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NATURAL SCIENCES: PLANNING & PREPARATION



GRADE	8	TERM	1	KNOWLEDGE STRAND	LIFE AND LIVING
TEACHERS	DATE: Term 1 Week 1 & Week 2 2021				
	Topic / Content / Concepts / Skills (WHAT I am going to teach/guide/support...)		Teaching Methodologies & Classroom Management (HOW I am going to teach/guide/support...)		Resources / LTSM (WHAT I am going to use to teach/guide/support...)
	LIFE & LIVING Topic: Photosynthesis and Respiration Content and Concepts: - Photosynthesis - Respiration Energy is needed to sustain life and without it nothing would be able to live on Earth. Our most important source of energy is the Sun. Most organisms cannot directly use the energy from the sun to perform the life processes. We are going to investigate the processes involved in transferring the Sun's energy (radiant energy) to our bodies. The two important processes that we will be investigating is <i>photosynthesis</i> and <i>respiration</i>. All living organisms can use energy in the form of chemical potential energy for the life processes. This is the energy that is stored in the food that organisms eat. Plants can capture the radiant energy from the Sun and transfer it to chemical potential (stored) energy for other organisms to use. They do this through the process of photosynthesis. All organisms release the stored potential energy from the food that they eat to support their life processes. This process is called respiration.		Focus for this Lesson: Discuss the photosynthesis and respiration processes. Expose learners to practical examples of photosynthesis and respiration. Key concepts - The need for energy drives the interactions and interdependence in an ecosystem. - The Sun provides energy to the Earth in the form of radiant (light) energy and heat energy. - Photosynthesis is the process whereby green plants use carbon dioxide from the air, water from the soil and radiant energy from the Sun in a series of chemical reactions to produce glucose (food) and oxygen. - Plants can photosynthesize because they contain chlorophyll, a green pigment that can capture light energy from the Sun.		Laboratory Equipment: goggles, test tubes, small beakers (or test tubes), rubber tubes or drinking straws, 20 ml syringe (or larger if available), Bunsen Burner Materials: green leaves, iodine solution, ethanol, lime water, drinking straws, white tile Natural Sciences Textbooks/ Siyavula Workbooks (Pages: 4-25) Laptop / tablets / smart phones, etc. Links to Natural Sciences Siyavula Grade 7-9 Workbooks: http://www.mstworkbooks.co.za/ Natural Sciences: http://www.mstworkbooks.co.za/natural-sciences/natural-sciences.html

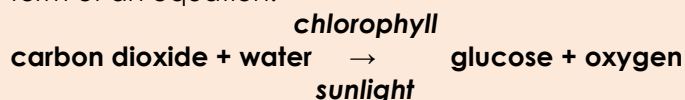
GRADE 8 NATURAL SCIENCES DRAFT LESSON PLAN: PHOTOSYNTHESIS AND RESPIRATION

Photosynthesis

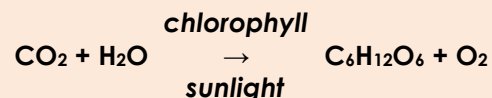
Photosynthesis takes place in small structures called **chloroplasts**, which are inside the cells of the **leaves** and stems of green plants. Inside the chloroplasts are green pigments called **chlorophyll**. This is what gives plants their green colour. Photosynthesis is **the process in which chlorophyll molecules absorb the radiant energy from the sun and transfers it into chemical potential energy**. The only function of chlorophyll is to trap the sunlight energy; chlorophyll is not produced or used up during photosynthesis.

Plants use radiant energy from the Sun in a series of chemical reactions to change **carbon dioxide** from the **air** and **water** from the **soil** into **glucose**. The process releases **oxygen**.

The process of photosynthesis can be presented in the form of an equation:



Or



The glucose that a plant produces when it photosynthesises is the food for the plant. The plant can use this glucose directly and release the energy during its own respiration or it can store the glucose or convert it into other chemical compounds.

