# SSERC logo

**SSERC Risk Assessment** (revised version March 2018)

(based on HSE’s INDG 163 ‘Risk assessment - A brief guide to controlling risks in the workplace’)

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| Activity assessed | Orange Oxidation |
| *Date of assessment* | 30th June 2020 |
| *Date of review (****Step 5****)* |  |
| *School* |  |
| *Department* |  |

| Step 1 | Step 2 | Step 3 | Step 4 | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *List Significant hazards here:* | *Who might be harmed and how?* | *What are you already doing?*  *What further action is needed?* | *Actions* | | | | |
| *by whom?* | | *Due date* | | *Done* |
| **Extraction of limonene**  No chemicals involved but normal hazards from reflux/distillation | Pupils while refluxing / distilling | Ensure apparatus is held firmly with clamps and clips.  Wear eye protection.  Heat carefully - watch out for hot mixture spurting out of the top of the reflux apparatus. |  |  | |  | |
| **Extraction of pectin**  Ethanol (or propanol) is highly flammable. | Pupils by ignition of solvent. | Handle in a well-ventilated area, well away from sources of ignition. (Switch off Bunsen burner before carrying out this step). |  |  | |  | |
| Propanone is an eye and respiratory irritant | Pupils/teacher/technician by splashing or inhalation | Handle in a well-ventilated area. Avoid splashes, wear eye protection if needed. |  |  | |  | |
| **Filtering water**  Methylene blue (solid) is harmful (Cat 4 toxin) by ingestion, inhalation and skin contact, it is also a Cat 2 eye irritant.  The solution is of low hazard.  There are no significant hazards for the rest of the activity. | Technician preparing solution | Avoid raising dust. Wear eye protection. |  |  | |  | |

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| **Description of activity:**  This is a suite of 3 activities that involve the use of a waste material, orange peel, for useful purposes.  As well as showing some simple chemistry, they can also be used to support teaching of the Circular Economy  1) Extraction of limonene – this process uses steam distillation to extract orange oil from the flavedo layer (zest).  2) Extraction of pectin – this process involved boiling the albedo layer (pith) with dilute hydrochloric acid and then precipitating the pectin with ethanol or propanone.  3) Filtration – Dried orange peel is ground up (in a coffee grinder). Methylene blue solution is trickled through a bed of it in a tube and comes out significantly cleaner. (though coloured by the β-carotene). This process is being used to remove acid dyes, in particular from water in some developing countries. |
| **Additional comments:** |