Science English

Analyze the Results “Tatara iron making”

Self – Introduction &
Free Conversation with TA

Today’s word

Today's Words

- conduct （熱、電気）伝える
- electric current　電流
- metallic luster　金属光沢
- copper　銅
- oxidation-reduction reaction 酸化還元反応
- confirm　確かめる
- combine　結びつける

Today's Words

- matter　物質
- product　生成物
- oxide　酸化物
- observation　観察
- experiment　実験
- describe　～の特徴を述べる
- apply　適用･応用･利用する

conduct

（熱、電気）伝える

conduct electricity　／　conduct heat

current

電流

An ***electric current*** runs through this wire.

metallic luster

金属光沢

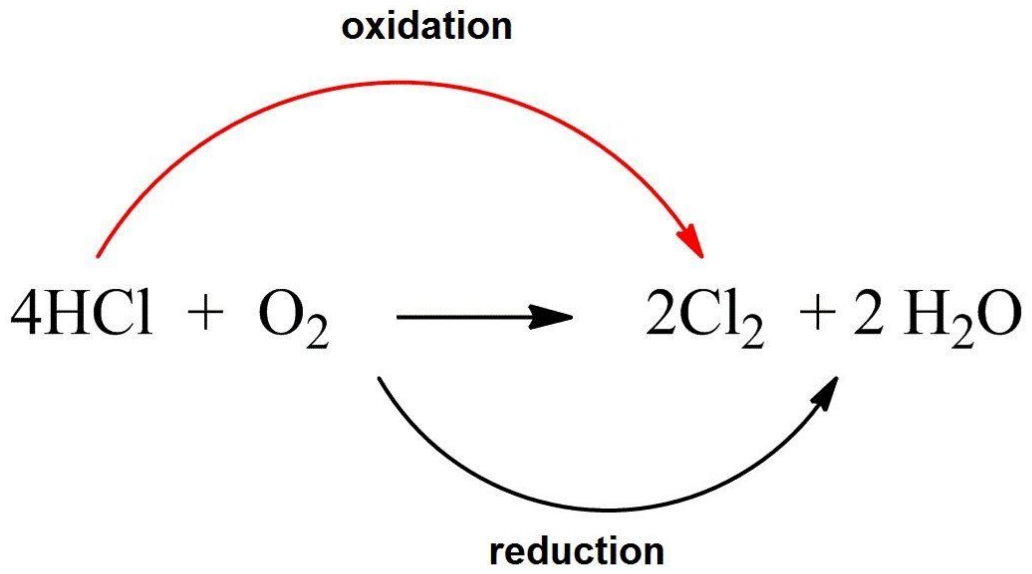
copper

銅

Copper is a metal.

oxidation-reduction reaction

酸化還元反応



confirm

確かめる

www.irasutoya.com

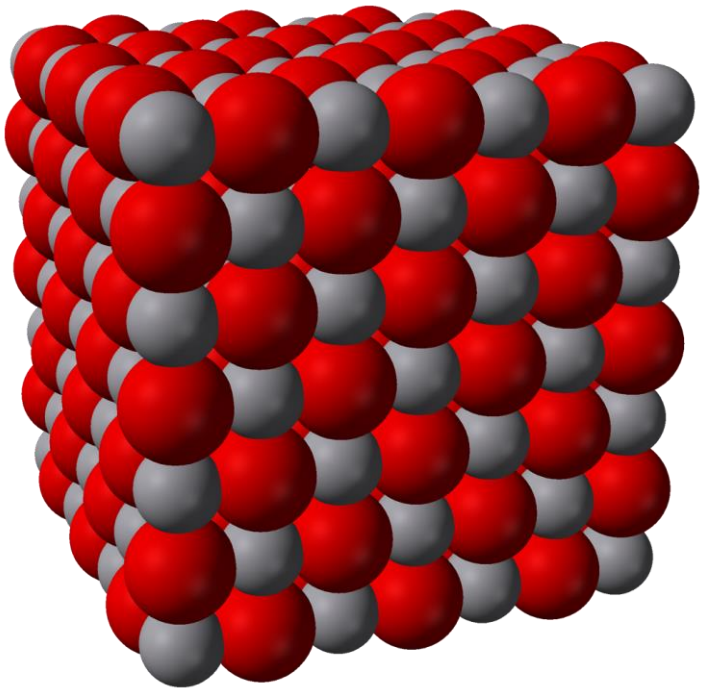
She is ***confirming*** the safety of the window.

