**UV Radiation and damage to life**

**Experiment Guide - Teachers**

*In the kit: UV Beads, Sunscreen and UV key rings*

*In the classroom: paintbrushes, petri dishes or clear plastic, materials to block out light (optional). UV colour change charts*

**This experiment is specifically focused on radiation as a damaging agent for life. Ultraviolet radiation in sunlight in particular can limit the ability of life to grow.**

Ultraviolet radiation is damaging to life since it interacts with organic molecules and causes damage to them or makes them change chemical characteristics. It can damage important molecules such as DNA by breaking the strands or it can cause proteins to unfold or ‘denature’.

In this simple experiment you will shine UV radiation onto the UV beads provided (note that the levels of UV radiation produced by the keyring are negligible and not damaging. However, obviously you should discourage people from deliberately shining the UV into eyes, particularly at short distances).

The beads you have been provided with change colour under UV radiation because of complex chemical reactions between the plastic and UV radiation. As plastics are made of hydrocarbons like you and me (but obviously our hydrocarbons are in a different form) they are a good analogue for how UV radiation has enough energy to drive active chemistry in complex carbon compounds.

You can accompany this experiment with a discussion about how life might protect itself against UV radiation (tanning), why life on a planet like Mars with no ozone shield might experience more UV radiation and why this might be damaging, and why the ozone hole on Earth is a concern.

**Experiment overview**

**Here we are demonstrating how sunscreen can be used to shield our skin from UV rays. We could alter the SPF of the sunscreen and observe the effect on the UV beads**

**Suggested approaches**

**Pupils could design an experiment to test the effect of the various SPF sunscreens on the UV beads. Using the colour chart for UV, they could determine the best way to record their observations – number of beads changing colour, number of beads that fall into each UV sun index categories. Idea being that more beads in the higher sun index categories means higher UV damage.**

**Variables**

**Independent (variable being investigated) – Sunscreen SPF**

**Variables being controlled – number of UV Beads, distance between UV beads and torch, plastic covering over beads, time the torch is shone on the beads.**

**Dependent variable (variable being measured) – tbc by pupils – number of beads changing colour, colour category they fall into – UV Sun index.**

**Steps**

1. Put UV beads into the plastic petri dish or on to the table in the classroom, adding some form of plastic covering.

2. Use the paintbrush to apply a thin layer of sunscreen to the plastic covering.

3. Shine the UV torch on to the beads and observe colour of the beads. 60 seconds

 should do it! Around 8cm above the plastic covering works well.

**Alternative experiment**

To test different materials – which materials would be best use in an Astronauts space suit? Opportunity to look at control of variables – size of material, thickness etc