



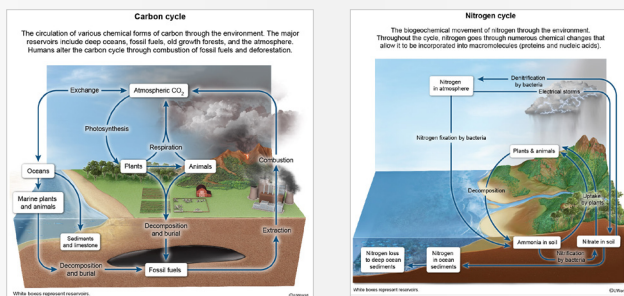
# Lesson Activity: The Carbon & Nitrogen Cycles

AP<sup>®</sup> Environmental Science

**Duration** Approximately 40 minutes

## Materials Needed

- UWorld “Carbon Cycle” and “Nitrogen Cycle” Pages:



(full-size pages included at the end of the lesson activity)

- Notebook paper and pencils

## College Board<sup>®</sup> Standards

### Carbon Cycle

- ERT-1.D.1:** The carbon cycle is the movement of atoms and molecules containing the element carbon between sources and sinks.
- ERT-1.D.2:** Some of the reservoirs in which carbon compounds occur in the carbon cycle hold those compounds for long periods of time, while some hold them for relatively short periods of time.
- ERT-1.D.3:** Carbon cycles between photosynthesis and cellular respiration in living things.
- ERT-1.D.4:** Plant and animal decomposition has led to the storage of carbon over millions of years. The burning of fossil fuels quickly moves that stored carbon into the atmosphere.



## Lesson Activity: The Carbon & Nitrogen Cycles

### College Board<sup>®</sup> Standards *(Continued)*

#### Nitrogen Cycle

- **ERT-1.E.1:** The nitrogen cycle is the movement of atoms and molecules containing the element nitrogen between sources and sinks.
- **ERT-1.E.2:** Most of the reservoirs in which nitrogen compounds occur in the nitrogen cycle hold those compounds for relatively short periods of time.
- **ERT-1.E.3:** Nitrogen fixation is the process in which atmospheric nitrogen is converted into a form of nitrogen (primarily ammonia) that is available for uptake by plants and that can be synthesized into plant tissue.
- **ERT-1.E.4:** The atmosphere is the major reservoir of nitrogen.

### Activity Objectives

**ERT-1.D: Explain** the steps and reservoir interactions in the carbon cycle.

**ERT-1.E: Explain** the steps and reservoir interactions in the nitrogen cycle.

### Activity Instructions

1. **Present** the UWorld “Carbon Cycle” image to the class. **Discuss** and **brainstorm** with students about what they already know about this scientific process.
2. **Repeat** step 1 with the UWorld “Nitrogen Cycle” image.
3. **Pose** the following questions (activity prompts) to your students. Have students either **work together** to formulate their answers, or have them **respond** individually. Some questions may require students to use a textbook as a reference.
4. Have students **share** their answers with the class and **discuss**.
5. After the activity, **print** the images as posters to hang in your classroom to reinforce the lesson.

### Guiding Question

**How** are the Carbon Cycle and Nitrogen cycle similar?

**How** are they different?



## Lesson Activity: The Carbon & Nitrogen Cycles

### Activity Prompts

- **Which** reservoirs of the carbon cycle hold carbon for a relatively short time?
- **What** is the chemical reaction for photosynthesis?
- **What** types of terrestrial ecosystems are likely to produce fossil fuels over millions of years?
- **What** is Earth's biggest reservoir of nitrogen?
- **Describe** how anthropogenic activities can alter the carbon and nitrogen cycles.
- **Identify** the forms of nitrogen that are produced in each step of the nitrogen cycle.

### Possible Variations

- **Split** the room in half and have one half **come up** with 3-5 questions that exemplify free-response task verbs (describe, explain, identify) on the carbon cycle and have the other half do the same thing for the nitrogen cycle. Have each group **present** their questions to the class.
- **Ask** students to create a slide presentation of their responses to the activity prompt questions, making sure to include graphics and/or visual aids.
- After discussing the activity prompt questions, have students **write** at least one open-ended question related to the carbon or nitrogen cycle on a sticky note and **place** it on a board in the room. Have each student **choose** another classmate's sticky note and **answer** their open-ended question as an exit ticket to the lesson.

