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TEACHERS WITHOUT BORDERS PROGRAMME

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In Bill Gates words, at the Mandela Day 'Living Together' address: "Maintaining the quality of this country's higher education system while expanding access to more students will not be easy. But it's critical to South Africa's future" – working together, we can help achieve this."

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Small school. Big heart.

GRADE 10 **LIFE SCIENCES** **JUNE 2019**

NAME:

EXAMINER: M. GREYLING **MODERATOR: B. WILLOWS**

TIME: $2^{1/2}$ Hours + 10 Mins Reading Time **TOTAL: 150**

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. Write your name in the block above
2. Answer **QUESTION 1** on the question paper and **QUESTIONS 2-5** on the folio paper provided. **QUESTION 1** is in the yellow booklet (pages 1-7) and **QUESTIONS 2-5** are in the white booklet (pages 8-21). Check that you have the correct number of pages.
3. You have ten minutes to read through this examination paper before you begin. You are advised to read carefully and spend time planning your work.
4. Number your answers exactly as the questions are numbered.
5. It is in your own interest to write legibly and to present your work neatly.
6. Use the total marks which can be awarded to each question as an indication of the amount of detail required.
7. Calculators may be used where required.

THEORY PAPER	PRACTICAL	TOTAL	%
150	50	200	

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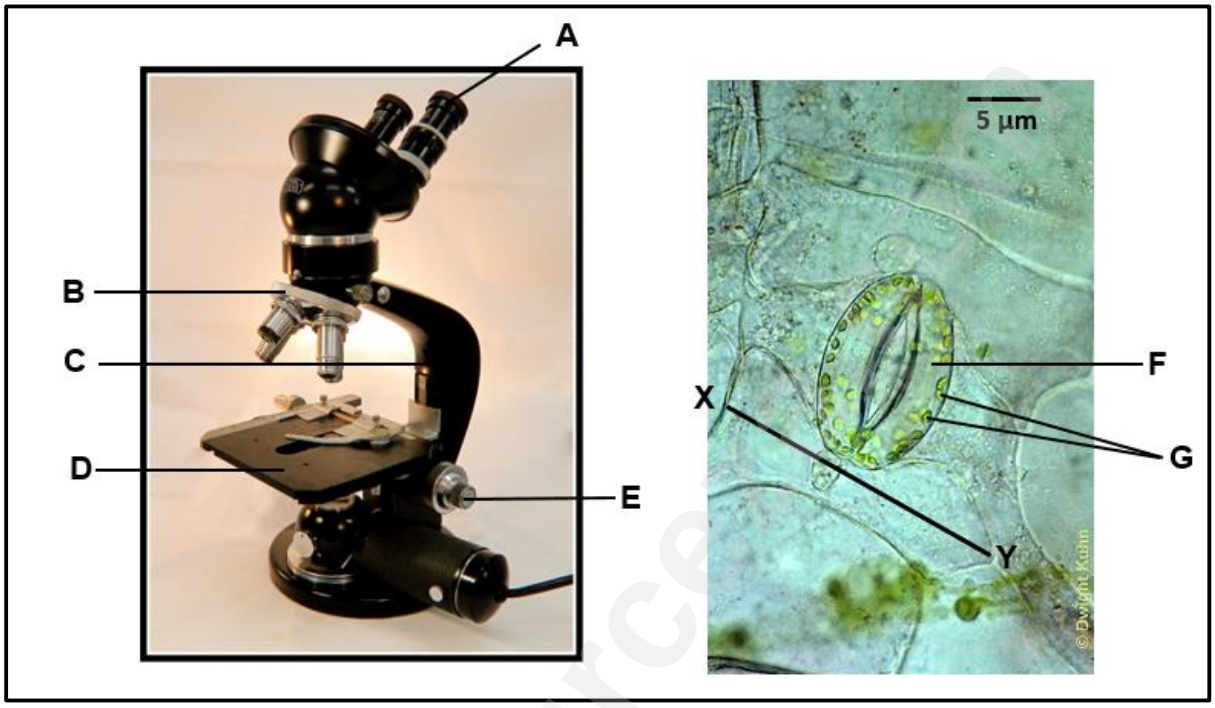
QUESTION 2

2.1 Study the images below showing a microscope similar to one you have used in the lab and, alongside, a micrograph showing cells from the lower epidermis of a leaf as seen through the microscope on its highest power.



