

Seb Academy

Topic: Metals Reduction of Metal Oxides Homework 2

Time allowed: 40 min

Date: _____

Name: _____

The design of this homework is to train up your data handling skills.

- A partially filled reactivity series is as shown:
 - Fill in the missing metals for the reactivity series. [1]
 - Put a tick to the metals, whose oxide can be reduced by carbon and hydrogen. [2]

Reactivity series	K	Na				C					H	
Reduction by C and Co												
Reduction by H												

- Write an equation for the reduction of iron (III) oxide by hydrogen gas.

[1]

[Total: 4 marks]

- Some versions of the Periodic Table place hydrogen in Group I (Fig. 7.1). Other versions place hydrogen alone and not with any other group (Fig. 7.2).

- The experiment uses silver (I) oxide. The reaction forms liquid silver in the hot tube. Write an equation, with state symbols, for this reaction.

[2]

- The changes that happen during the experiment involve both reduction and oxidation. What is reduced and what is oxidised during the experiment? Explain your reasoning

[3]

- In two separate experiments, hydrogen was passed over heated magnesium oxide and heated copper (II) oxide. Describe the changes, if any, you would expect to see in each experiment. Explain your reasoning.

Observations

Reasons

[3]

[Total: 12 marks]

Reduction of metallic oxides to predict reactivity

- (2019/SEB/C18) Hydrogen gas cannot reduce
 - A** Iron oxide
 - B** Zinc oxide
 - C** Copper (II) oxide
 - D** Tin oxide

- (2018/SJI/FE/2) The reaction of a metal oxide with hydrogen is shown below.

Which of the following is correct?

	Metal Oxide	Mass of metal oxide after heating
A	Zinc Oxide	decreases
B	Lead(II) Oxide	decreases
C	Copper(II) oxide	increases
D	Iron(II) oxide	increases

- (2018/TKGSS/FE/2) Metal oxides react with some metals.

Look at the list of metals and metal oxides below.

Copper	Silver oxide
Iron	Sodium oxide
Zinc	Calcium oxide
Magnesium	Potassium oxide

Which metal and which metal oxide are most likely to react together to give the most vigorous reaction?

- A** copper and potassium oxide
- B** copper and silver oxide
- C** magnesium and silver oxide
- D** magnesium and calcium oxide

- (2018/PLMGSS/FE/2) Hydrogen gas is produced by the reaction of a metal X and a dilute acid. When this same gas was passed over an oxide of metal Y, it reduced the metallic oxide to its metal in the presence of heat.

Which of the following substances could give the above results?

	<u>Metal X</u>	<u>Acid</u>	Oxide of metal Y
1.	Zinc	Sulfuric acid	Calcium oxide
2.	Calcium	Hydrochloric acid	Lead (II) oxide
3.	Iron	Sulfuric acid	Copper (II) oxide
4.	Copper	Hydrochloric acid	Zinc oxide

- A** Only 3 is correct
- B** 1 and 3 are correct
- C** 2 and 4 are correct
- D** 1 and 4 are correct

[Total: 4 marks]

- (1994/O/GCSE/J/P2)
In an experiment. Copper (II) oxide was reduced by heating it with powdered chromium. Chromium(III) oxide and copper were formed. The table below gives some information about the substances involved.

<i>substance</i>	<i>action of water</i>	<i>action of hot dilute sulfuric acid</i>
Chromium, Cr	insoluble	reacts to give a green solution
Chromium(III) oxide, Cr ₂ O ₃	insoluble	reacts to give a green solution
Copper, Cu	insoluble	does not react
Copper(II) oxide, CuO	insoluble	reacts to give a blue solution

- Construct an equation to show the reduction of copper(II) oxide by chromium.

[1]

- At the end of the heating experiment, all four substances were present in the reaction mixture. Suggest how a pure dry sample of copper can be obtained from this mixture.

[2]

- Name 2 gases which reduces copper(II) oxide on heating.

[1]

SEB TIP: Use the metal reactivity series. There are 2 non-metals in the reactivity series which are above Cu. And when **non-metal** bond with **non-metal**, they usually form **covalent** substances with **low BP**, which are hence gases at RTP.

- Similar experiments between other metals and metal oxides were carried out. The findings from these experiments are shown in the table below.

Metal used	Metal oxide used	Was the metal oxide reduced?
chromium	copper(II)oxide	yes
copper	lead(II)oxide	no
lead	chromium(III)oxide	no
sodium	chromium(III)oxide	yes

- Place the metals chromium, copper, lead and sodium in order of decreasing reactivity, from the most to the least reactive.

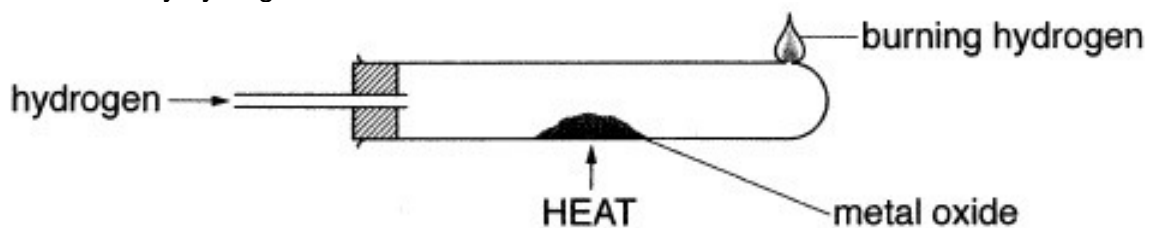
[1]

- Hence predict what would be observed if a piece of chromium is dipped into aqueous lead(II) nitrate.

[1]

[Total: 6 Marks]

- (2009/O/GCSE/9 Either) Experiments are set up to investigate the reduction of three metal oxides by hydrogen.



The table shows the appearance of each metal oxide when cold

Experiment	Metal oxide	Colour when cold
1	Calcium oxide	White
2	Copper (I) oxide	Red
3	Lead (II) oxide	yellow

- What would you expect to see happen in each experiment?

[3]

- In which tube would you expect to see the fastest reaction?

[1]

- - Write an equation for the reaction that happens between lead oxide, PbO, and hydrogen.

[1]

- - Explain, in terms of oxidation state, why lead is said to be reduced in the reaction.

[2]

- The following table shows the mass change in experiment 2

Mass of copper oxide at start / g	0.72
Mass of copper at end / g	0.64

Use the results to work out the empirical formula of the copper oxide used in experiment 2.

[3]

[Total: 10]

Answering Techniques for metal displacement and reduction.

1. *A **more reactive metal** can **displace** a less reactive metal from its salt solution*
What happens if we add iron filings to a solution of copper(II) sulfate? Write an equation, and also describe the observations you would see.

[2]

2. *A **more reactive metal** can **reduce** the oxide of a less reactive metal.*
What happens in a mixture of zinc powder and copper(II) oxide? Write an equation, and also describe the observations you would see.

[2]

[Total: 4 marks]