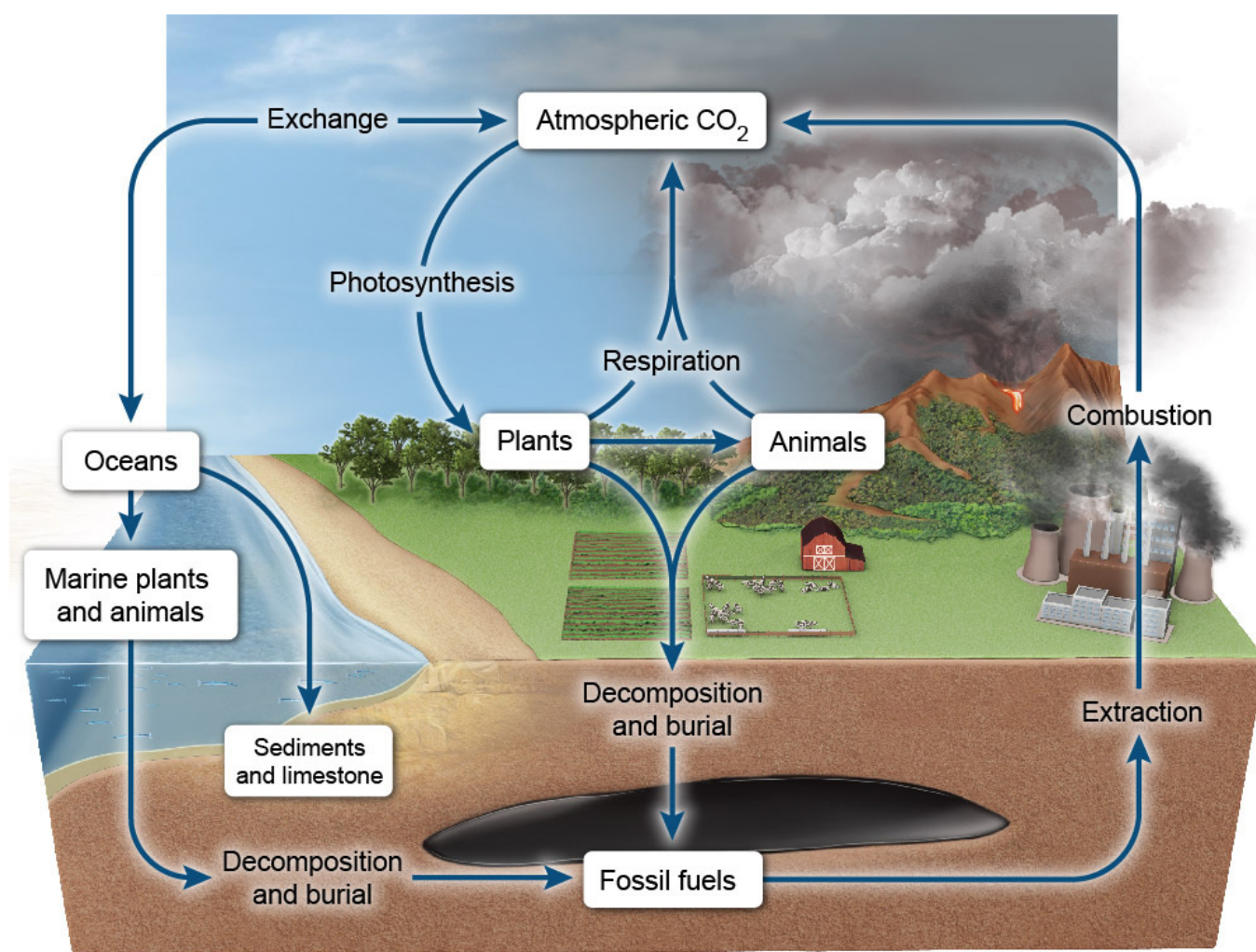
### Lesson Extension

The following UWorld's Learning Tools for AP Courses questions can be used for additional practice, a quick formative assessment, homework, or small group interventions: UWorld Question IDs 701331, 701790, 702105, 702106, 702324, 702490, 702491.



## Carbon cycle

The circulation of various chemical forms of carbon through the environment. The major reservoirs include deep oceans, fossil fuels, old growth forests, and the atmosphere. Humans alter the carbon cycle through combustion of fossil fuels and deforestation.



