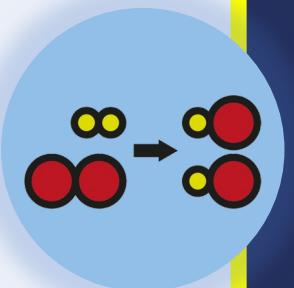


## Taking it Further: Corrosion and its Prevention

Answer the questions below.

1. What must be present in order for iron to rust?  
**water, oxygen**
2. On which electrode will a metal sometimes form during electrolysis?  
**The cathode (negative electrode)**
3. How will the mass of an electrode change if a metal ion is discharged at that electrode?  
**The mass of the electrode will increase**
4. Explain why alkali metals are stored under oil.  
**Alkali metals are stored under oil to prevent them from reacting with oxygen in the air.**
5. Write a word equation for the reaction of lithium and oxygen.  
**Lithium + oxygen → lithium oxide**



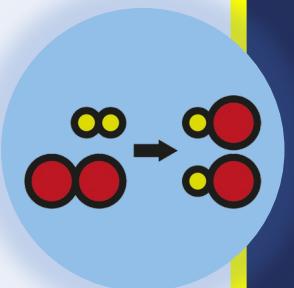
## Taking it Further: Corrosion and its Prevention

### **Do Now:**

1. What must be present for iron to rust?
2. On which electrode will a metal sometimes form during electrolysis?
3. How will the mass of an electrode change if a metal ion is discharged at that electrode?
4. Explain why alkali metals are stored under oil.
5. Write a word equation for the reaction of lithium and oxygen.

### **Drill:**

1. Write a word equation for the reaction of sodium and oxygen to make sodium oxide.
2. Write a balanced chemical equation for the reaction of sodium and oxygen to make sodium oxide ( $\text{Na}_2\text{O}$ )

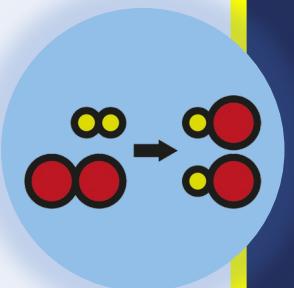


## Corrosion and its Prevention

### **Read Now:**

Shipwrecks from World War 2 are leaking pollutants into the World's oceans. Over time, many of the iron materials in these ships corrode and wear away, which results in pollutants leaking out into the oceans. These pollutants include fuel which is carcinogenic (cancer-causing), explosives and chemical weapons. Many of these wrecks have been deemed too costly or dangerous to clean up. The scale of this problem is vast. During the Second World War alone, it is estimated that at least 20,000 ships were sunk around the world, with many more lost during other conflicts in the same period. The higher temperatures caused by global warming will mean that more of these pollutants will dissolve in the water, and as a result, will expose marine organisms to higher levels of toxic compounds.

1. Why are pollutants leaking out of World War 2 shipwrecks into the oceans?
2. List some of the pollutants that are leaking out.
3. What does the word 'carcinogenic' mean?
4. How many World War ships are estimated to have been sunk?
5. Why does the problem of global warming exacerbate this situation?



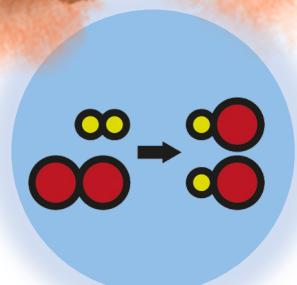
# Taking it Further: Corrosion and its Prevention

C4.2.13

Science  
**Mastery**

- C4.2.1 PKR: Reactions of Metals
- C4.2.2 Extracting Less Reactive Metals
- C4.2.3 PKR: Ions, Ionic Bonding and Deducing Ionic Formulae
- C4.2.4 (HT) Ionic Equations and Displacement Reactions
- C4.2.5 (HT) Writing Half Equations
- C4.2.6 (HT) Ionic Equations for the Reactions of Acids and Metals