combine

結びつける

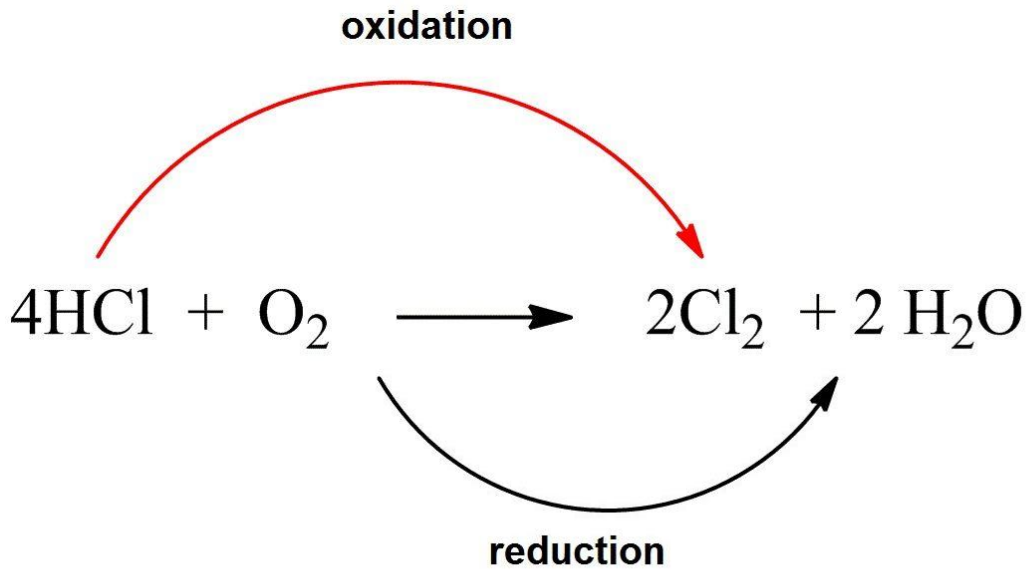
matter

物質



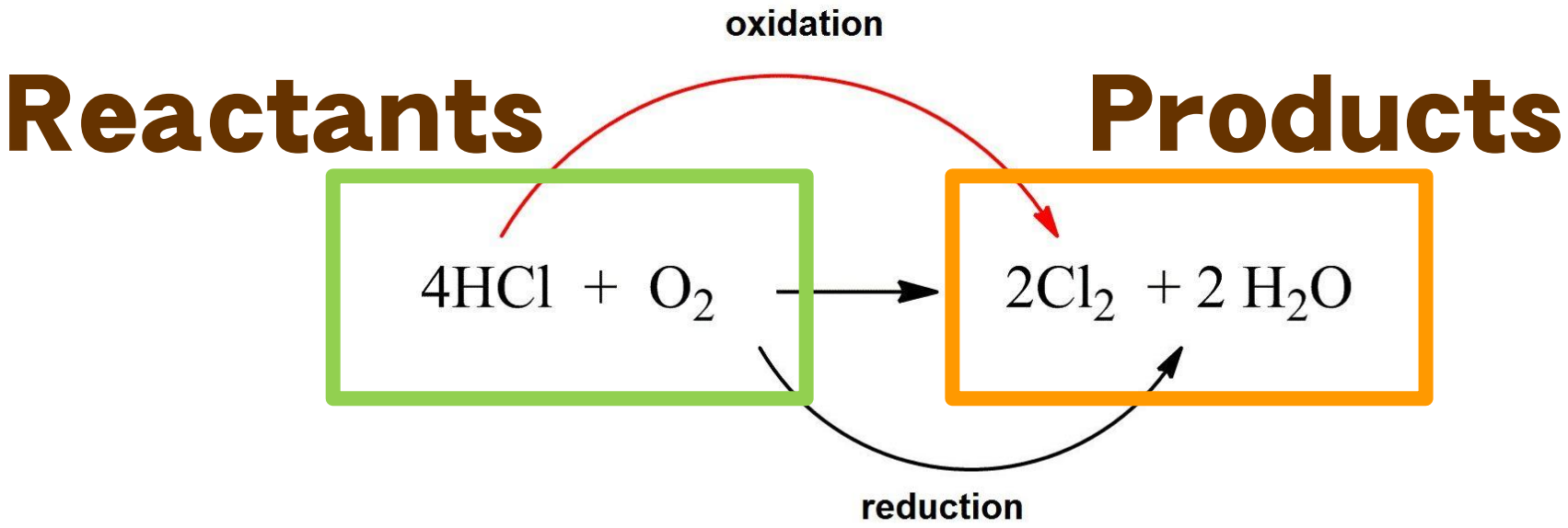
oxidation-reduction reaction

酸化還元反応



product

生成物



oxide

酸化物

observation

観察

He ***observes*** flowers every day.

