

Activity 2

In the website: <http://comenius.susqu.edu/hons/250/scientists/lavoisier.htm>

You can find the following picture:

Phlogiston theory:



Lavoisier theory:



A calx is what we call the metal oxide today.

The evolution of knowledge in chemistry is presented in the above picture. By using information from the narration you have just watched, please work cooperatively and prepare a story about this specific development. Please present your story to the class.

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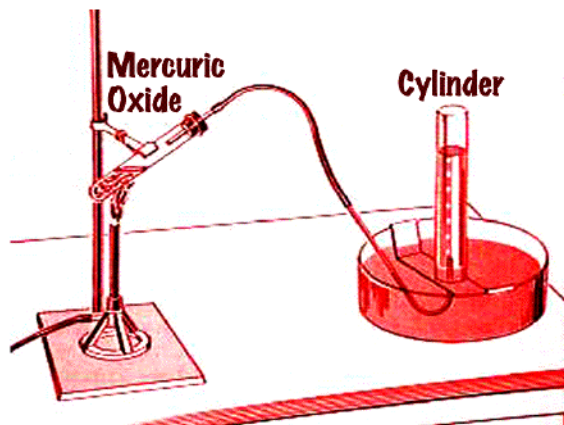
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Activity 3

You can see in the picture an apparatus with which the experiment with mercury oxide that has a red colour, «common red precipitate of mercury» can be conducted.



When the test tube is heated gas is produced and is collected in the cylinder by displacing the water the level of which goes down in the inverted tube.

How would a proponent of the phlogiston theory and how a proponent of Lavoisier’s theory explain the phenomenon?

By which experimental procedure can we choose the most plausible explanation?