Glucose is soluble in water. To store large amounts of glucose, plants need to convert it into compounds which are insoluble in water. Therefore, the plant converts **glucose into starch**, which is insoluble in water. In

- Plants change the glucose that they produce into starch that can be stored more easily.
- Plants also produce cellulose fibres that give plants strength and support and are important to our digestive systems.
- The food that a plant produces is used by animals when they eat the plant and by other animals that eat them.
- This food contains chemical potential energy that needs to be released from the food.
- Respiration is the process in all living organisms by which energy is released from glucose in a series of chemical reactions.
- Respiration uses oxygen while carbon dioxide and water are given off as by-products.

Support from teacher:

- Engage the learners in doing science to consolidate the practical application of what they have already learned.
- Print the Worksheet for the learners.
- Provide guidance regarding handling of apparatus safety and following instructions during the teacher demonstrations.

Natural Sciences:

<https://www.siyavulaeducation.com/work-oer.html>

	addition to starch, plants also convert glucose into cellulose. Cellulose is used to support and strengthen plants. Glucose is also converted into other chemical compounds that enable processes in the plant such as reproduction and growth. We have learnt that plants produce glucose during photosynthesis and store this in the form of starch. Therefore, to see if a plant photosynthesises, we can test to see if the plant produced starch. Iodine changes from brownish-orange to dark blue-black when it comes into contact with starch. Respiration The energy that our bodies need to move and do work is obtained from the food that we and all other organisms eat. The glucose from the food that we eat is combined with oxygen in a series of chemical reactions to release the energy. The glucose is broken down and the energy is released. This energy is then used to drive all the other processes in your body. This process is called respiration. We can define respiration in all living organisms as <i>the process by which energy is released from glucose in a series of chemical reactions.</i> Respiration produce energy, water and carbon dioxide. We can write an equation for respiration as follows: glucose + oxygen → carbon dioxide + water + energy $\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{energy}$ The carbon dioxide that is produced in the body of an organism during respiration needs to be removed. In humans, we do this by breathing out carbon dioxide-rich air. We can test for the products of respiration using our own breath. To test if a gas contains carbon dioxide, simply	• Guide learners on Activities in Siyavula Explore; Grade 8 A Workbook pg. 4 – 25 that should be completed for consolidation) • Focus learners' attention on the Information given on the provided worksheet below.	
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	bubble the gas through clear limewater. If the clear limewater turns milky, then the gas contains carbon dioxide.		
PARENTS 	Parents would teach similar concepts to what teachers would teach, as indicated above – this could be a repeat of the teacher's lesson	Tips to parents: Learners are provided with information that is followed by activities. The information and activities are designed in such a way that parents should not need to explain any of the content. Should a learner struggle to understand content, a parent can support in the following ways. • Ask the learner to read the information provided out loud or explain to you the given information in their own words. • If they are still stuck, ask them to formulate a proper question or statement to explain what they are stuck with. • If they have contact with a teacher, encourage them to post the question. If not, help them to write down the question in a workbook so that they can follow up later. • Monitor that all worksheet questions are answered by learners.	Laboratory Equipment: goggles, test tubes, small beakers (or test tubes), rubber tubes or drinking straws, 20 ml syringe (or larger if available), Bunsen burner Materials: green leaves, iodine solution, ethanol, lime water, drinking straws, white tile Natural Sciences Textbooks/ Siyavula Workbooks (Pages: 4 - 25) <u>Access to:</u> • Science journal / Workbook /writing pad, pencils, laptop / tablets / smart phones • Data
LEARNERS' ACTIVITIES 	Learner Activities: Learner information is provided in the worksheet below.		
Informal Assessment	Activities and memos are provided in the worksheets below.		