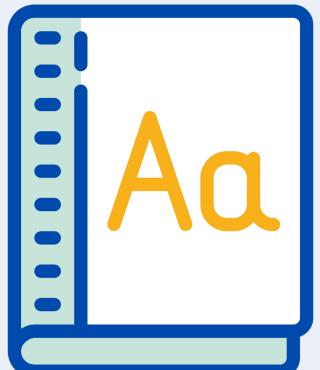
- C4.2.7 Introduction to Electrolysis
- C4.2.8 Extracting Metals by Electrolysis
- C4.2.9 Electrolysis of Molten Ionic Compounds
- C4.2.10 Electrolysis in Solutions
- C4.2.11 RP: Electrolysis of Aqueous Solutions
- C4.2.12 RP: Electrolysis of Aqueous Solutions
- **C4.2.13 TIF: Corrosion and its Prevention**
- C4.2.14 (HT) Obtaining Raw Materials
- C4.2.15 Recycling Metals
- C4.2.16 Feedback Lesson



## Following this lesson, students will be able to:

- Define corrosion
- Describe some methods used to prevent corrosion
- Explain how electroplating is carried out

### Key Words:



corrosion

sacrificial metal

electroplating

# This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach, explanation, demonstration or modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.

Answer the questions below.

1. Which answer is not a reason that graphite is used for electrodes?  
 A. Graphite is an inert material  
 B. Graphite is a simple covalent substance  
 C. Graphite is a good conductor of electricity
2. What will a student observe at the negative electrode when carrying out the electrolysis of sodium chloride?  
 A. A solid will form (sodium metal)  
 B. A gas will form (chlorine gas)  
 C. A gas will form (hydrogen gas)
3. A gas is collected at the negative electrode. When a lit splint is placed in the gas, a squeaky pop sound is heard. What is the gas?  
 A. Hydrogen  
 B. Oxygen  
 C. Chlorine

# Corrosion

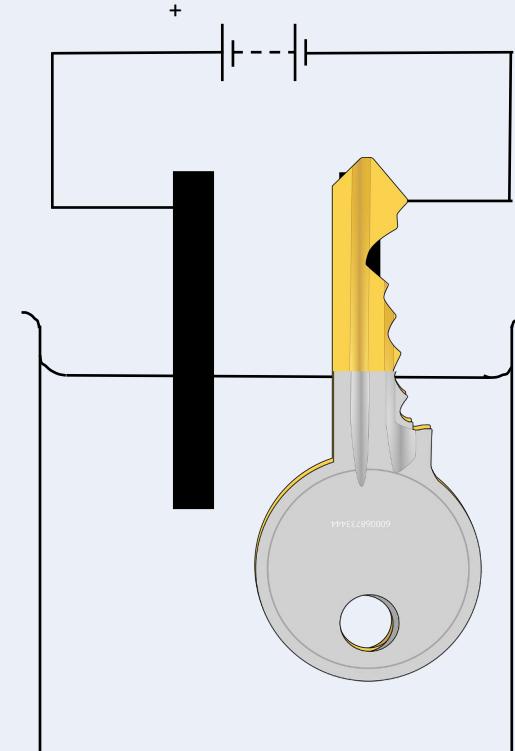
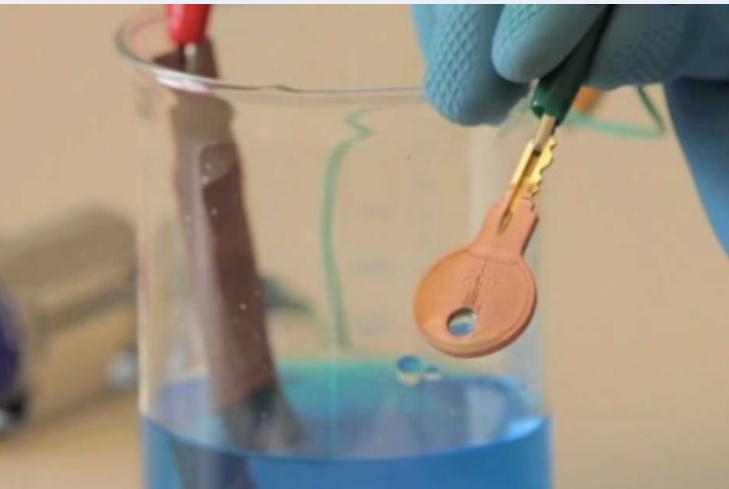
**Corrosion** is the destruction of materials by chemical reactions with substances in the environment.

