Title:	Loony Luminescence
Overview:	Preparing luminol, measuring its light output and then comparing this to commercially available luminescent sources (e.g. glow sticks, glow-in-the-dark toys etc).
Length:	1 session
Equipment:	Lux meters (needs to operate at quite low light levels), top pan balances (2 d.p.), 1L flasks / beakers, spatulas, stirring rods, measuring cylinders, chemicals (as outlined in participant worksheet).
Activity:	1. Set up room and equipment ready for measuring the low light levels produced by the luminol and other luminescent objects. 2. Each group prepares the luminol and the oxidising solutions (details in the participant worksheet). Precision is important! 3. Measure the amount of light given off by the reaction. 4. Compare this with the amount of light given off by other luminescent sources. How does this compare to a torch? A candle? A mobile phone screen?
Risk assessment suggestions:	Check CLEAPSS for the hazards associated with the chemicals you are using. Working in a darkened room – check for trip hazards.
Additional resources:	Participant worksheet
Activity notes:	0.2 lux is the minimum light level for emergency lighting. Does your luminol meet this requirement?
Possible extensions:	Investigate bioluminescence – some bioluminescent microorganisms are commercially available (search online). Luminol is used in forensics to detect traces of blood at crime scene. This activity could lead in to a forensics project.
With thanks:	Tanfield Specialist College of Science and Engineering, Stanley, County Durham.

Participant Worksheet

Materials:

A 1000 ml beaker or flask

Luminol Solution:
500 ml distilled water
2.0 g sodium carbonate
12.0 g sodium bicarbonate
0.25 g ammonium carbonate
0.2 g copper (II) sulfate pentahydrate
0.1 g luminol

Oxidizing Solution:
25 ml of 3% hydrogen peroxide
500 ml distilled water

Instructions:

1. Measure the appropriate amounts of the dry chemicals for the luminol solution and dissolve them in the 500 ml of water.
2. Prepare the oxidizing solution. You now have 2 solutions - one that is clear and colourless and one that is clear and light blue in colour.
3. Dim the lights in the room so that it is dark, but so there is still enough light to see what you are doing.
4. Pour the 2 solutions into the flask. An iridescent blue light will be emitted.
5. Measure the luminescence of your mixture by measuring it with a lux meter.

Safety:
The chemicals used in this experiment should never be ingested. They can be disposed of down the sink with lots of water.

Hints
Observe that this is a chemical reaction. And a gas is also released.

Science Principle
The oxidation-reduction reaction releases a photon of light from an excited molecule. This is an oxidation experiment where light is produced. The reaction oxidizes the luminol compound producing an amino phthalate derivative, which is in an excited state. The luminol derivative is then reduced to a lower energy state, emitting energy in the process. In the absence of another compound to absorb this energy, light is released as the molecule returns to the ground state.