experiment

実験

Mendel used pea plants in his ***experiments.***

describe

～の特徴を述べる

Describe the characteristic of girl A.

apply

適用・応用・利用する

The principles of electromagnetic induction are ***applied*** in many devices.

.

Vocabulary games with TA

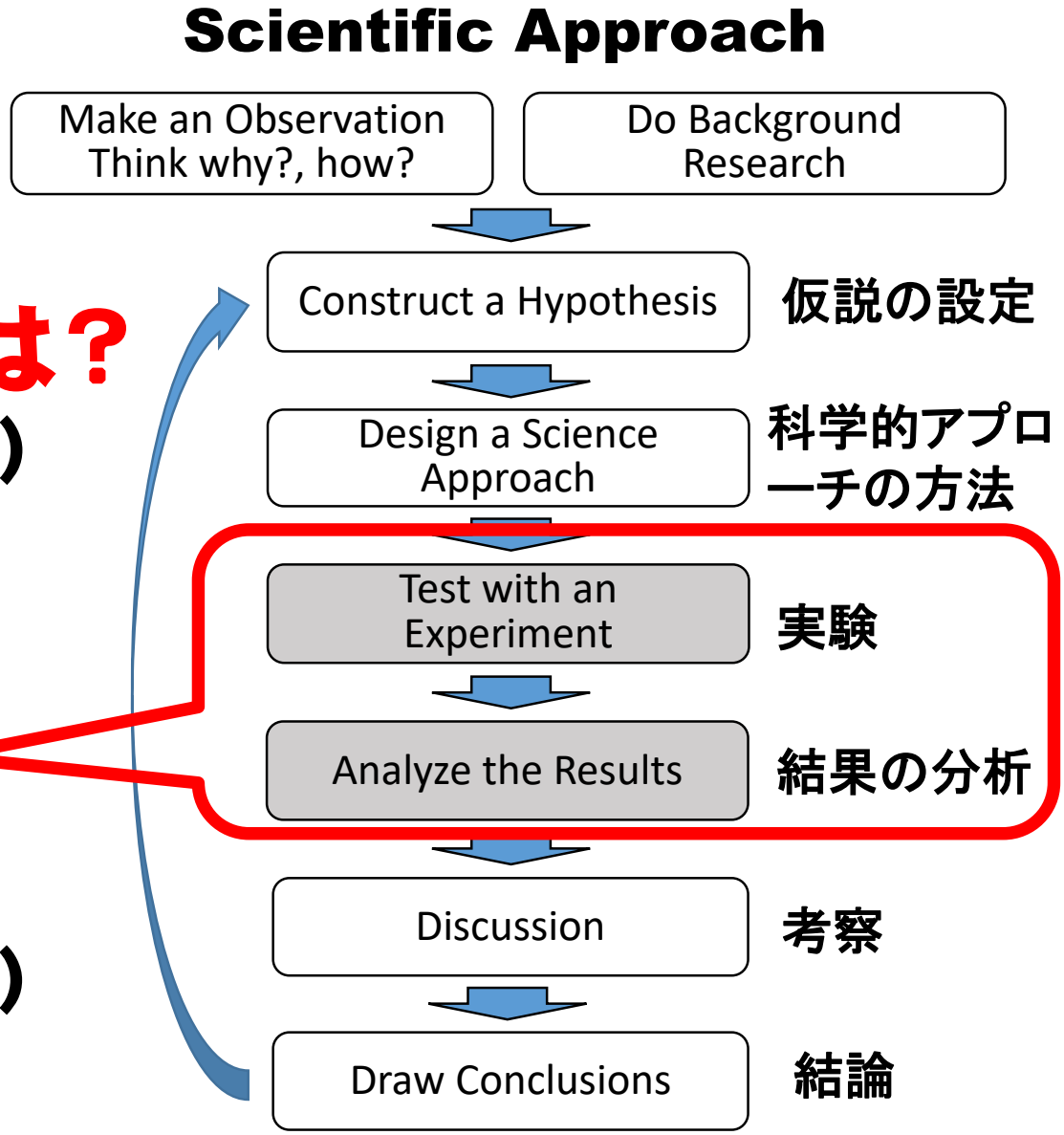
Science English

Analyze the Results “Tatara iron making”

今日のポイント

①たたら製鉄とは？
（化学分野の勉強）

②この過程で
何が大切か？
（研究手法の勉強）



Have you ever watched “PRINCESS MONONOKE”?

