**Chemistry: 6. Carbon Dioxide**

***Please remember to photocopy 4 pages onto one sheet by going A3→A4 and using back to back on the photocopier.***

**Syllabus**

**OC27** Prepare carbon dioxide (word equation and chemical equation), and show that it does not support combustion

**OC28** Carry out simple tests on carbon dioxide involving its reaction with limewater (word equation and chemical equation), and with moist litmus paper

**OC29** Investigate the density of carbon dioxide relative to air (qualitative only), and state two uses of carbon dioxide

 **Student Notes**

**Preparation of carbon dioxide**

**Calcium carbonate + Hydrochloric acid 🡪 Calcium Chloride + Water + Carbon Dioxide**

 (Marble chips)

 CaCO3 + 2HCl → CaCl2 + H2O + CO2

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**Procedure**

Set up as shown (calcium carbonate is the chemical name for marble chips).

1. Slowly release the hydrochloric acid into the flask underneath.
2. Carbon dioxide is collected it the gas jar

Test 1:

Pour a small volume of limewater into the jar and shake – the limewater will turn milky showing that the gas is carbon dioxide.

Test 2:

Add water to a fresh jar of carbon dioxide and test with blue litmus paper: it turns red demonstrating that it is an acid.

**Limewater and carbon dioxide**

**Limewater + carbon dioxide → calcium carbonate + water**

 Ca(OH)2 + CO2 → CaCO3 + H2O

**To show that carbon dioxide does not support combustion**

Light a wooden splint and insert it into a gas jar of carbon dioxide.

Result: the splint will extinguish showing that carbon dioxide does not support combustion.

**Carbon dioxide has a greater density than air**



**Demonstration**

Pour the gas over the candle as shown.

Because carbon dioxide is denser than air the gas sinks and extinguishes the candle.

**Uses of carbon dioxide**

1. Fizzy drinks
2. Fire extinguishers
3. Special effects on stage (dry ice in water cause a ‘smoke’ effect)

**Exam Questions**

1. [2007]

Give the chemical name for marble.

1. [2009 OL] [2007 OL]

The diagram shows an arrangement of apparatus suitable for the preparation of carbon dioxide gas in a school laboratory.

Name suitable substances X and Y from which carbon dioxide can be made.

1. [2007]
2. The diagram shows an apparatus that can be used for the preparation and collection of carbon dioxide.

Give the formula of a suitable acid.

1. What physical property of carbon dioxide allows the gas to be collected in the manner shown in the diagram?
2. [2006 OL] [2012 OL]

Name the chemical that turns milky white if carbon dioxide is bubbled through it.



1. [2008]

The liquid and solid shown in the diagram react together to produce a gas that turns limewater milky. Name a liquid and a solid that react together in this way.

1. [2006]

Carbon dioxide turns limewater milky.

Complete the chemical equation for the reaction of carbon dioxide with limewater.

Ca(OH)2 + CO2 →

1. [2007]

If a strip of moist blue litmus paper and a strip of moist red litmus paper are put into a jar of carbon dioxide what effect, if any, does the gas have on them?

1. [2009]

Carbon was burned in oxygen and the products tested with pieces of moist red and blue litmus paper.

Give the result of the litmus test described above and make a conclusion based on this result.

1. [2006 OL]

The diagram shows a gas jar of carbon dioxide gas being poured onto a lighting candle.

* 1. What happens to the lighting candle when the carbon dioxide gas is poured over it?
	2. This test demonstrates two properties of carbon dioxide gas. List the two properties.
1. [2007][2009]

Give two uses of carbon dioxide.

**Exam Solutions**

1. Calcium carbonate
2. X: Hydrochloric acid

Y: Calcium Carbonate (CaCO3) / limestone / marble chips / chalk

1. HCl
2. It is denser (heavier) than air
3. Limewater
4. Liquid: hydrochloric acid (HCl)

Solid: marble/ calcium carbonate/ CaCO3)/ bread soda/ sodium hydrogen carbonate (sodium bicarbonate)…

1. Ca(OH)2 + CO2 → CaCO3 + H2O
2. Both pieces of litmus paper will be red (or pink)
3. The blue litmus paper turns red

Conclusion: The product is acidic.

1.
2. Quenches
3. Carbon dioxide doesn’t support combustion and is heavier than air
4. Fire extinguishers/ fizzy drinks/ photosynthesis/ ‘dry ice’/ ‘stage effects’…

**Other Test Questions**

1. Describe a laboratory experiment to prepare carbon dioxide
2. Give the word equation for this reaction.
3. Give the chemical equation for this reaction.

1. How would you demonstrate that carbon dioxide does not support combustion?
2. Describe how you would carry out a simple test to demonstrate the reaction between carbon and moist litmus paper.
3. Describe how you would investigate the density of carbon dioxide relative to air.
4. Give the formula for limewater.
5. Identify the milky-white precipitate formed from the reaction between limewater and carbon dioxide.
6. Name a suitable liquid and solid that could be used for the preparation of carbon dioxide.
7. Give a test for carbon dioxide gas
8. Complete and balance the following chemical equation for the reaction between limewater and carbon dioxide:

Ca(OH)2 + CO2 +

1. Complete and balance the following equation:

HCl + CaCO3 + +