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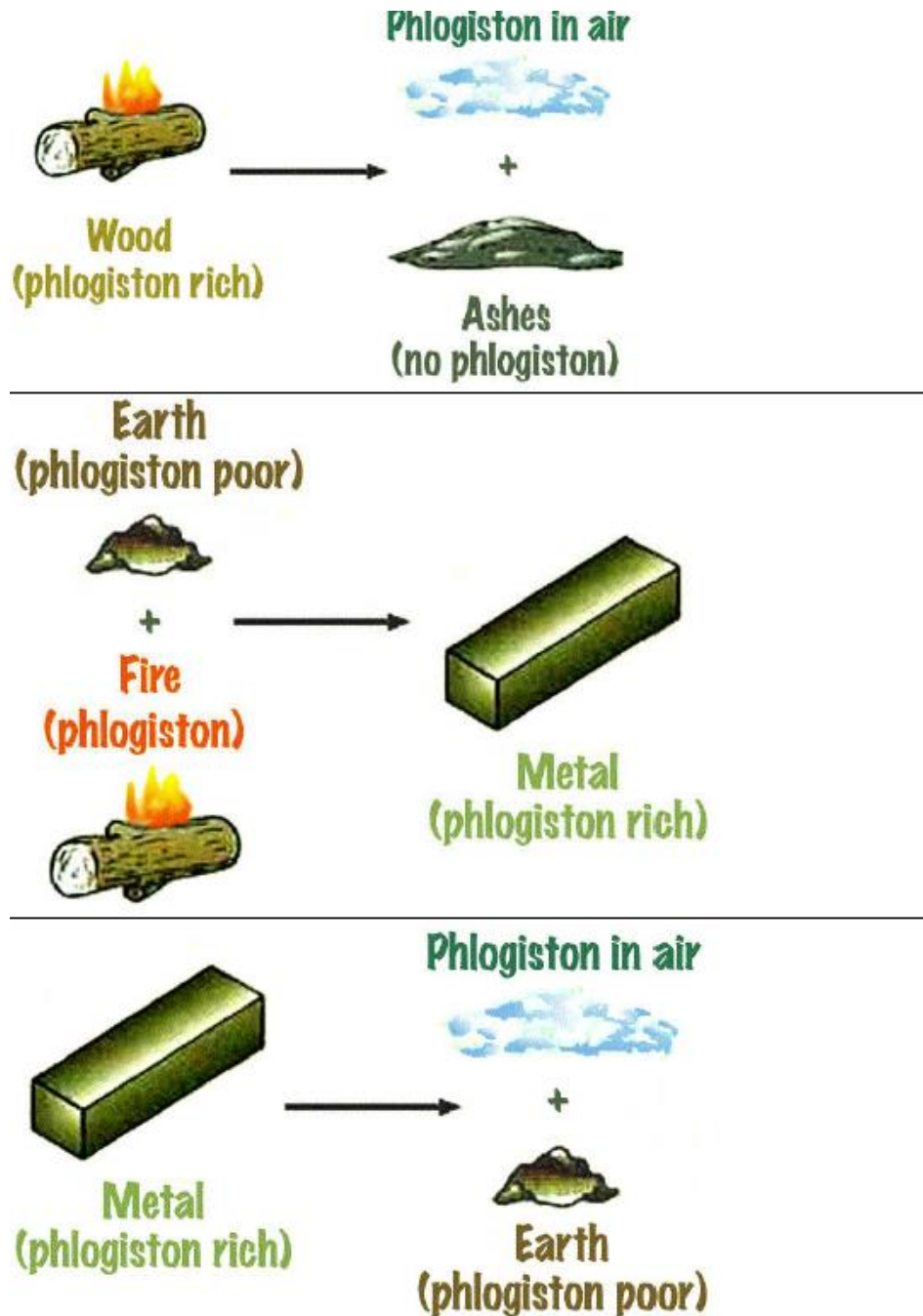
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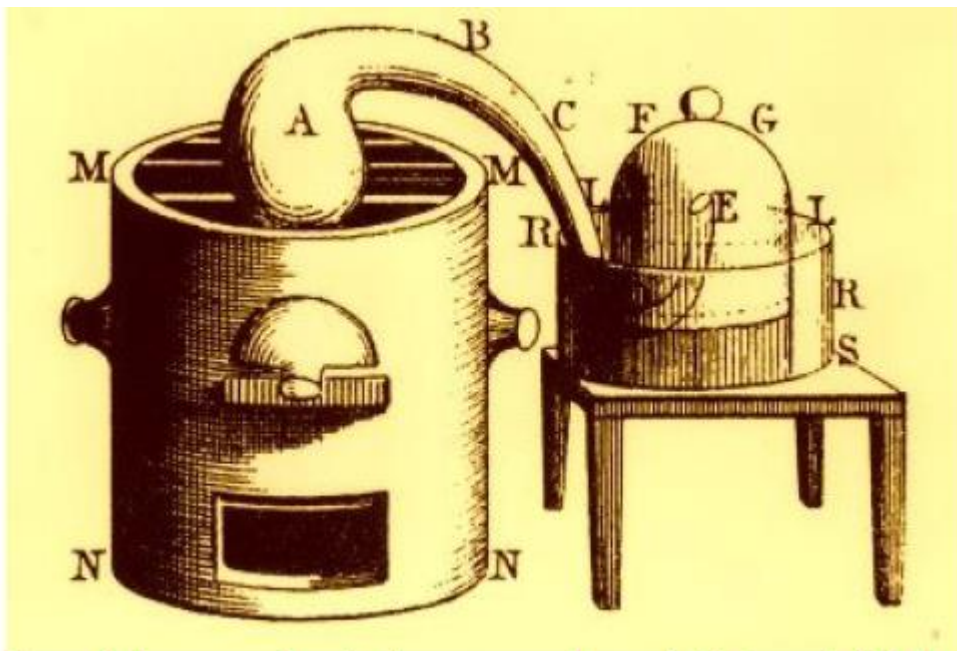
Activity 4

What is presented in these three drawings is the role of fire in the treatment of ore as used in the process of the production of minerals. Study them in order to ascertain the role of phlogiston in the production of rust during oxidation and during the production of minerals.