Chat GPTにて作成した画像

Tatara iron making

Ores

● Metal oxides

Hematite
(Fe_2O_3)
赤鉄鉱

Cassiterite
(SnO)
錫石

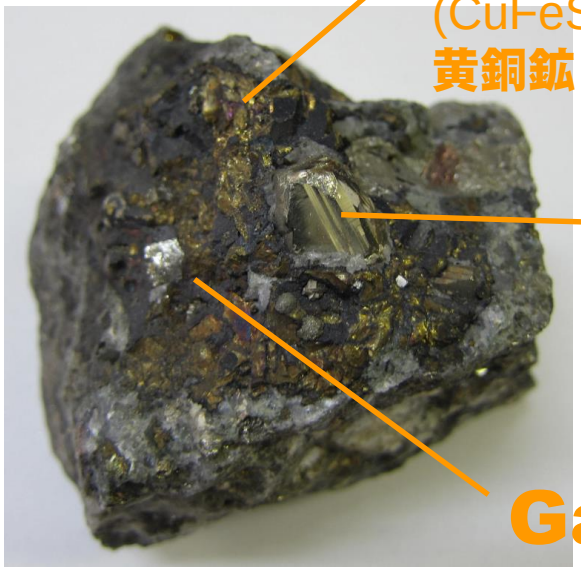
Iron sand
(Fe_2O_3) **砂鉄**

● Metal sulfides

Chalcopyrite
($CuFeS_2$)
黄銅鉱

Pyrite
(FeS_2)
黄鉄鉱

Galena
(PbS)
方鉛鉱



Peacock ore

Microwave oven

CuO

動物の寿命図鑑
https://www.zooing.net/archives/%E3%82%A4%E3%83%B3%E3%83%89%E3%82%AF%E3%82%B8%E3%83%A3%E3%82%AF

Science Approach

- Aim 目的

  To develop a method to take out metal from ore at a laboratory level. 実験室での方法を開発する

- What is known わかっていること

Tatara iron making

We can heat up a charcoal

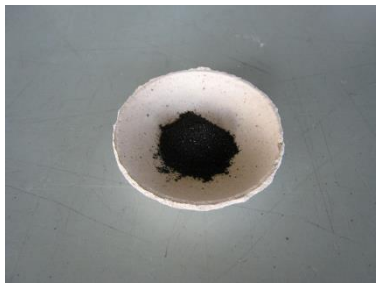
- Hypothesis 仮説

  Copper will be taken out from copper oxide by heating the oxide with charcoal powder using a microwave oven.

