

Chemistry Problem-Based Learning (PBL) Bundle

- ✓ Complete Chemistry PBL Bundle - 10 PBL Activities
- ✓ Engaging, Student-Led Problem-Based Learning Projects



No Prep - Ready to Go!

10 Complete PBL Activities

- **PBL – Acid Rain & Rocks- Which Materials Survive?**
- **PBL – Bath Bomb Engineering- Optimize the Fizz**
- **PBL – Battery Builders- Power a LED with Homemade Cells**
- **PBL – Bioplastic Builder - Engineer a Plant-Based Polymer**
- **PBL – Chemistry of Clean Water**
- **PBL – Gas Law Glider- CO₂-Powered Car**
- **PBL – pH Patrol- Map the Acids and Bases Around Us**
- **PBL – Reaction Rate Rescue- Safer Sidewalk De-Icer**
- **PBL – Stop the Rust- Corrosion Protection Challenge**
- **PBL – Thermal Pack Chemistry- Hot vs. Cold**

All PBLs include

- Background for Students
- Full Instructions Sets
- Guiding Questions

PBL – Gas Law Glider: CO₂-Powered Car

Topic Question

How can we optimize a small car powered by a safe chemical reaction to travel the farthest distance?

Background

Gas generation from an acid-base reaction produces CO₂. The amount of gas, pressure, and system mass affect motion. By balancing reactant ratios and design, you'll connect chemistry to motion.

Materials

- Small wheels/chassis (toy car or cardboard build), film canister or capped bottle as reaction chamber
- Baking soda and vinegar; measuring spoons
- Stopwatch, meter tape; eye protection

Instructions

Step 1: Design: Create a safe reaction chamber that directs gas to push the car (teacher must approve).
 Step 2: Ratios: Test at least three reactant ratios while keeping total mass constant.
 Step 3: Trials: Conduct 3 runs per ratio; measure distance and time; note any leaks.
 Step 4: Optimize: Select the best ratio and design tweaks to reduce friction and leaks.

Final Product

- Performance table (distance, time, average speed).
- Labeled diagram of the car and chamber.
- Short explanation linking gas production to motion.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Work (1)
Safety & Build	Approved design; secure seals; safe handling	Minor issues addressed	Occasional leaks/lapses	Unsafe/unchecked
Experimental Control	Fair comparisons with repeats	Mostly fair	Some confounds	Uncontrolled
Performance	Consistent, longest average distance	Solid distance	Moderate results	Poor performance
Scientific Links	Clear gas law & reaction links	Some links	Basic statements	No connection
Communication	Neat diagram and labels	Mostly clear	Some confusion	Unclear

PBL – Stop the Rust: Corrosion Protection Challenge

Topic Question

What is the most effective method to prevent iron from rusting in a salty environment?

Background

Rusting is the oxidation of iron. Barriers (paint/oil) and sacrificial metals (zinc) can slow corrosion. You'll test strategies and monitor changes over several days.

Materials (or simple substitutes)

- Identical iron nails, cups, saltwater (3–5%), tap water (control)
- Vegetable oil, clear tape/paint (teacher-approved), zinc strip (optional)
- Labels, camera for daily photos; gloves and eye protection

Instructions

Step 1: Treatments: (A) bare nail in saltwater, (B) oiled nail, (C) taped/painted nail, (D) nail wired to zinc (if available), (E) tap water control.
 Step 2: Monitor: Photograph and record color/precipitate changes daily for 5–7 days.
 Step 3: Rate Index: Create a 0–4 rust index with examples; rate each sample daily.
 Step 4: Conclude: Identify the best strategy and explain using redox concepts.

Final Product

- Time-series photo panel with rust index graph.
- Short explanation of oxidation/reduction and protection mechanism.

Rubric (20 points)

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Work (1)
Experimental Setup	Consistent volumes and exposures	Mostly consistent	Some variability	Inconsistent
Observations	Complete daily records with evidence	Minor gaps	Limited records	Sparse
Analysis	Correctly explains results with redox reasoning	Mostly correct	Partial reasoning	Incorrect
Conclusion	Best method justified with data	Some justification	Weakly justified	No justification
Presentation	Clear visuals and labels	Mostly clear	Some clutter	Hard to read

Marking Rubrics

Who is it for?

- **Chemistry and Physical Science Teachers**
- **Teachers who want to increase their student engagement and retention**
- **Teachers who want low-prep and student-led classroom projects**

Save yourself the **STRESS AND TIME**



TWF

Spend your time WISELY

