

# The International School of Azerbaijan



M5A & B End of Year Exam 2010

**Chemistry**

**50 min**

Instructions

Answer **ALL** questions

Materials required: Calculator, Ruler, Pen, Pencil, Eraser

This exam paper contains 11 pages.

The last page contains a Periodic Table which you may want to tear off and refer to during the exam.

**Name:** \_\_\_\_\_ **Homerroom** \_\_\_\_\_

**Level Award:** \_\_\_\_\_

	<b>Total marks</b>	<b>Marks achieved</b>
<b>Level 1-2</b>	<b>9</b>	
<b>Level 3-4</b>	<b>15</b>	
<b>Level 5-6</b>	<b>20</b>	

1. The use of most metals depends on their reactivity.

- (a) Reactivity of metals can be compared by using displacement reactions. The reactions of four metals **R**, **S**, **T** and **U** with their salt solutions are shown. (These letters are not the chemical symbols for the metals).

Metal salt solution	Metal			
	R	S	T	U
R		✗	✗	✓
S	✓		✗	✓
T	✓	✓		✓
U	✗	✗	✗	

✓ = reaction      ✗ = no reaction

- (i) Use the information to arrange the metals **R**, **S**, **T** and **U** in order of reactivity, with the most reactive first.

Most reactive .....

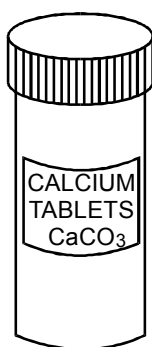
.....

.....

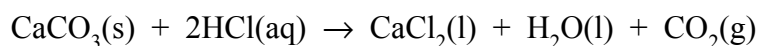
Least reactive .....

(2)

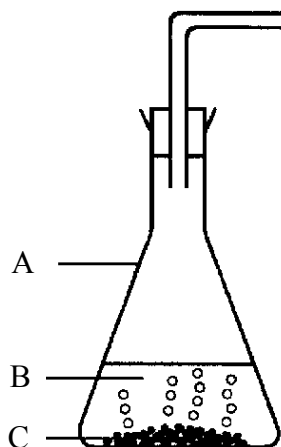
2. Calcium tablets are taken to build and maintain strong bones and teeth.



These tablets react with hydrochloric acid in the stomach.



- (a) The rate at which the calcium tablets react with the acid can be studied by measuring the amount of carbon dioxide gas produced. Part of the setup is shown below.



Complete the diagram to show how you could measure the volume of carbon dioxide during the reaction and name the pieces of apparatus and reagents labelled **A**, **B** and **C**.

**A** .....

**B** .....

**C** .....

(5)

(b) Suggest **two** ways in which the reaction of calcium tablets (calcium carbonate) and hydrochloric acid could be speeded up.

1. ....

2. ....

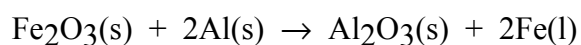
(2)

(Total 9 marks)

3. Most of the cans used for drinks are made from aluminium.



The reaction between aluminium and iron oxide is used to join lengths of railway track. It is called the thermit reaction.



(a) Why does aluminium react with iron oxide?

.....

(1)

(b) Both oxidation and reduction happen during this reaction. Explain how.

.....  
.....  
.....  
.....

(2)

4. This item appeared in the *Wolverhampton Express and Star* on October 31st, 1997. Read the passage and answer the questions that follow.

**Fumes scare at  
factory**

Workers were forced to flee a factory after a chemical alert. The building was evacuated when a toxic gas filled the factory. It happened when nitric acid spilled on to the floor and mixed with magnesium metal powder.

(a) The equation which represents the reaction between magnesium and nitric acid is:



The reaction of nitric acid with magnesium metal powder is more dangerous than if the acid had fallen on to the same mass of magnesium bars. Explain why using collision theory.

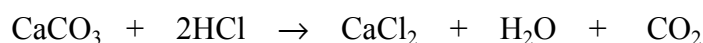
.....  
.....

.....  
..... (2)

(b) Water was sprayed on to the magnesium and nitric acid to slow down the reaction.  
Explain, in terms of collision theory, why the reaction would slow down.