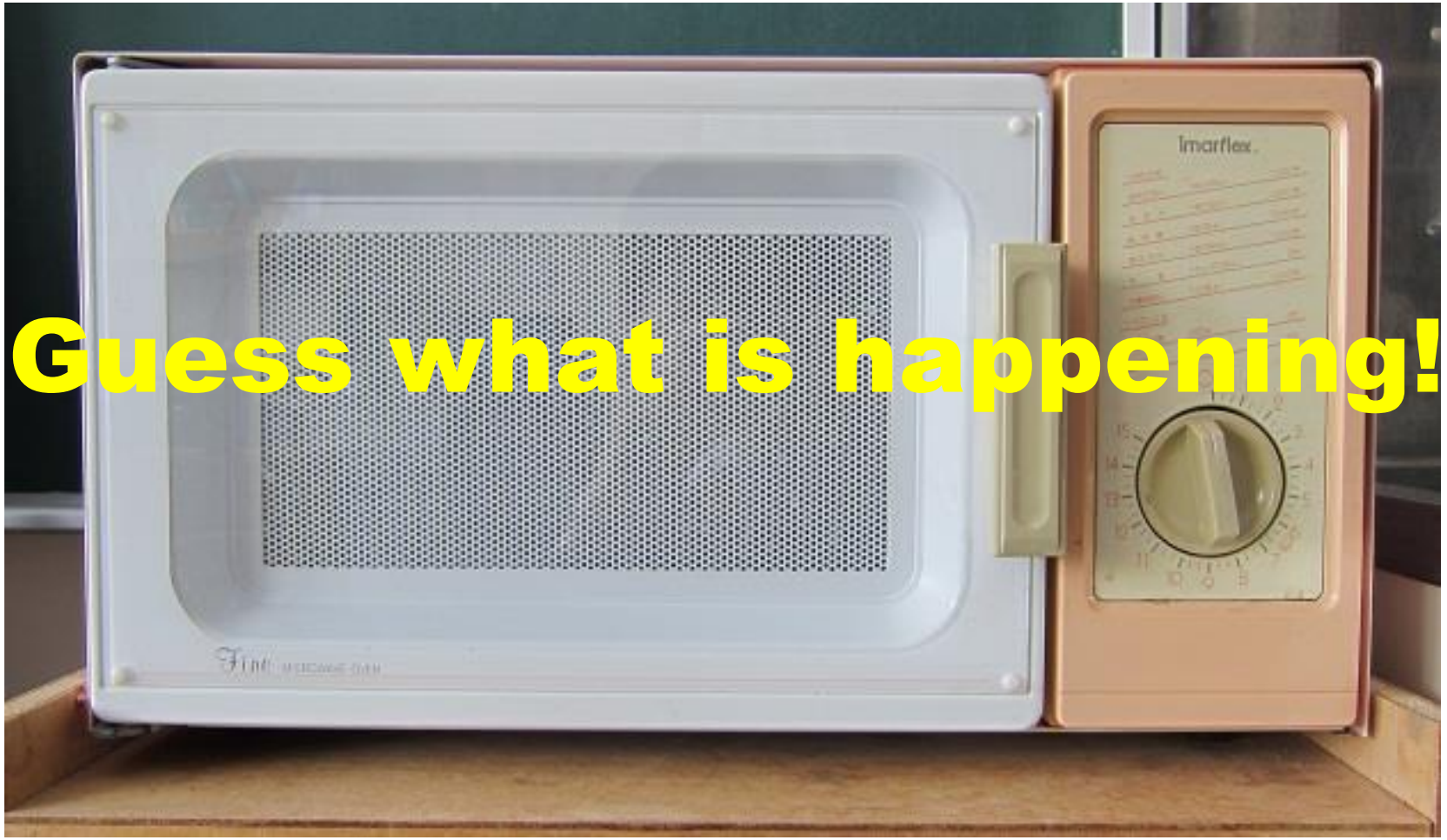
  電子レンジの加熱でクジャク石から銅を取り出せる

malachite

ceramic dish



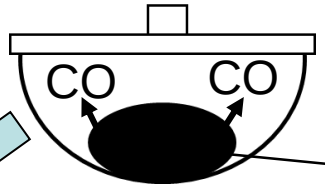
charcoal



Mechanism : Metal Oxide → Metal

metal oxide

charcoal



carbon monoxide

$$Fe_2O_3 + 2CO \rightarrow 2Fe + 3CO_2$$

lose oxygen

Fe_2O_3 **reduced** 還元される

Decompose **分解する**

$$Cu_2CO_3(OH)_2 \longrightarrow 2CuO + CO_2 + H_2O$$

$$2CuO + C \longrightarrow 2Cu + CO_2$$

CuO **reduced** 還元される

Discussion

metal

reduction

$Cu_2CO_2(OH)_2$

success

Critical Thinking 批判的思考

Is it true?

Is this really a metal?

Metal?
Copper?

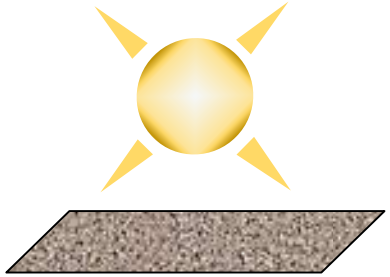
What is the property of all metals?

特性

What is the property of all metals?