- **Rusting** is an example of corrosion.
- For iron to rust, **water** and **oxygen** must be present.
- Corrosion can be prevented by putting a **barrier** on the surface of the metal



# Preventing corrosion

- Corrosion can be prevented by **painting, greasing or electroplating**.



Is this correct?

**Rusting** is the destruction  
of any metal by  
chemical reactions with  
substances in the  
environment

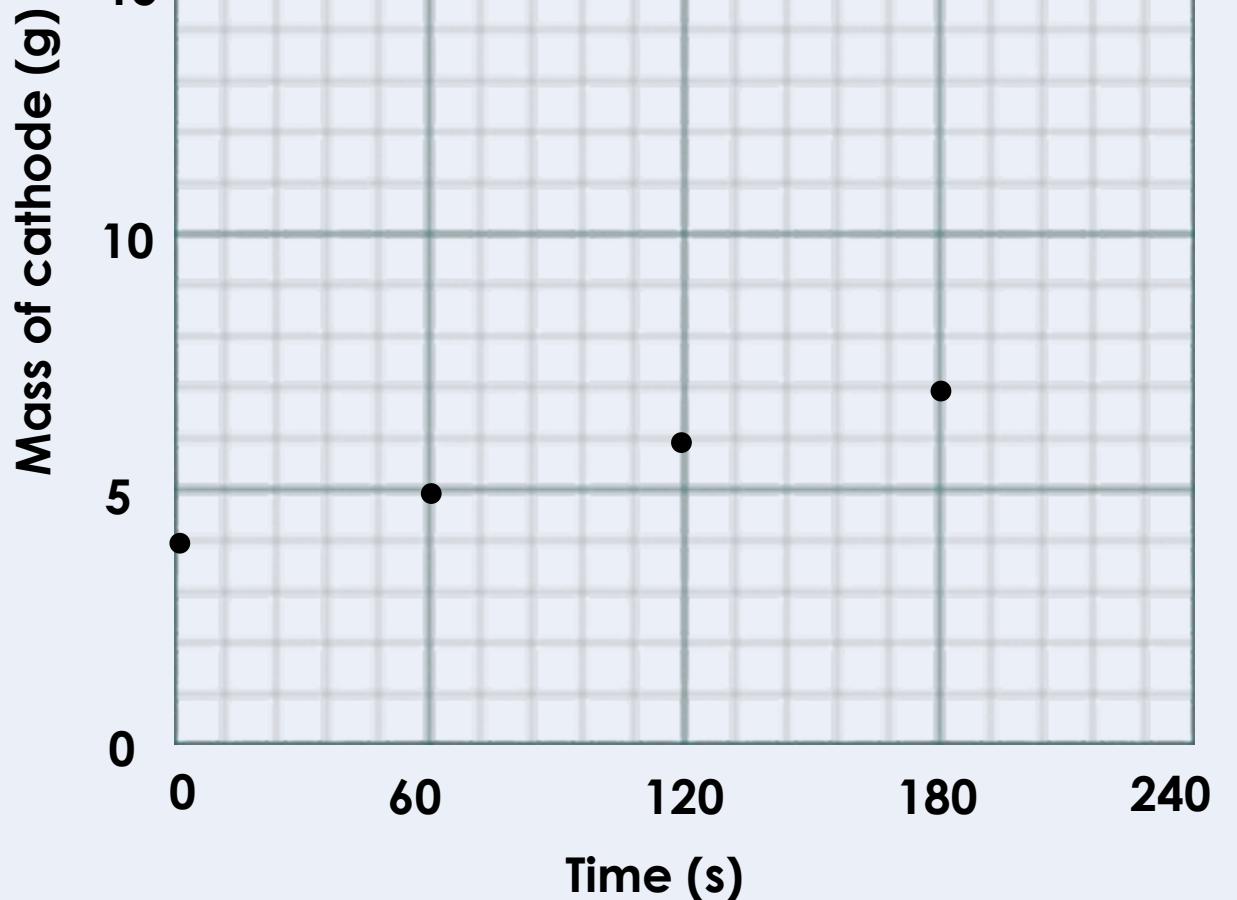
## Drill

1. What is corrosion?
2. What is the corrosion of iron called?
3. What 2 substances must be present for the corrosion of iron to occur?
4. What is the product of the corrosion of iron?
5. List 3 methods used to prevent corrosion in metals.
6. What process is used to electroplate a metal.
7. Which electrode is electroplated?
8. What separating technique is used to obtain metal from the solution which hasn't attached to the cathode?
