

Quiz (Kahoot!) Carbon cycle – UCM: Drive it down!



Goal

Familiarize children with carbon cycle topics. The primary focus is to expose them to acronyms (e.g., "GHG", "GWP", "ABL") and chemical structures of greenhouse gases (e.g., CO_2 , CH_4 , H_2O , N_2O , F-gases). Most of the questions are related to greenhouse gas emissions within cities, stimulating children's awareness about GHG sources in urban areas and related mitigation strategies (e.g., changing transport modes).

Proposed activity

Materials:

- 30-questions quiz about carbon cycle on Kahoot!.

Instructions:

- Access to online quiz (Kahoot) using the QR code or the link: <https://tinyurl.com/CarbonCycleUCM>
- Open your Kahoot! and duplicate the "Carbon cycle – UCM: Drive it down!" Kahoot!.
- Feel free to adapt questions as it suits.
- Remember: Kahoot! account is free for teachers and students!



Setup:

- All the questions are set up to 1 minute time limit.
- All questions are set up to standard points.
- All questions are setup with "original" image reveal.

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Q = Question / A = Answer

- 1 - Q. There are **no** greenhouse gas emissions in the cities.
A. False. Cities are large contributors of CO₂ fossil fuel emissions, from several economic sectors such as transportation, commercial and residential, and electricity. (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)
- 2 - Q. Greenhouse gases are invisible gases that act like a blanket in the sky. They keep Earth from cooling down.
A. True. Greenhouse gases trap heat in the atmosphere. (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)
- 3 - Q. We produce **the least amount** of greenhouse gases by
A. Walking to school. Burning fossil fuels emit CO₂ (carbon dioxide), making rubbish and burps emit CH₄ (methane). (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>).
Did you know when we walk, we also produce CO₂? By respiration!
- 4 - Q. Which gases contribute to the greenhouse gas effect?
A. Methane, carbon dioxide, water vapor, nitrous oxide, fluorinated gases. Non-greenhouse gases do not have their molecular structure affected by infrared radiation. (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)
- 5 - Q. Which transport mode is the most energy-efficient for cities?
A. Bicycle. Cycling requires our human energy, but all other options (car, bus, train) require use of electric energy (if they are electric vehicles), or fossil fuels. (More: [Force of habits](#); <https://tinyurl.com/force-habits>)
- 6 - Q. What are some ways to reduce greenhouse gases emissions from cities?
A. All options! Trees absorb carbon dioxide for photosynthesis. Walking, cycling, riding scooters and using electric vehicles prevent emissions from fossil fuel vehicles. (More: [Force of habits](#); <https://tinyurl.com/force-habits>)
- 7 - Q. Which sector is the largest contributor to greenhouse gas emissions in Auckland Tāmaki Makaurau?
A. Transportation. In Auckland, it is estimated that 44% of total emissions are from the transport sector (More: [Auckland GHG emissions profile](#) <https://tinyurl.com/aklghgprofile>).
- 8 - Q. Cities are responsible for the majority of (fossil fuel) greenhouse gas emissions worldwide.
A. True. It is estimated that 70% of fossil fuel greenhouse gas emissions are from cities. (More: [Urban carbon dioxide insights](#); <https://tinyurl.com/urban-co2>)

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9 - Q. What is the primary GHG (greenhouse gas) in urban transportation?

A. Carbon dioxide. Fossil fuel vehicles emit carbon dioxide as a result from the combustion (gasoline and diesel fuel, in internal combustion engines). (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>).

10 - Q. What is the primary GHG (greenhouse gas) emitted by organic urban waste?

A. Methane. When organic waste is sent to landfills it emits CH_4 . (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)

11 - Q. Which one is **not** a greenhouse gas?

A. O_2 (Oxygen). Oxygen molecule is not affected by infrared radiation, while carbon dioxide, methane, and water vapor are. (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)

12 - Q. Which greenhouse gas has the longest lifetime (lives longer) in the atmosphere?

A. Carbon dioxide. CO_2 has a lifetime of thousands of years, and this is one of the reasons why it builds up in the atmosphere and why we need to reduce its emissions. Other gases have shorter lifetimes (e.g., CH_4 , N_2O , H_2O) or have much smaller concentrations (e.g., F-gases, N_2O). (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)

13 - Q. What does GWP stand for?

A. Global warming potential. GWP is a measure of how much a greenhouse gas can trap heat in the atmosphere over a period of time. (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)

14 - Q. Global potential warming (GWP) is a measure of how much a greenhouse gas can trap heat in the atmosphere.

A. True. Using the GWP, one can convert emissions of a gas to CO_2 -equivalent emissions. (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)

15 - Q. Which greenhouse gas (gases) has (have) the largest Global Warming Potential (traps more heat over time)?

A. Fluorinated gases. For example, HFCs' GWP is up to 12400, PFCs' up to 11100, NF_3 is 16100, SF_6 is 23500. (More: [Overview of Greenhouse Gases](#); <https://tinyurl.com/overview-ghg>)

16 - Q. Which greenhouse gas is the most abundant in the atmosphere?