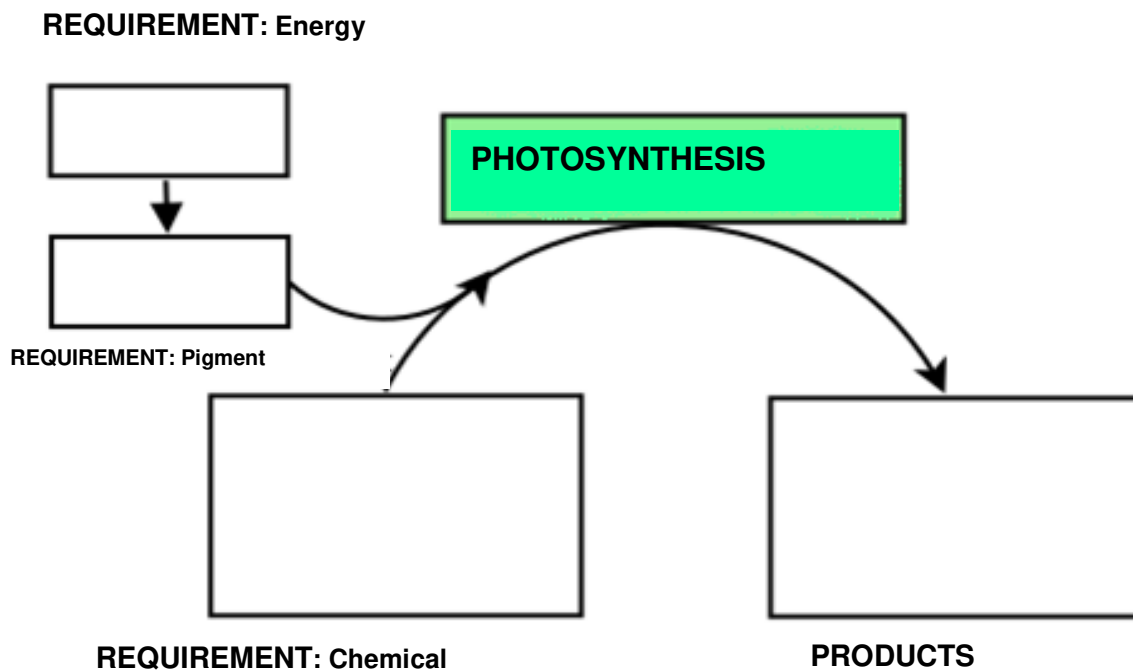
Photosynthesis and Respiration Consolidation Activity

QUESTION 1

a) Requirements and products of photosynthesis

INSTRUCTIONS:

1. Summarise what you have learnt about photosynthesis in the diagram below.
2. Fill in the requirements of photosynthesis in the block on the left and fill in what type of energy is needed and the name of the pigment that absorbs the energy.
3. Fill in the products of photosynthesis in the block on the right.