9. What property of metals make them suitable to use as an electrode?

## Drill answers

1. Corrosion is the destruction of materials by chemical reactions with substances in the environment.
2. The corrosion of iron is called rusting
3. For rusting to occur, water and oxygen must be present
4. Iron oxide is the product of the rusting of iron
5. Painting, greasing and electroplating can be used to prevent corrosion of metals
6. Electrolysis is used to electroplate a metal
7. The cathode is always electroplated
8. Filtration is used to obtain metal from the solution
9. Metals are suitable to use as electrodes as they are good conductors of electricity

# I: Electroplating a cathode



A student plotted this graph as she investigated the electrolysis of copper (II) sulphate solution.

(a) Describe the change in mass of the cathode (1)

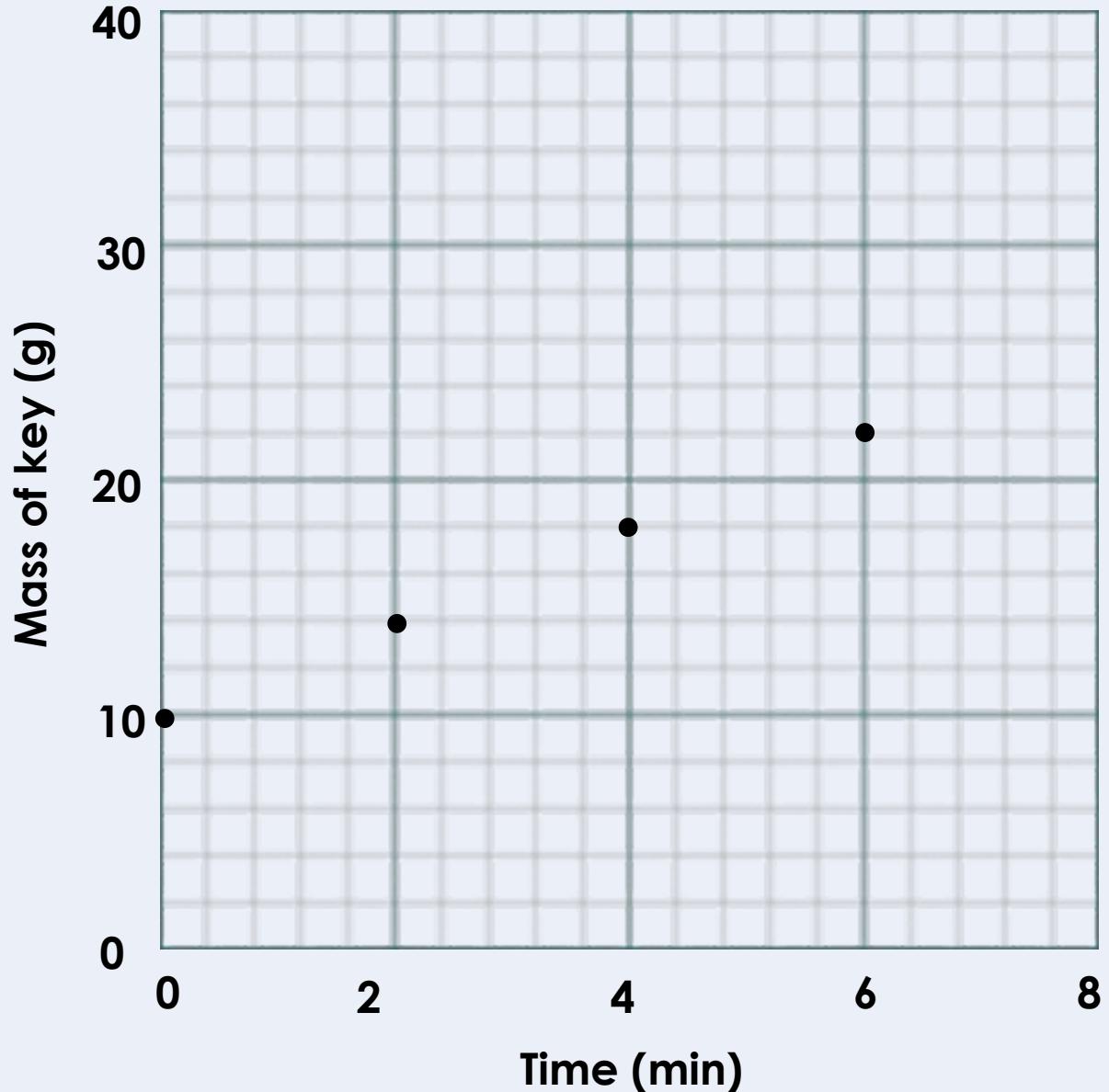
**The mass of the cathode is increasing.**