A. Carbon dioxide. For example, 0.04% of the atmosphere is CO_2 , while methane accounts for 0.00018% and nitrous oxide, 0.00003%. Even such small quantities are enough to trap lots of heat. (More: [Greenhouse gases and the atmosphere](#); <https://tinyurl.com/ghg-atmosphere>)

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17 - Q. Typically, atmospheric concentrations of greenhouse gases are higher in the cities than in the rural areas. **A.** True. Typically, urban areas have higher emissions of fossil fuels than rural areas. However, some rural areas can have significant methane emissions. (More: [Urban carbon dioxide insights; https://tinyurl.com/urban-co2](https://tinyurl.com/urban-co2))

18 - Q. The ozone hole *is caused by* global warming?
A. False. The greenhouse gas effect is responsible for global warming, while the ozone hole is caused by ozone depletion. (More: [The Ozone Hole; https://tinyurl.com/ozone-hole-global](https://tinyurl.com/ozone-hole-global))

19 - Q. During the day, plants absorb carbon dioxide through photosynthesis.
A. True. Plants absorb CO₂ and release oxygen during photosynthesis. But, during day and night, they also respire, releasing CO₂. (More: [Carbon Cycle video - nature vs. human impacts; https://tinyurl.com/video-carboncycle](https://tinyurl.com/video-carboncycle))

20 - Q. The Oceans are one of the largest *carbon sinks* (absorbs carbon) in the world.
A. True. Oceans absorb about 25% of carbon dioxide emissions. (More: [The ocean; https://tinyurl.com/ocean-sink](https://tinyurl.com/ocean-sink))

21 - Q. Too much CO₂ (carbon dioxide) in the water hurts plants and animals. This happens because water becomes:
A. Acidic. CO₂ is building up in the surface of oceans, and when oceans become more acidic it is dangerous to shellfish, corals and crustaceans. (More: [Carbon Cycle video - nature vs. human impacts; https://tinyurl.com/video-carboncycle](https://tinyurl.com/video-carboncycle))

22 - Q. A carbon sink is a location that absorbs more carbon than it releases.
A. True. Some examples are plants, the ocean, and the soil. Carbon sources are the opposite, they emit more than absorb carbon. (More: [Carbon Cycle video - nature vs. human impacts; https://tinyurl.com/video-carboncycle](https://tinyurl.com/video-carboncycle))

23 - Q. "ppm" is a unit we use to measure the atmospheric concentration of CO₂. What does "ppm" stand for?
A. Parts per million. Atmospheric concentrations of GHGs are expressed as "*moles of analysed gas divided by moles of total air*". Carbon dioxide is in ppm, while methane and nitrous oxide are measured in ppb (parts per trillion). (More: [Greenhouse gas concentrations; https://tinyurl.com/ghg-concentration](https://tinyurl.com/ghg-concentration))

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- 24 - Q.** Which number is the closest number to the current atmospheric concentration, in parts per million, of CO₂?
A. 419. According to Stats NZ, "In December 2022, carbon dioxide concentrations were 415 parts per million, up 6 percent since 2012". (More: [Greenhouse gas concentrations](#); <https://tinyurl.com/ghg-concentration>)
- 25 - Q.** A thin layer of air (100 to 3000 meters) closest to the ground is known as ABL, which stands for:
A. Atmospheric boundary layer. Also known by Planetary Boundary Layer (PBL). (More: [Atmospheric boundary layer](#); <https://tinyurl.com/ABL-pbl>)
- 26 - Q.** The atmospheric boundary layer (ABL) does not change with air temperature or time of the day.
A. False. All of these variables will change how deep the atmospheric boundary layer is. High temperatures will generate a deep boundary layer. For example, temperature is typically higher in the afternoon, the ABL will be deeper than during the nighttime. (More: [Atmospheric boundary layer](#); <https://tinyurl.com/ABL-pbl>)
- 27 - Q.** The thin air layer closest to the ground (ABL) is where pollutants and greenhouse gases are emitted and trapped.
A. True. Because most of air pollutants and greenhouse gases are emitted close to the Earth's surface, they are many times trapped within this layer. However, they can also be emitted above the ABL (e.g., airplane emissions). (More: [Atmospheric boundary layer](#); <https://tinyurl.com/ABL-pbl>)
- 28 - Q.** What of the options below is not a natural source of carbon dioxide?
A. Cars and trucks. Volcanic eruptions, respiration of living organisms, and ocean's exchanges cannot be controlled by humans, however, cars and trucks' emissions can! (More: [Carbon Cycle video - nature vs. human impacts](#) ; <https://tinyurl.com/video-carboncycle>)
- 29 - Q.** We need greenhouse gases to survive but if we have too much it hurts our planet.
A. True. We need GHG's to keep our planet warm enough for us to survive, but the excess of GHG's can substantially increase the planet's temperature. (More: [Carbon Cycle video - nature vs. human impacts](#) ; <https://tinyurl.com/video-carboncycle>)
- 30 - Q.** Concentrations of GHG's (greenhouse gases) that are too high can:
A. All options. Some of the consequences of high concentrations of GHGs are the warming of the seas, warming of the air, and the increasing chances of disasters. (More: [Carbon Cycle video - nature vs. human impacts](#) ; <https://tinyurl.com/video-carboncycle>)