2.1.1 Identify the microscope shown above. (1)

2.1.2 Provide ONE precaution that must be taken when viewing a specimen under high power. (1)

2.1.3 Give the LETTER and NAME of the part which holds the objective lenses in place. (2)

2.1.4 Provide ONE advantage of this microscope over the other microscopes you have learnt about. (1)

2.1.5 Identify the cell labelled **F**. (1)

2.1.6 Identify the organelles labelled **G**. (1)

2.1.7 Discuss the significance of the pore shown in the micrograph for the process of photosynthesis. (4)

2.1.8 Use the scale line on the micrograph to calculate the actual size of the cell along the line **X** to **Y**. (3)

2.1.9 Provide ONE precaution that would have been taken when preparing the wet mount slide of the tissue in the micrograph. (1)

[15]

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Scientists Working With Mice Just Discovered How Cells Can Stop The Spread of Cancer

DAVID NIELD (8 MAY 2019) - Adapted

One of the biggest challenges in fighting cancer is stopping metastasis – preventing tumour cells from spreading through the body. Now scientists have identified a promising new way of blocking this growth, and it has shown positive results in mice.

A team of researchers in Switzerland have found a "barrier" that stops cancer from metastasising. It is built by a protein called Activin B and a receptor called ALK7 - the combo appears to play a crucial role in stopping tumours in their tracks.

The results of their research so far show that Activin B and ALK7 create a signalling pathway that causes cancer cells to naturally kill themselves off (apoptosis), and prevents tumours from forming (tumorigenesis) and spreading.

While the bulk of the tests so far have only been carried out in mice, we share enough biological and chemical similarities with the furry rodents, especially when it comes to how cancer develops - hence this barrier could be a promising target for cancer-fighting drugs in the future.

2.2.1 From your own knowledge describe what is meant by the term "metastasis". (2)

2.2.2 What components make up the barrier that is said to stop the spreading of tumours? (1)

2.2.3 Name four elements that would make up Activin B. (1)

2.2.4 Give ONE advantage and ONE disadvantage of the use of mice as the test subjects in the trials mentioned in the passage. (2)

[6]

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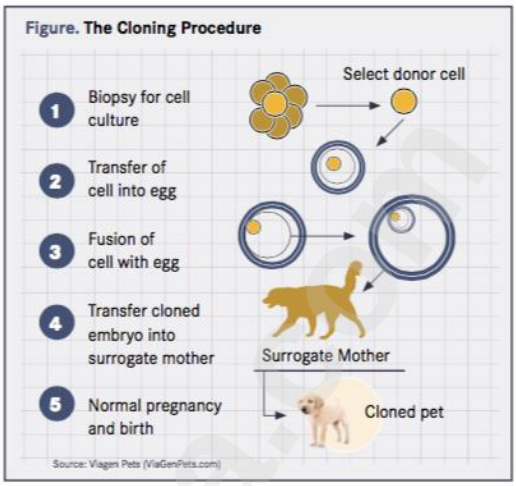
puppies for sale. The puppies are clones of a dog called Missy, which died in 2011. The genetic material was removed from Missy before she died. The puppies will be auctioned, with the bidding starting at R 884 000.

The pictures below show the three puppies as well as the process of cloning.



2.3.1 What is cloning? (2)

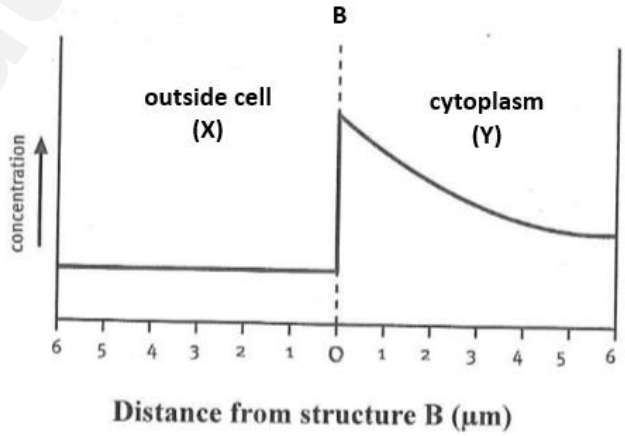
2.3.2 Will the puppies be identical to Missy in every way when they are fully grown? Give a reason for your answer. (2)