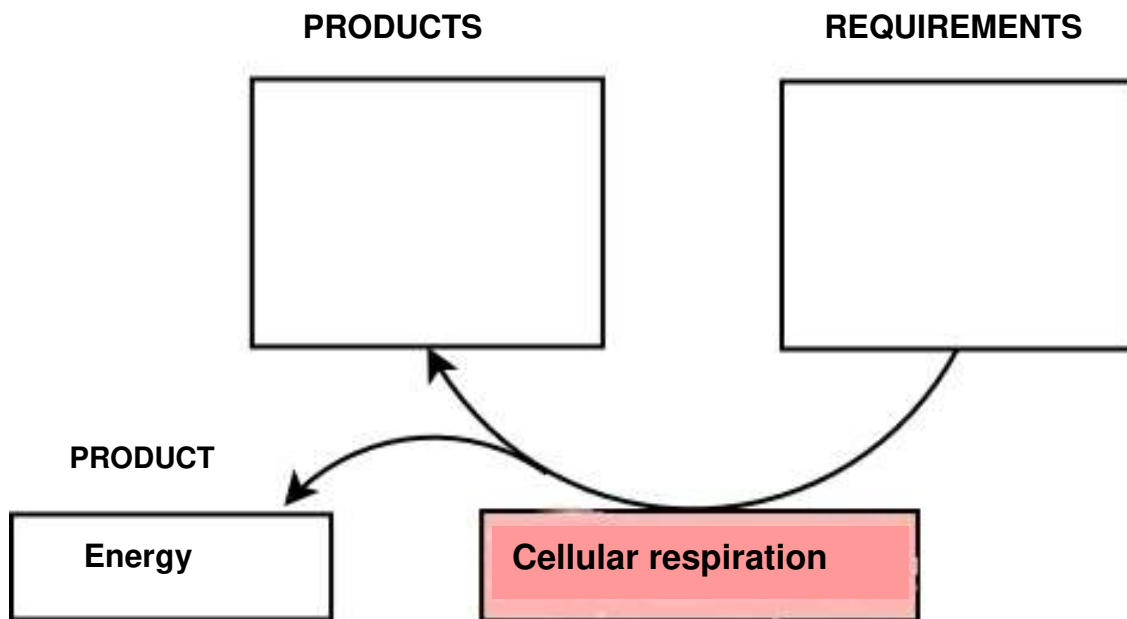


(4)

b) Requirements and products of cellular respiration

INSTRUCTIONS:

1. Summarise what you have learnt about cellular respiration in the summary diagram below.
2. Fill in the requirements of cellular respiration in the block on the right.
3. Fill in the products of cellular respiration in the block on the left.



(2)
[6]

QUESTION 2

Choose the correct term in **Column B** which match **Column A**. Only write the correct letter in your answer book (e.g. 2.9. J)

COLUMN A	COLUMN B
2.1 The green pigment in leaves required for photosynthesis.	A. glucose
2.2 The energy of the sun absorbed by plants.	B. starch
2.3 The gas required for photosynthesis.	C. oxygen
2.4 The substance that is absorbed by the roots and transported to the leaves.	D. CO ₂
2.5 The gas released during photosynthesis.	E. water
2.6 The part of the plant in which photosynthesis takes place.	F. chlorophyll
2.7 The food produced during photosynthesis.	G. radiant energy
2.8 The form in which the food is stored in a plant.	H. leaves

[8]

QUESTION 3

3.1 What is the reaction for photosynthesis?

- A. light + water $\rightarrow$ starch + O₂
- B. CO₂ + light + water $\rightarrow$ starch + O₂
- C. light + water $\rightarrow$ starch + CO₂
- D. CO₂ + light $\rightarrow$ starch + O₂ (2)

3.2 The process of making food in a plant is called ...

- A. Transpiration
- B. Respiration
- C. Photosynthesis
- D. Fertilisation (2)

3.3 Which of these is not needed to make food in a plant?

- A. Flowers
- B. Sunlight
- C. Carbon dioxide
- D. Chlorophyll (2)

3.4 What by-product do animals use which is produced during photosynthesis?

- A. Carbon dioxide
- B. Water
- C. Chlorophyll
- D. Oxygen (2)

3.5 What do animals and humans breathe out?

- A. Water
- B. Carbon dioxide
- C. Oxygen
- D. Chlorophyll (2)

3.6 Where does the energy for photosynthesis come from?

- A. The air
- B. Water
- C. The Sun
- D. None of the above (2)

3.7 What plant pigments are involved in photosynthesis?

- A. Chlorophyll
- B. Chloroform
- C. Chlorine
- D. Chloroplast (2)

3.8 What is given off during cellular respiration?

- A. Carbon dioxide
- B. Oxygen
- C. Water
- D. Water, carbon dioxide and energy (2)

3.9 In what form is sugar stored in plant cells during photosynthesis?

- A. As glucose
- B. As starch
- C. As water
- D. Plants can't store sugar (2)