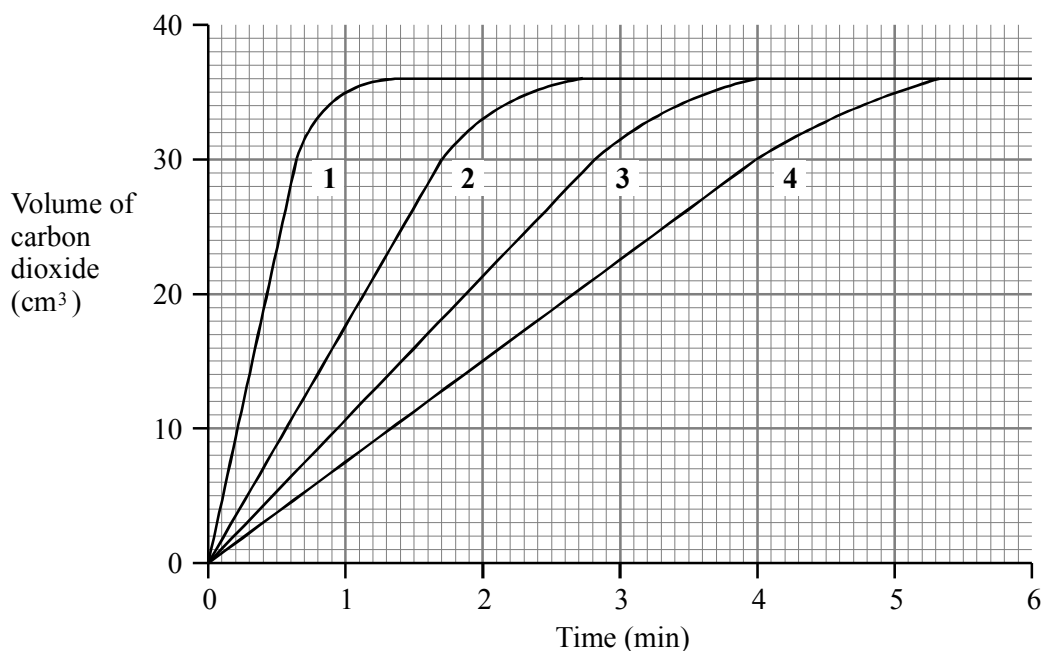
.....  
.....  
..... (2)

5. Calcium carbonate reacts with dilute hydrochloric acid as shown in the equation below.



The rate at which this reaction takes place can be studied by measuring the amount of carbon dioxide gas produced.

(a) The graph below shows the results of four experiments, 1 to 4. In each experiment everything was kept the same except the temperature of the acid. The calcium carbonate was in the form of small chips of marble.



(i) Which graph, 1 to 4, shows the results of the experiment in which the acid had the highest temperature?

Experiment .....

Explain citing two evidences for how you know.

.....  
.....  
.....  
.....

..... (3)

(ii) In experiment 2, how does the rate of reaction after one minute compare with the rate of reaction after two minutes?

.....  
..... (1)

(iii) Explain, as fully as you can, why the reaction rate changes during experiment 2.

.....  
.....  
.....  
..... (2)

(iv) Give the rate of the reaction for experiment 2 at three minutes.

..... (1)

(v) Explain why the same volume of carbon dioxide was produced in every experiment.

.....  
..... (1)

(Total 15 marks)

6. Neodymium (Nd) is a member of the group of elements known as the lanthanides. It is a silvery, white metal. It has a number of uses including making special alloys.

In the reactivity series of metals neodymium is above magnesium but below calcium. Predict how neodymium might react with each of the substances in (i) and (ii) below.

If you think a reaction will take place you should suggest **how vigorous** it might be and **name the products** that might be produced.

- (i) How might neodymium react with water?

Reaction .....

.....

Products .....

.....

- (ii) How might neodymium react with dilute hydrochloric acid?

Reaction .....

.....

Products .....

.....

(6)