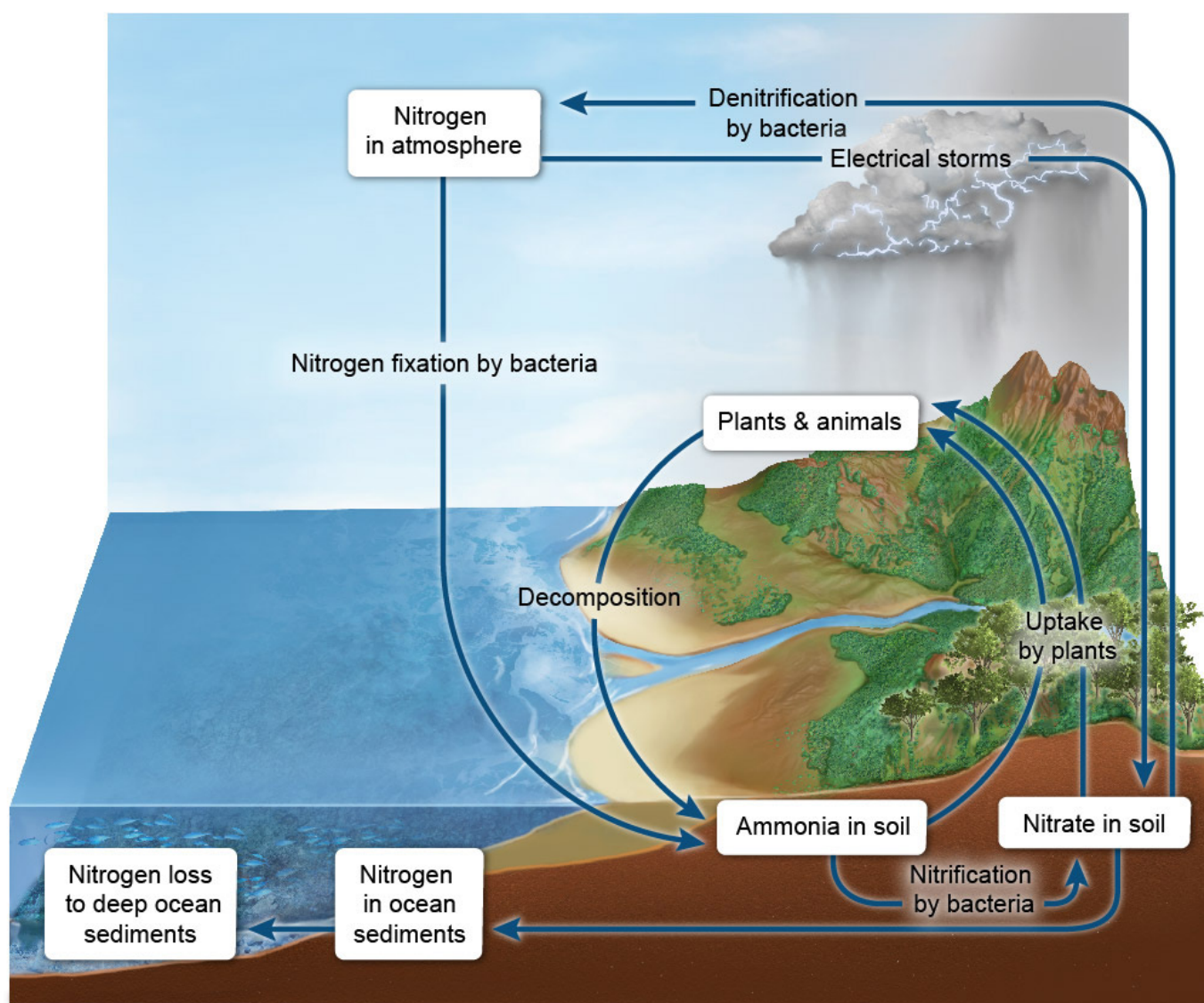
White boxes represent reservoirs.

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## Nitrogen cycle

The biogeochemical movement of nitrogen through the environment. Throughout the cycle, nitrogen goes through numerous chemical changes that allow it to be incorporated into macromolecules (proteins and nucleic acids).



White boxes represent reservoirs.

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