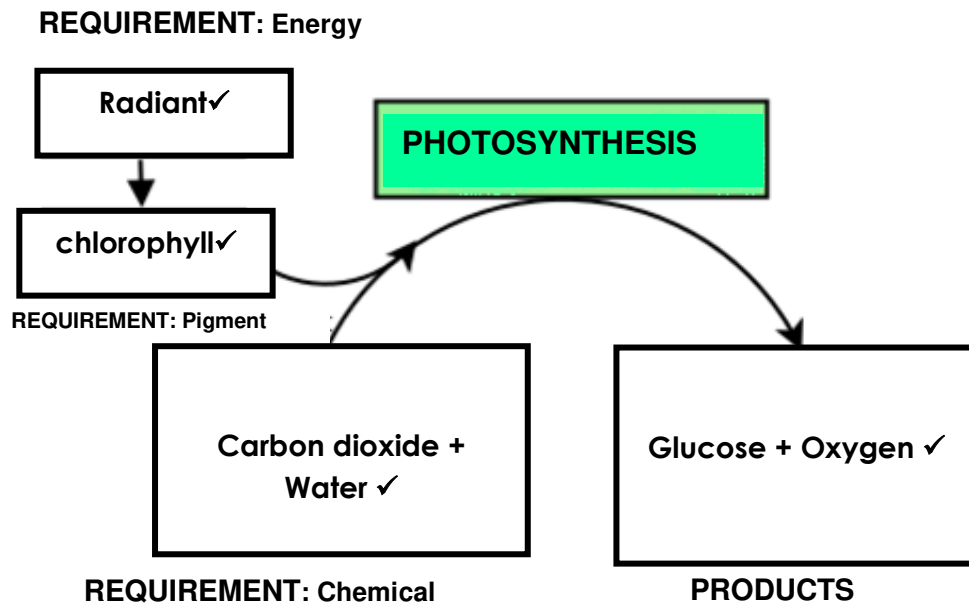
3.10 What energy conversion occurs during photosynthesis?

- A. Light energy to kinetic energy
 - B. Chemical energy to light energy
 - C. Light energy to chemical energy
 - D. None of the above (2)
- [20]**

Photosynthesis and Cellular Respiration Consolidation Activity - Marking Guideline

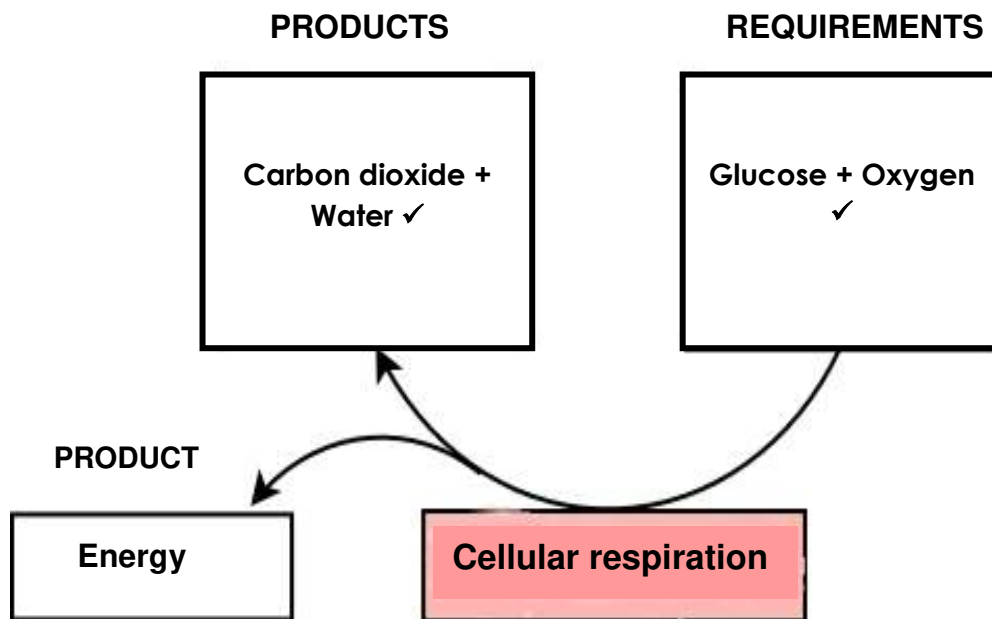
QUESTION 1

a)



(4)

b)