(b) Predict the mass of the cathode after 240 seconds (1) **8 g**

(c) Some of the copper produced did not stick to the electrode, but sank to the bottom of the beaker. Suggest how the student obtained the measurement at 180 seconds. (3)

- **filter the solution to obtain all of the copper**
- **wash and dry the copper (residue)**
- **weigh the copper collected**
- **Add to the increase in mass of the electrode**

# We: Electroplating a key



A student plotted this graph as she electroplated a key with gold.

(a) State the mass of the key at the start of the electrolysis process (1)

**The mass of the key was 10 g.**

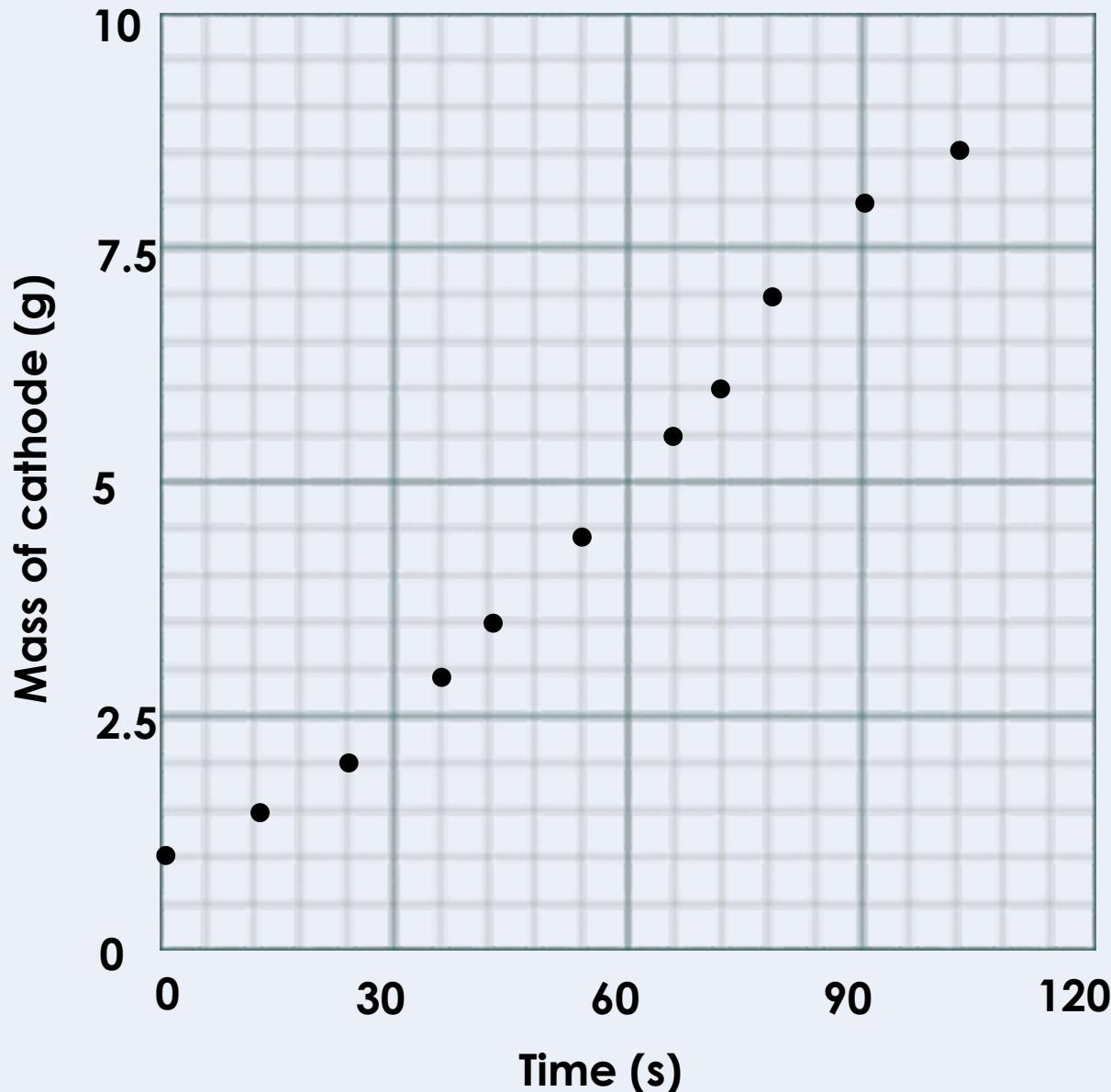
(b) Predict the mass of the key after 8 minutes (1) **26 g**

(c) Some of the gold produced did not stick to the key, but sank to the bottom of the electrolysis container. Suggest how the student obtained the measurement at 6 minutes. (3)

- **filter the solution to obtain all of the gold**
- **wash and dry the gold (residue)**
- **weigh the gold collected**
- **Add to the increase in mass of the key**

# You: Electroplating a cathode

## Apply



A student plotted this graph as she investigated the electrolysis of silver chloride solution.

- (a) Describe the change in mass of the cathode (1)

**The mass of the cathode is increasing.**

- (b) Predict the mass of the cathode after 120 seconds (1) **10 g**

- (c) Some of the silver produced did not stick to the electrode, but sank to the bottom of the beaker. Suggest how the student obtained the measurement at 90 seconds. (3)

- **filter the solution to obtain all of the silver**
- **wash and dry the silver (residue)**
- **weigh the silver collected**
- **Add to the increase in mass of the cathode**

## Answer the questions below.

1. What is corrosion?  
 A. The destruction of materials by chemical reactions with substances in the environment  
 B. The destruction of iron by chemical reactions with substances in the environment  
 C. The destruction of metals by chemical reactions with substances in the environment
  
2. Which option is not a method to prevent the corrosion of metals?  
 A. Electroplating  
 B. Electrolysis  
 C. Painting
  
3. Which technique can be used to separate metal from a solution?  
 A. Filtration  
 B. Distillation  
 C. Fractional distillation

## Lesson C4.2.13

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)  
or by emailing [sciencemastery@arkonline.org](mailto:sciencemastery@arkonline.org)  
Thank you!