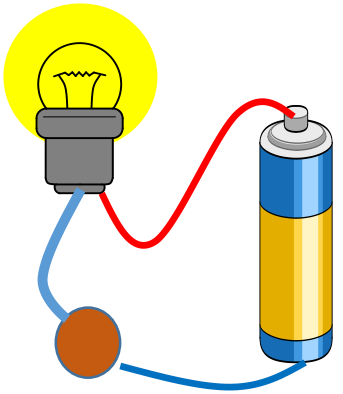
特性

Ductility



Metallic luster

Malleability

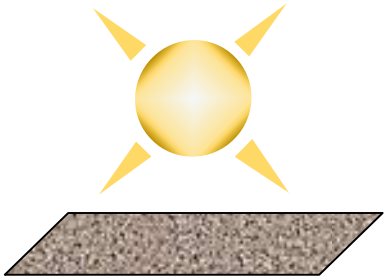


Electrical conductivity

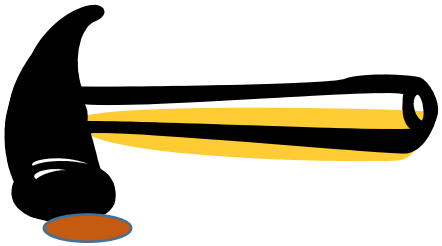
Discuss with TA

How do you confirm whether this matter is a metal or not?

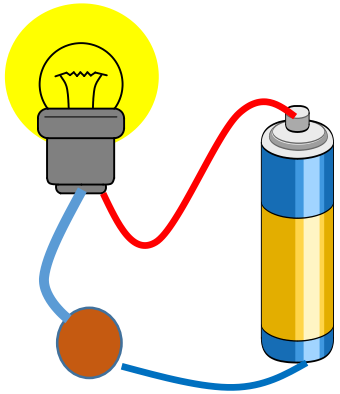
Ductility



Metallic luster



Malleability



Electrical conductivity

Discuss with TA

Case B

B1 Test with an Experiment & Analyze the Results -Verify Data (Is it true?)-

Thinking Critically

Activity 2

You expect the product is copper. How do you know? What knowledge can you use?

【TAs Question】

Q1.

【Your Answer】

→ reply

Metals are/have...

★ Remember what you have studied in junior high school.

Activity 3 What experiment can you do to be sure that the product is metal?

【TAs Question】

What experiment will you design?

● **What is known** -How to use your knowledge-

1. Metals have ( ).

【Design an Experiment and Let's Try It】

● **Methods 1**

→ reply

we confirm
polish
sand paper

Describing Events

・ When the product was polished with sand paper, the product showed a _____ _____.

● **What is known** -How to use your knowledge-

2. Metals have (ductility and _____).

● **Methods 2**

→ reply

we confirm
hit
hammer

Describing Events

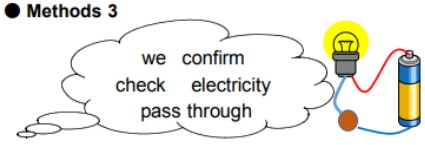
・ When the product was hit with a hammer, the product showed a _____.

● **What is known** -How to use your knowledge-

3. Metals have ( ).

● **Methods 3**

we confirm
check electricity
pass through



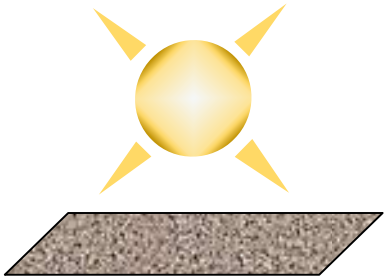
Describing Events

・ When wires were connected in series to a battery, a bulb and the product, the product showed _____ _____.

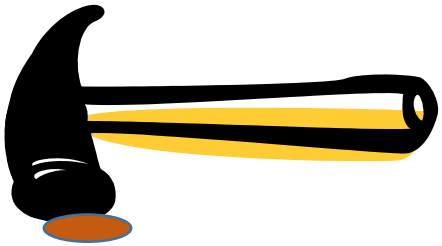
Experiment with TA

How do you confirm whether this matter is a metal or not?

