



BRAINIACS OLYMPIAD

GRADES 7-8

CHEMISTRY SAMPLE PAPER (PRACTICAL PART)



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CHEMISTRY SAMPLE PAPER-PRACTICAL PART

Grade: 7-8

Time: 120 minutes

Total points: 100

Equipment: Not required

TASK 1 (50 points)

Metals and Their Oxides

A bent test tube (in Fig. 1 indicated by number 1) was filled with mercury(II) oxide and strongly heated. In the bend of the tube, droplets of metal X, of a silvery-gray color, condensed. A gas was released from the test tube and passed through a glass tube (in Fig. 1 indicated by number 2). The tube contained powder of metal Y, which is red in color and which turned black upon heating.

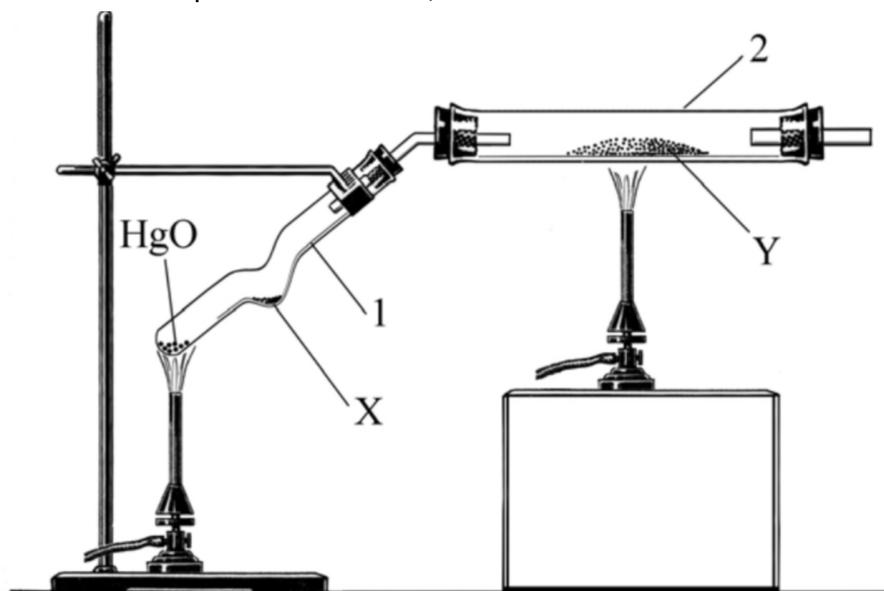


Fig. 1

Later, a stream of carbon monoxide gas was passed through the same tube (Fig. 2). The powder became red again. The gaseous product of the reaction was directed into a beaker with limewater (in Fig. 2 indicated by number 4), which turned cloudy.

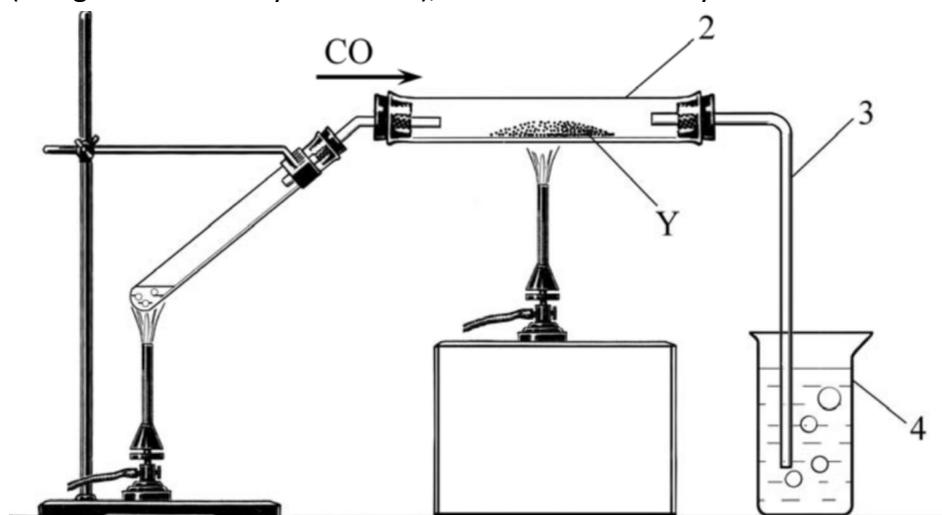


Fig.2

Questions

A. Which safety precautions must be taken when conducting this experiment with mercury compounds and carbon monoxide? List at least three. (6 points)

B. Which metals X and Y are described in this problem? (8 points)

C. What substances are formed during the heating of mercury(II) oxide? Write the corresponding chemical equation. (8 points)

D. Why did metal Y first turn black in the first experiment, and then become red again in the second experiment? Illustrate your answer with chemical equations. (12 points)

E. Why did the limewater turn cloudy in the second experiment?(6 points)

F. Predict what would happen if instead of carbon monoxide, hydrogen gas was passed over the black oxide of metal Y. Write the equation. (5 points)

G. Suggest how this experiment relates to industrial metal extraction processes. Give one real example. (5 points)

TASK 2 (50 points)

Secret Behind the Delicious Juices

I. Introduction

Acidity is a property of substances that can be taste. Foods have certain acidity to make them delicious and safe to eat. Too much acid or too little acid make foods harmful to eat. This is usually the case in expired foods. **Be aware with food of expire date.**

A very simple way to determine acidity of substances is using a litmus paper. Simple litmus papers produced in two colors appearance, i.e., red and blue. If a red litmus paper is immersed in an acidic substance, the color does not change, but when immersed in a non-acidic substance the color changes to blue (non-acidic substances also known as base substances). If a blue litmus paper is immersed in a base substance, the color does not change, but when immersed in an acid substance the color changes to red.

	Acid	Base (non-acidic)
Red Litmus	Remains red	Changes to blue
Blue Litmus	Changes to red	Remains blue

II. Objectives

The main objectives of the present exploration are as follows.

1. Classifying various substances, either acid or base, using litmus papers.

III. Equipments

1. Four different juices: Strawberry, pineapple, orange, sour-sop.
2. Limewater.
3. Soap water
4. Pure water
5. Plastic cups
6. Blue and red litmus papers
7. Spoon

IV. Procedure

Identifying a substance, either an acid or a base

Part A

1. Put one spoon of strawberry juice in a plastic cup
2. Use litmus paper by immersing for 1 minute to test the acidity.
3. Conclude either the substance is an acid or a base
4. Write your observation results on the answer sheet
5. Repeat steps 1 – 4 for different juices and for limewater and soap water.
6. Classify which substances are acids and which substances are bases.

Changing the Acidity

Part B

Mix one spoon of orange juice and one spoon of limewater (measured using spoon).

1. Observe the color of red litmus paper when immersed in the mixture.
2. If the color of litmus paper in [1] does not change, add the limewater into the mixture. Determine the volume of limewater (number of spoonful) at which the color of red litmus paper suddenly changes into blue.
3. If the color of litmus paper in [1] changes to blue, add the orange juice into the mixture. Determine the volume of the orange juice (number of spoonful) at which the color of red litmus paper does not change.

V. Conclusion

Write down the general conclusion you obtained from this exploration.