Activity 5

You can find the picture and the text below in the following website:
<http://philosophyofscienceportal.blogspot.gr/2008/07/phlogiston.html>



In 1777, Lavoisier conducted an experiment that established a fatal shortcoming of the phlogiston theory. He heated mercury and air using a bell-jar for 12 days. Red mercury calx (now HgO) formed and the volume of air decreased from 50 to 42 in³. The remaining air was determined to be atmospheric mofette, and later renamed azote (now nitrogen). The red [HgO] was heated in a retort producing 8 in³ of dephlogisticated air [O₂]. The sequence of experiments established that heat caused formation of a calx (the doctrine of phlogiston explained phlogiston was released): $\text{Hg(l)} + \text{O}_2(\text{g}) \rightarrow \text{HgO(s)}$ and then stronger heating reverted the calx back to the original substances (which the doctrine of phlogiston would predict to be impossible): $\text{HgO(s)} \rightarrow \text{Hg(l)} + \text{O}_2(\text{g})$

Please answer the following questions:

1. Is this a qualitative or a quantitative experiment?
- 2 . Which quantitative elements and of which body demonstrate the conservation of mass?

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Activity 6

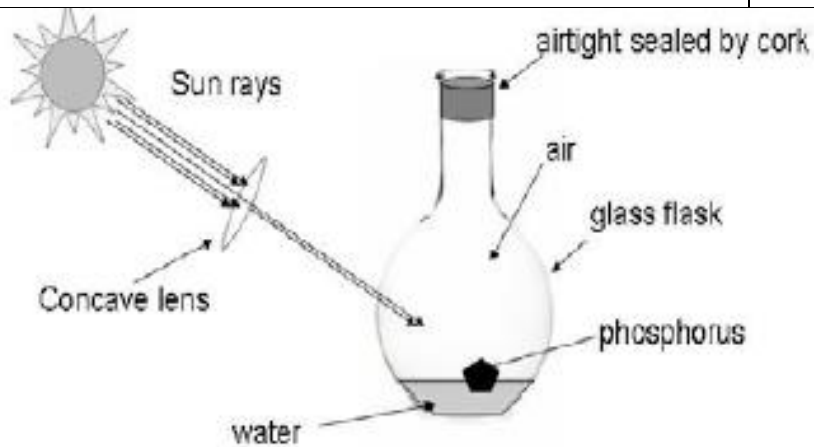
A small quantity of wire wool was placed on tray P. The scale was balanced with weights placed on tray Q.



The wire wool was removed and heated in the open air. A black powder was formed. The powder was carefully collected and placed again on tray P. What do you think that will happen? Please justify your answer.

Source: Driver et. al. (1985), Children's ideas in science , Milton Keynes & Philadelphia: Open University Press

Please write your answer here.



A piece of phosphorus was placed inside a bottle as it can be seen in the sketch above. The mass of the bottle with its content is 205 gr. When the sun rays are focused on the phosphorus, the phosphorus is set on fire. The white smoke that is produced dissolves in the water. When they get cold, the mass of the bottle and its content are measured again.

A. Its mass should be:

Tick the box as appropriate

- a. More than 205 g
- b. 205 g
- c. Less than 205 g
- d. We do not have sufficient data to answer the question

B. Please justify your answer

Source: Driver et. al. (1985), Children's ideas in science , Milton Keynes & Philadelphia: Open University Press

After answering these two answers individually, you should discuss them collectively as a team in order to reach an agreement on them. You will present your answers to your classroom.

Activity 7

Using the list of ideas that describe the characteristics of science and the ways it develops, try to locate and write these ideas in the story you heard and the activities of this lesson. These ideas that scientists call Nature of Science (Nature Of Science-NOS-) are:

Characteristics of Nature of Science (NOS)

1. Science demands and relies on empirical evidence.
2. Knowledge production in science includes many common features and shared habits of mind.
3. Scientific knowledge is tentative but durable.
4. Laws and theories are related but distinct kinds of scientific knowledge.
5. Science is a highly creative endeavor.
6. Science has a subjective element.
7. There are historical, cultural, and social influences on science.
8. Science and technology impact each other, but they are not the same.
9. Science and its methods cannot answer all questions.

Scientists argue that in order to learn science one must first understand what exactly science is. Because it is difficult to define science, scientists give a list of its characteristics.

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Student's Learning Activities (Lavoisier and the conservation of mass) were written by Ioannis Vlachos and Aikaterini Rizaki with the support by the European Commission (Project 518094-LLP-1-2011-1-GR-COMENIUS-CMP) and the NKUA of Greece. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained there in.