

Example lesson plan: Earth science – the carbon cycle

Education in Chemistry

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Use this plan alongside the *Education in Chemistry* article [How to teach the carbon cycle at 11–14](#)

Lesson section	Notes	Resources
Starter/settler	<p>Probe prior knowledge with some simple questions. Students spend 5–10 minutes writing down their thoughts and discussing (think-pair-share).</p> <ol style="list-style-type: none"> 1. What different forms of carbon have you heard of before? Answers could be anything from allotropes of carbon (fullerenes, diamond, graphite), carbon dioxide, calcium carbonate, hydrocarbons, carbohydrates, sugars etc 2. a) Define the words ‘respiration’ and ‘photosynthesis’. Respiration involves chemical reactions that break down nutrient molecules in living cells to release energy. It can be aerobic (needs oxygen) or anaerobic. Photosynthesis is the process by which plants/algae use energy from the sun to transform carbon dioxide and water into glucose (sugar) and oxygen. b) Write the word equations for these processes. Aerobic respiration: glucose + oxygen → carbon dioxide + water Photosynthesis: carbon dioxide + water → glucose + oxygen c) What links them together? The reactants and products of aerobic respiration and photosynthesis are opposites. 3. What role does carbon dioxide play in our atmosphere? It is a greenhouse gas that traps heat. 	<p>Questions (on starter slide)</p>
Main activity 1	<p>The carbon cycle game</p> <p>Students take on the role of a carbon atom and move around different stations by flipping two coins. They should record their travels in their passport.</p> <p>Stations can be set up around the lab, or reduced scale versions used so each table can have a set.</p> <p>Download the instructions and materials here: rsc.li/3faemw5</p>	<p>Two coins per student/group</p> <p>Carbon cycle station cards</p> <p>Carbon cycle passport worksheet</p>

<p>Main activity 2</p>	<p>Producing a carbon cycle diagram</p> <p>From their travels around the stations, students should produce a carbon cycle diagram which shows the different stations they travelled to and which processes took them there.</p> <p>This could be scaffolded as a card-sort or cut-and-stick activity by giving students the names of each station, the processes and arrows.</p>	<p>Filled in passport worksheets</p> <p>Scaffolded cut-and-stick activity worksheet, if desired</p>
<p>Consolidation</p>	<p>Class discussion</p> <p>Lead the class in a discussion of what happened to them as carbon atoms in the game.</p> <p>Learning can be extended by discussing the natural and human-led processes, the fast and slow processes, and the forms of carbon they became at each stage.</p> <p>Example questions which could be asked:</p> <ol style="list-style-type: none"> 1. Which stage did you go to most often? 2. Who was 'locked up'? What were the carbon reservoirs? 3. How many times did you enter the atmosphere? How many processes led to the atmosphere, and how many led away from it? 4. Which processes are natural? Which are human led? 5. What was the approximate timescale of each process? 	<p>Discussion questions</p>