Carbon Game Explanation

Purpose
A quick, kinesthetic simulation where students act as carbon atoms moving between reservoirs to experience how fluxes and human activities change the distribution of carbon among the atmosphere, biosphere, hydrosphere, and geosphere.

Quick Overview

- **Round 1 = Pre-industrial conditions.** Station instructions/probabilities model natural fluxes.
- **Round 2 = Post-industrial conditions.** Flip station cards to the back so reservoirs/dice outcomes increase atmospheric entry (represents fossil fuel combustion, land-use change).
- Students move from station to station as "carbon atoms," roll one die per move, record where they are, how long they stay, and count snapshots (freeze counts). After both rounds, students and teachers compile class totals, create graphs, and then write a CER using class data and the provided reading.

Materials (per class)

- 1 station card per reservoir (post each taped around the room; front = Round 1; back = Round 2)
- 1 six-sided die per student
- Student worksheet (data table + questions) — 1 per student
- Tape/magnets to hang stations, clipboard(s) optional
- Timer or stopwatch
- Whiteboard or spreadsheet (for class totals + graphing)

Station Setup (before students arrive)

1. Place station cards around the room (at least 6–8 stations representing major reservoirs).
2. Front side = **Round 1** instructions (pre-industrial probabilities). Back side = **Round 2** instructions (post-industrial probabilities).
3. Number stations and display which sphere each belongs to (Atmosphere, Biosphere, Hydrosphere, Geosphere).
4. Prepare a teacher copy of station rules and post/checked totals sheet.

Player Rules (what each student does)

1. Each student is a carbon atom. Start at a random station.
2. At each turn: roll the die → follow the station card instruction (move to named station/stay/transfer). Record: station name, sphere, flux mechanism (e.g., photosynthesis, respiration), and years stayed (as indicated on card). Make a tally mark for each visit.
3. Move promptly and quietly. Spend the required minutes at each station (the teacher enforces the minimum time).
4. At two announced **FREEZE** moments per round, students count and record how many students are at each station (class snapshot). One student per station may be assigned to call out the count to the teacher recorder.

Freeze Procedure

- Teacher announces "FREEZE." Students freeze where they are.
- Teacher or designated recorders tally the number of students at each station. Record immediately on the class totals sheet.
- Resume play on the teacher's signal. (Two freeze points per round.)

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Data to Collect (student worksheet items)

- Station visited (name + sphere)
- Flux mechanism used (from station instruction)
- Tally of visits per station (total visits over round)
- Total years spent at each station (as directed on card)
- Two snapshot counts per round (class distribution)
- Post-round: class totals table (teacher compiles) and class graph (compare Round 1 vs Round 2)

Timing (sample for a 50-minute class or one period)

- Engage / explain game rules & predictions: 8–10 min
- Round 1 play (including 2 freezes): 12–15 min
- Quick debrief & flip stations: 3–5 min
- Round 2 play (including 2 freezes): 12–15 min
- Collect data / start class graph: 8–10 min
  (If you have two periods, use Day 2 for graphing + CER writing.)

Teacher Tips / Classroom Management

- Model one round quickly with 2–3 volunteers before the full class starts.
- Enforce a one-way walking pattern to reduce collisions.
- Tell students: "This is not a race—accurate recording matters."
- Assign 1–2 student recorders during each freeze to speed data collection.
- Use humor to keep energy positive (short scripted lines are in the lesson plan).
- If the class is large, run students in parallel waves (half start at different stations).

Quick Troubleshooting

- Students not recording? Stop play, ask everyone to check their last 2 moves, and resume.
- Too noisy? Shorten the time at each station and increase the number of teacher-led freezes.
- Confusion about station instructions? Post a teacher copy of every station in one visible place for quick reference.

Post-Game: What to Do Immediately

1. Collect or compile class totals (visits and total years per station).
2. Create a bar graph (Round 1 vs Round 2) of students in the Atmosphere (or % visits to Atmosphere).
3. Lead a short 5-7 minute discussion linking game data to the provided long-term carbon graph.
4. Assign CER: claim about how photosynthesis/respiration + human activity changed carbon distribution; evidence = class data + reading; reasoning = connect flux mechanism changes to reservoir proportions.

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