

Lesson 50: Material Science & Metal — Iron**PLL PART TWO****Classical Inquiry • Iron**

"Tell something that is made of iron. How does the iron feel? When you try to lift it, what would you say it is? Where do we get iron? Of what use is it?"

Material Science Focus: Physical properties (hard, cold, heavy) • Iron mining & metallurgy • The blacksmith forge • Industrial utility.

1 PHYSICAL PROPERTIES & ORIGIN

Observe the physical qualities of iron. Answer each question on the handwriting lines.

1. Touch: How does a piece of unheated iron feel to your fingers? _____

2. Weight: When you try to lift a block of iron, what would you say it is? _____

3. Origin: Where do we get iron? Dug from deep within the _____

4. Iron Objects: Name two common things made of iron: _____

2 SCIENCE DETECTIVE: THE FORGE & FIRE

Discover how humans shape such a hard metal into useful tools.

A. The Magic of Heat: What happens to hard iron when heated in a blacksmith's glowing coals?

It becomes red-hot and _____ so it can be hammered into shape.

B. The Blacksmith's Anvil: Why must an anvil be made of heavy iron?

To withstand the heavy blows of the _____ without breaking.

3 THE ESSENTIAL UTILITY OF IRON

In two complete sentences, explain why iron is one of the most useful metals on earth. Mention buildings, trains, or tools.

Sentence 1: _____

Sentence 2: _____

4 MATERIAL COMPARISON CHALLENGE

Why would a wooden hammer or paper nail not work? Explain the special strength of iron.

Iron Strength: _____

1 MATERIAL SCIENCE & PHYSICAL PROPERTIES

Seri's Pedagogical Focus: Introduce elementary metallurgy and physics through everyday physical sensations (temperature: *cold*, texture: *hard/smooth*, gravity: *heavy*). Connect raw natural resources (iron ore mined from the earth) to human industry (blacksmithing, construction, machinery).

Standards Addressed: CCSS.ELA-LITERACY.RI.2.1 (Physical Properties in Scientific Text), L.2.5.B (Real-world distinctions among adjectives), W.2.2 (Informative explanations).

✓ COMPLETE ANSWER KEY

Section 1: Physical Properties & Origin

1. Touch: *hard* and *cold*.
2. Weight: *heavy* (or *dense / solid*).
3. Origin: *earth* (mined from iron ore in mines).
4. Iron Objects: Accept: *nails, horseshoes, hammers, anvils, gates, skillets, railroad tracks*.

Section 2: Science Detective: The Forge & Fire

- A. Heat: *soft* (or *malleable / bendable*).
- B. Anvil: *hammer* (blacksmith's hammer).

Section 3: The Essential Utility of Iron (Sample Response)

Iron is the most useful metal because it is strong enough to build railways, bridges, and sturdy tools. Without iron, we could not build modern ships or tall buildings.

Section 4: Material Comparison Challenge (Sample Response)

Wood and paper would splinter or bend, but iron holds firm under immense pressure because it is dense and unbreakable.

! DIAGNOSTIC GUIDE & SENSORY PROMPTS

- **Tactile Sensation:** If an iron key, nail, or skillet is available, have students touch it to confirm that metal conducts heat away from the skin, feeling cold to the touch.
- **Iron vs. Steel:** For Grade 2, explain simply that steel is iron refined and toughened with carbon to make stronger tools and blades.

★ SCORING RUBRIC (20 POINTS TOTAL)

Evaluation Metric	Exemplary (5 Pts)	Proficient (3-4 Pts)	Developing (1-2 Pts)
Scientific Properties	Demonstrates complete mastery of iron properties (<i>hard, cold, heavy, mined</i>).	Correctly identifies physical properties and earth origin.	Confuses properties or origin; answers incomplete.
Technical Comprehension	Explains role of heat, blacksmith forge, and anvil strength accurately.	Understands that heat softens iron for shaping.	Does not grasp how iron is shaped; skips forge question.
Utility Synthesis	Writes 2 strong sentences highlighting industrial and structural importance of iron.	Explains why iron is useful in complete sentences.	Sentences fragmented or mention only 1 minor use.
Mechanical Accuracy	Capitalization, punctuation, and penmanship flawless throughout worksheet.	Legible writing with minor punctuation slip.	Multiple mechanical errors or illegible handwriting.