

## 3.4 Reactions in nature

### Lesson outcomes

At the end of this activity students will be able to:

- describe how energy is transferred through ecosystems
- recognise significant examples of chemical reactions in nature
- compare combustion and respiration as types of reaction that release energy, but occur at different rates
- explain the choice of variables to be controlled, changed and measured in an investigation
- present results and ideas in a formal scientific report.

### What ideas might your students already have?

Students should have some knowledge of photosynthesis and respiration from previous science studies, but may not have considered the chemical reactions involved.

### Key vocabulary:

Photosynthesis, respiration, fermentation.

### Equipment list

Each **GROUP** will require:

- **Science by Doing Student Digital**
- butcher paper for energy diagram
- butcher paper or whiteboard for **Concept Map**

### Fermentation experiment

Each **PAIR** will need:

- 4 or 5 small soft-drink bottles
- sachets of dry yeast (1 g per bottle)
- tea spoon
- 4 or 5 round balloons
- 250 mL each of a variety of fruit juices (orange, apple, cranberry, tomato, pineapple etc).

Each **STUDENT** will require:

- safety glasses
- **Notebook**

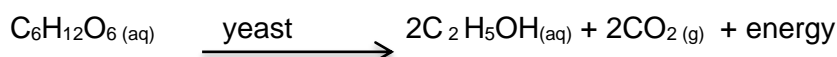
### Things to consider

**Fermentation experiment:** This experimental design activity can be used as an assessment task or as preparation for a later task (**Activity 4.6**). Students should work in pairs but write individual reports.

As you introduce the task, have the equipment available so students can consider it in their designs. The reaction is much faster in warm conditions, so a water bath if conditions are cool is advised. Good results can be achieved in half an hour if the mixture is warm, but the experiment may need to be left overnight. A pinch of sodium hydrogen phosphate can be added to improve reaction rate.

### Teacher content information:

**Fermentation:** a metabolic process that converts carbohydrates (usually starch or sugars such as glucose) to ethanol. It is an exothermic reaction that must be carried out in carefully controlled temperatures. It is a form of anaerobic respiration in microorganisms, which means it can occur in the absence of oxygen. The overall reaction for the process is:



### Lesson plan

- Step 1:** Introduce the lesson with a discussion of the reactions and chemical equations in *Science by Doing Student Guide*, inviting students to think of more. They then complete a group **Concept Map**.
- Step 2:** The experimental design activity on fermentation. Students need planning time.
- Step 3:** Students explore the energy cycle in *Science by Doing Student Digital* and consider the **Notebook** questions, which include a poster of the cycle.
- Step 4:** Students write a full report on their experiments, including a graph. This could be completed as a homework task.

### Suggested questions:

1. How will you make this a fair test?
2. What do you need to control?
3. How can you make your experiment more reliable?
4. Is there a better way to do this?