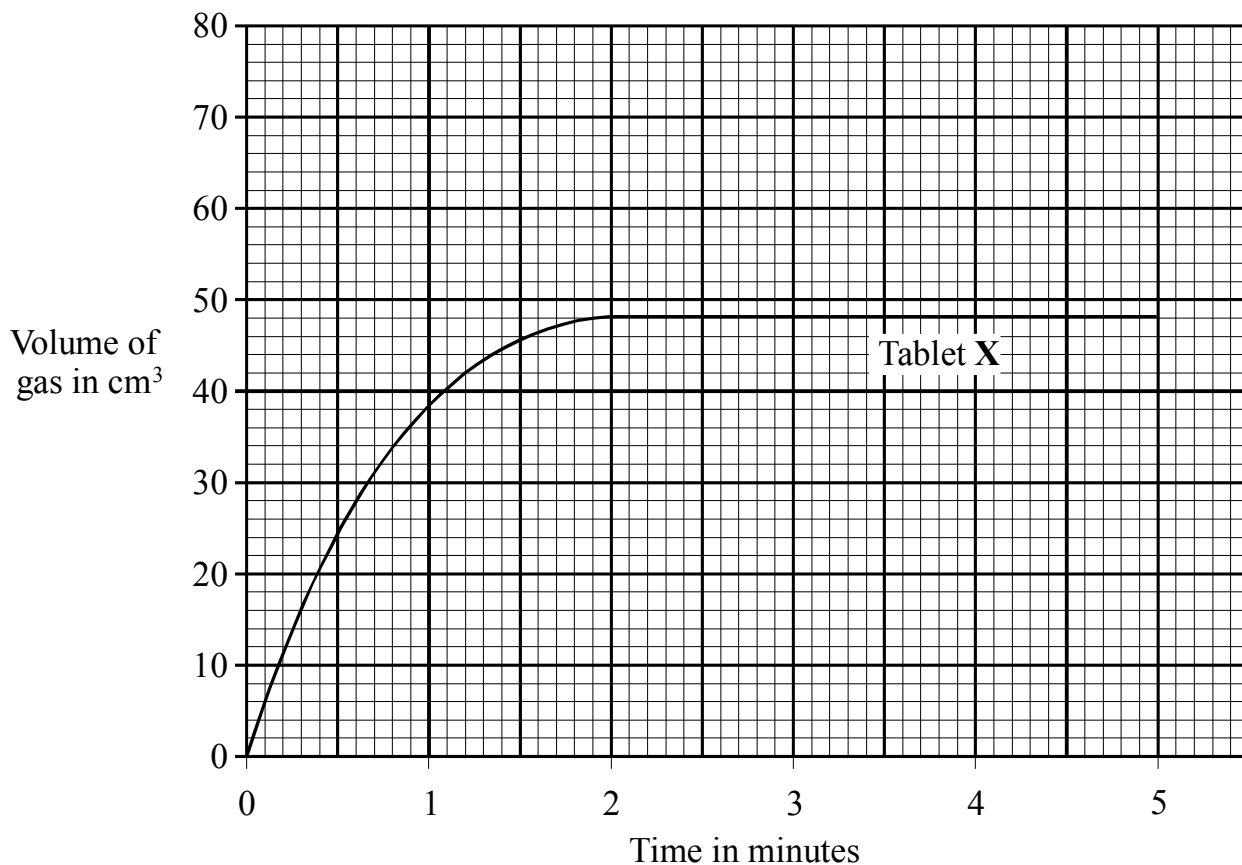
7. Indigestion tablets called antacids, containing calcium carbonate, can be taken to react with excess hydrochloric acid in the stomach.

- (a) A student investigated the rate of reaction of two different antacid tablets labelled **X** and **Y** with hydrochloric acid.

The student reacted equal masses of tablet **X** and then tablet **Y** with 100 cm<sup>3</sup> of a hydrochloric acid solution. The student measured the volume of gas produced during the first five minutes. The results are shown in the table.

<b>Time in minutes</b>	0	1	2	3	4	5
<b>Volume of gas in cm<sup>3</sup> Tablet X</b>	0	38	48	48	48	48
<b>Volume of gas in cm<sup>3</sup> Tablet Y</b>	0	31	54	67	72	72

- (i) Draw on the grid below a graph of the results for tablet **Y**. (A graph of the results for tablet **X** has been drawn for you.)



(3)

(ii) Which tablet contains less calcium carbonate? How do the results show that?

.....  
 .....

(2)

(iii) Apart from the volume of the acid and mass of tablets, state two other variables that must be kept constant to make this experiment a fair test.

.....  
 .....

(2)

(iv) Determine, using the graph above, the rate of reaction of tablet X at the **beginning** of the reaction.

.....  
 .....

(4)



(v) Draw, on the same grid, the curve that would be obtained if another analysis was carried out using ethanoic acid and tablet X keeping everything else the same. Label this curve E. Explain the shape of this curve.

.....  
.....  
.....  
..... (3)

(Total 20 marks)

END