(2)
[6]QUESTION 2

- 2.1 F ✓
 2.2 G ✓
 2.3 D ✓
 2.4 E ✓
 2.5 C ✓
 2.6 H ✓
 2.7 A ✓

2.8 B ✓

[8]**QUESTION 3**

3.1	B ✓✓	(2)
3.2	C ✓✓	(2)
3.3	A ✓✓	(2)
3.4	D ✓✓	(2)
3.5	B ✓✓	(2)
3.6	C ✓✓	(2)
3.7	A ✓✓	(2)
3.8	D ✓✓	(2)
3.9	B ✓✓	(2)
3.10	C ✓✓	(2)
		[20]

DEMONSTRATION: Photosynthesis in green leaves**Background information**

During photosynthesis a plant absorbs light energy using the pigment chlorophyll. This allows it to convert carbon dioxide and water into glucose.

This glucose is:

- transported to the growing parts of the plant for use in respiration
- transformed into cellulose, proteins and oils
- turned into starch for storage

Therefore, to test if a plant has been photosynthesising, you can test the leaf to see if starch is present. Iodine solution is used to test leaves for the presence of starch.

Investigative Question

Does green leaves produce starch during photosynthesis?

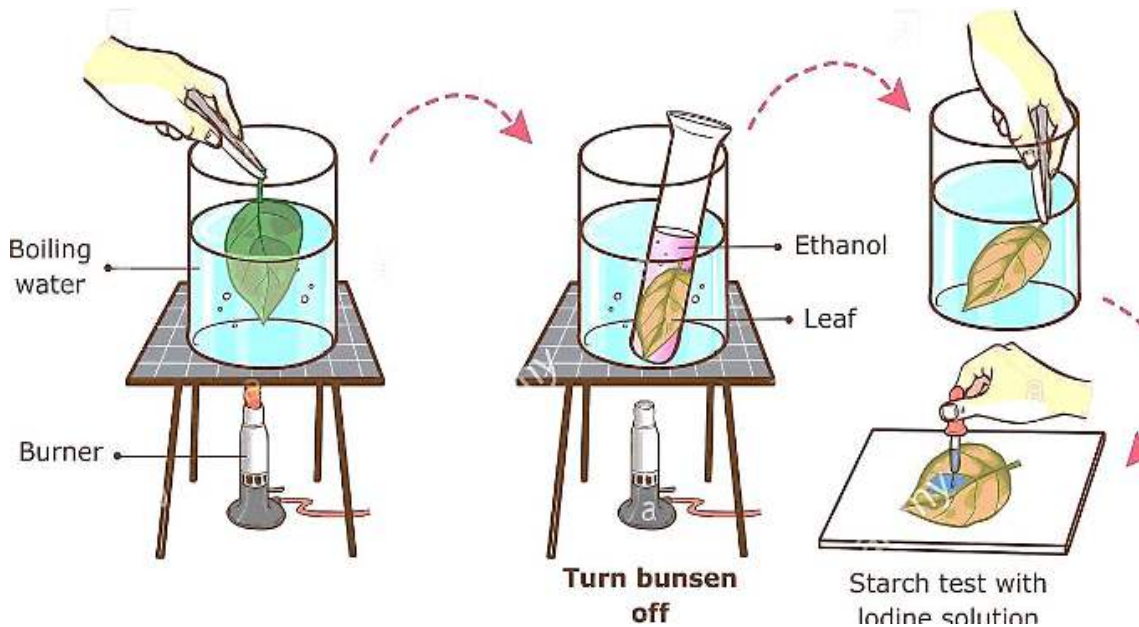
MATERIALS

- small beakers
- rubber tubes or drinking straws
- boiling water
- Bunsen burner
- 20 ml syringe (or larger if available)

INSTRUCTIONS:

You need to:

1. heat a green plant leaf in boiling water for 30 seconds
2. add the leaf to boiling ethanol in a water bath for a few minutes
3. wash with water to rehydrate and soften the leaf and spread onto a white tile
4. add iodine solution from a dropping pipette
5. After a few minutes, observe if a colour change occurs.