Ductility



Metallic luster



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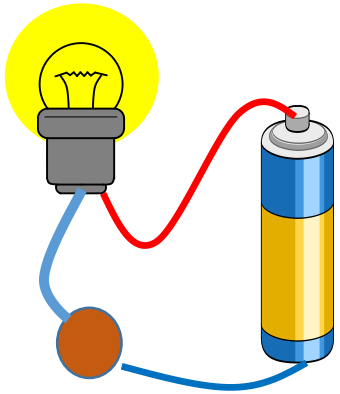


Electrical conductivity

Discussion

Case A: Finish your experiment when you got the product.

metal

reduction

$Cu_2CO_2(OH)_2$

success

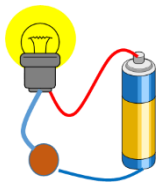
Discussion

Case B: Finish your experiment when you checked the product for the three properties of metal.

metal

reduction

$Cu_2CO_2(OH)_2$



metal

success

success

Discussion

Activity 4

In a scientific research, you conduct an experiment to identify the hypothesis that "Copper will be taken out from minerals by applying oxidation-reduction reactions". Discuss with your group what is the difference between the cases below. Then write down the best single English word which represents the difference.

Case A: Finish your experiment when you got the product.

生成物を得て実験を終える

Case B: Finish your experiment when you checked the product for the three properties of metal.

金属の3特性について生成物をチェックして実験を終える

Case C: Finish your experiment when you identified the product is copper.

生成物が銅であることを確認して実験を終える

Case C has more reliability than Case A in order to conclude that the product is copper.

信頼性

Presentation Exercise

Smelting

Ore

taking out

Metal

Ores

● Metal oxides

Hematite
(Fe_2O_3)
赤鉄鉱

Cassiterite
(SnO)
錫石

Iron sand
(Fe_2O_3) **砂鉄**

● Metal sulfides

Chalcopyrite
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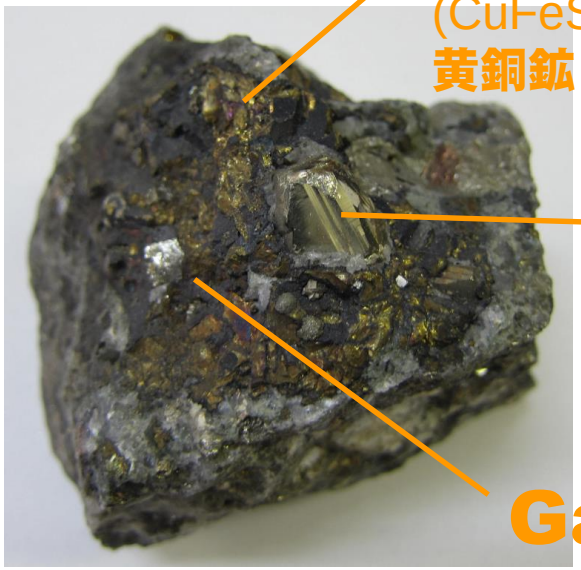

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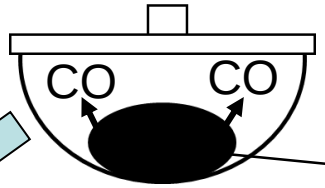

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Decompose **分解する**

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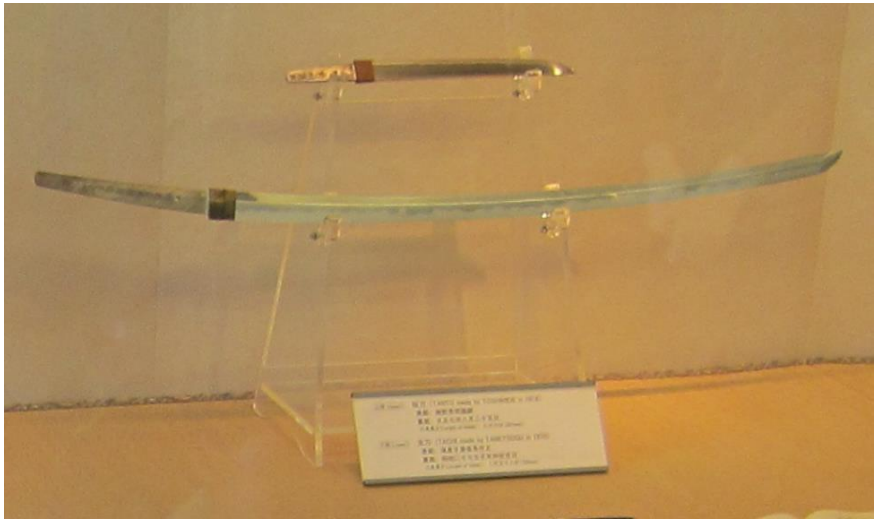
“Tatara iron making”

Edo period

Japanese swords



～Starting point of Japanese manufacturing technology～

Thank you very much!