final bundle and observe and record your observations.

**Step 6** Repeat for the control sample in the plastic bag, leaving it for 1, 2 and 5 minutes.



