

## Worksheet 5





### Activity 3 – Chemiluminescence

#### LUMINOL

The yellowish substance luminol is used to detect blood in criminology and as a marker for the activity of oxygen radicals in medical bioanalysis. The chemiluminescence reaction of luminol is a multistage reaction process catalysed by metal ions. In this reaction process, luminol is turned into 3-aminophthalate through the emission of light, which appears blue-white. The luminous efficiency is about 1% for this reaction.

#### I) Preparation

##### List of chemicals:

Name	Amount	GHS/CLP hazard symbol
<b>luminol</b> (3-aminophthalhydrazide)	~ 0.02 g	N/A
<b>ammonium chloride</b> (NH <sub>4</sub> Cl)	~ 0.4 g	 (GHS07 attention: harmful to health)
<b>sodium carbonate</b> (Na <sub>2</sub> CO <sub>3</sub> )	~ 0.4 g	 (GHS07 attention: irritant)
<b>hydrogen peroxide (3%)</b> (H <sub>2</sub> O <sub>2</sub> )	~ 6 ml	 (GHS05 corrosive: slightly)  (GHS07 attention: irritant)

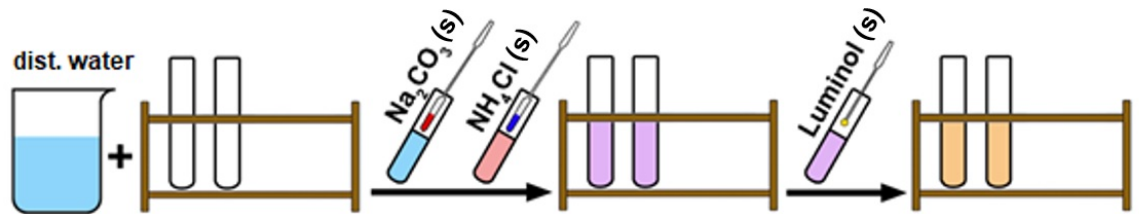
#### Materials

- A powder spatula (17 cm)
- A pipette (3 ml)
- Two pieces of copper wire
- A thermometer
- Two test tubes
- A kettle
- A microspoon spatula
- A test-tube rack
- A beaker (150 ml)

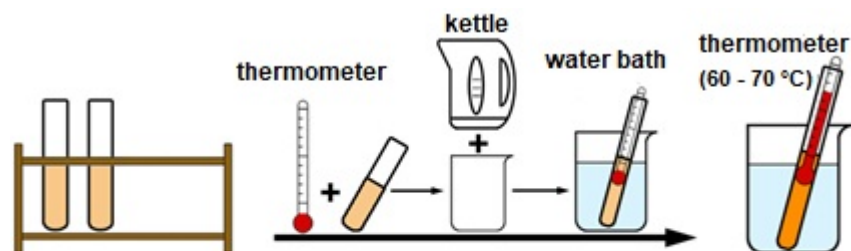
#### II) Setup & procedure

- 1) Two test tubes are filled (one-third each) with distilled water. A spatula tip each of ammonium chloride (ca. 0.2 g) and sodium carbonate (ca. 0.2 g) are added to

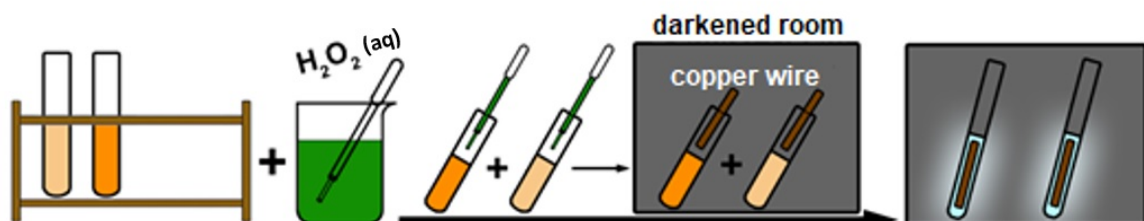
each test tube. Luminol (ca. 0.02 g) is added with the help of a micro-spoon spatula. Both solutions are mixed thoroughly through gently shaking.



- 2) Water is heated in a kettle and poured into the beaker, as a water bath. A thermometer is added to one of the test tubes and the solution is heated to 60–70 °C. If necessary, the water in the beaker is replaced with hot water from the kettle.



- 3) After one of the test tubes has been heated, 3 ml of hydrogen peroxide (3 %) are added with a pipette to both test tubes. Copper wire is then held into the solution of each test tube in a darkened room. The luminosity of the two solutions is compared.



### III) Observation

- 1) Do you notice any changes after adding hydrogen peroxide solution?

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2) Precisely describe the change you observe after adding the copper wire.

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3) Is there a difference between the heated test tube and the tube at room temperature?

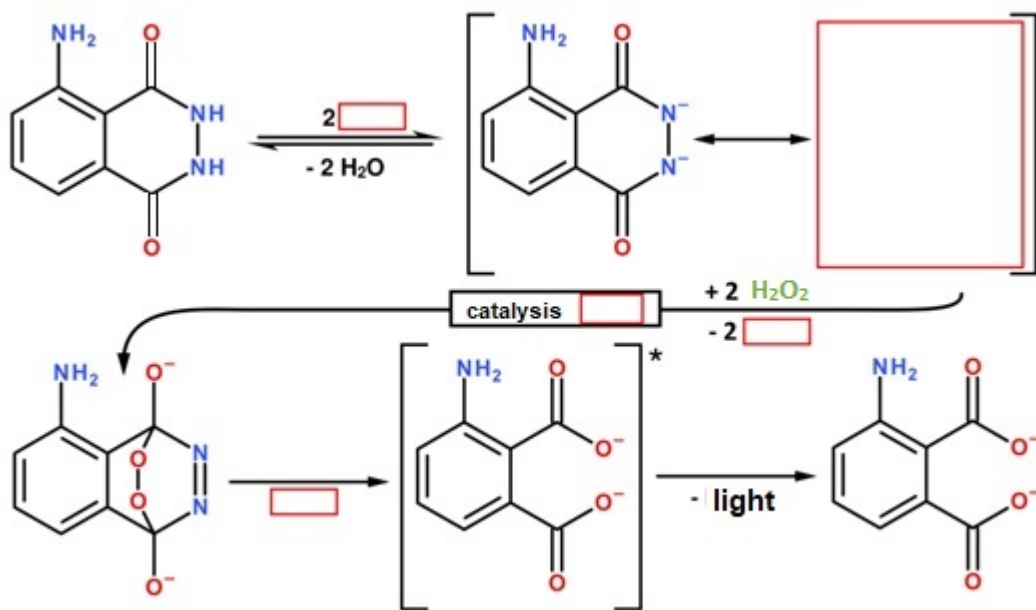
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#### IV) Interpretation of results

1) Try to fill in the gaps (red boxes) in the reaction process below:



2) Does the water's temperature have an effect on the reaction? If so, why?

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