QUESTIONS

1. Why do you need to boil the plant leave in water? (1)
2. Describe what happens when the leaf is boiled in the ethanol. (3)
3. Explain why ethanol is heated using a hot water bath instead of using a Bunsen burner. (1)
4. Explain why it is needed to wash the leaf with water after it has been removed from the ethanol. (2)
5. When iodine solution is added to the leaf a colour change is observed. Describe the colour change. (2)
6. Write a conclusion for this investigation. (1)

[10]

POSSIBLE SOLUTIONS

1. This kills the leaf, stopping any chemical reactions✓ (1)
2. The boiling ethanol dissolves the chlorophyll ✓and removes the green colour✓ from the leaf - it turns white ✓so it is easy to see the change in colour (3)
3. Ethanol is flammable and so is heated using a hot water bath instead of using a Bunsen burner. Because ethanol boils at 78°C, a tube of it boils when placed in a beaker of hot water.✓ (1)
4. Wash with water to rehydrate ✓and soften the leaf✓ (2)
5. The parts of the leaf that contain starch turn the iodine from brown ✓to blue/black✓ (2)
6. Green plant leaves contain starch (glucose)✓ (1)

[9]

DEMONSTRATION: Cellular Respiration**Investigative Question**

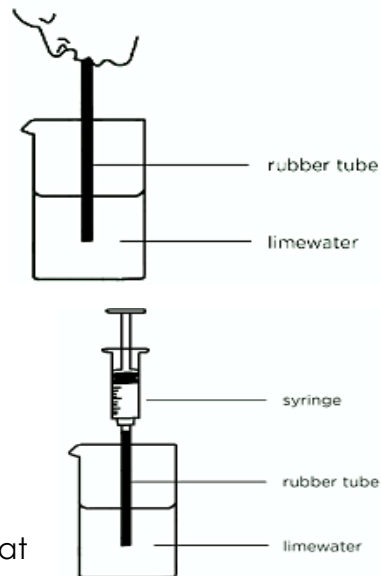
Does our breath contain carbon dioxide?

MATERIALS

- small beakers (or test tubes)
- rubber tubes or drinking straws
- limewater
- 20 ml syringe (or larger if available)

INSTRUCTIONS:

1. Work in groups of three.
2. Mark one beaker AIR and the other BREATH.
3. Pour clear limewater into each beaker until they are half full.
4. Blow bubbles through the rubber tube into the beaker marked BREATH, as shown in the diagram. Do this for at least 1 minute. Notice what happens to the clear limewater.
5. Attach a rubber tube to the front of a syringe. Draw air into the syringe from the atmosphere.
6. Place this rubber tube into the beaker marked AIR and push out the air inside the syringe slowly and carefully into the limewater as shown in the diagram. Notice what happens to the clear limewater.

**QUESTIONS**

1. Describe what you observed when you blew air from your lungs through the limewater. What does this mean? (1)
2. Describe what you observed when you used the syringe to bubble air from the atmosphere through clear limewater. (1)
3. A very small percentage of atmospheric air is carbon dioxide gas (0.03). Why do you think you observed the result you did when you pushed air from the atmosphere through the limewater? (2)
4. Think about respiration.
 - a) What are the requirements for respiration? (2)
 - b) What are the products of respiration? (2)

[6]**POSSIBLE SOLUTIONS**

1. The clear limewater turned cloudy white. This means our breath contains carbon dioxide from cellular respiration. (1)
2. The clear limewater did not change and remained clear. Some might notice a very slight change, which indicates that there is a small amount of carbon dioxide present in atmospheric air. (1)
3. As air contains such a small percentage of carbon dioxide, there is not enough to cause a noticeable difference in the limewater. Air from your lungs contains a much higher percentage of carbon dioxide from respiration and so this is able to turn the limewater cloudy in a shorter time than atmospheric air will. (2)
4.
 - a) Glucose and oxygen.
 - b) Energy, carbon dioxide and water. (2)

[6]