2.3.3 Suggest ONE place from where the "biopsy for cell culture" would have been taken from during the cloning of Missy. (1)

2.3.4 Suggest ONE reason why the biotechnology company wants people to pay so much money for these puppies. (1)

[6]

2.4 The graph below shows the concentration of a substance inside and outside an animal cell.



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2.4.2 If free to move by diffusion, in which direction would the substance move, from **X** to **Y** or **Y** to **X**? (1)

2.4.3 What property of structure B does NOT allow the substance to move freely by diffusion? (1)

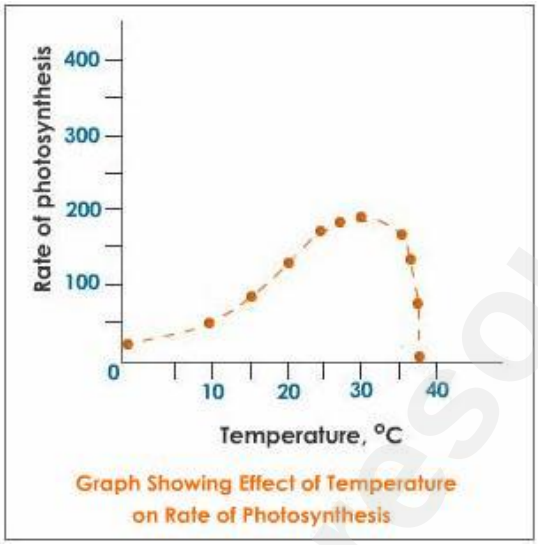
[3]

{30}

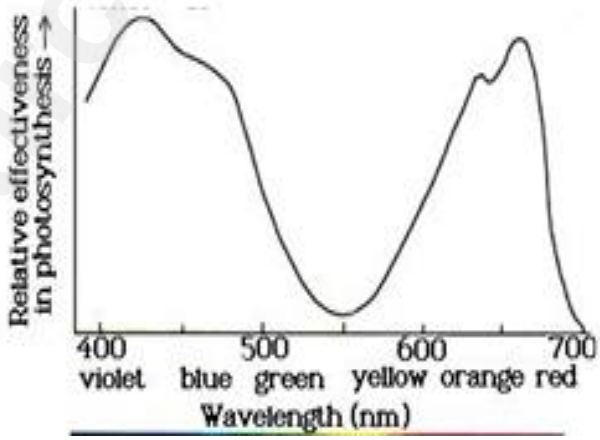
QUESTION 3

3.1 The following graphs show the results of two investigations into the rate of photosynthesis at different temperatures (**A**) and the effectiveness of photosynthesis in the presence of different light wavelengths (**B**).

A



B



3.1.1 Write a hypothesis for investigation **B**. (2)

3.1.2 Describe the optimum conditions for photosynthesis by using figures from the graphs above. (2)

3.1.3 Draw a labelled diagram of the organelle in which photosynthesis takes place. Include at least 4 labels. (7)

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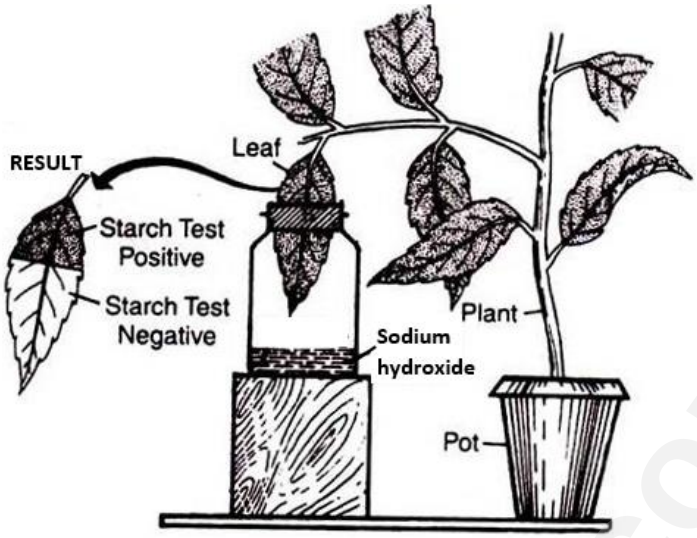


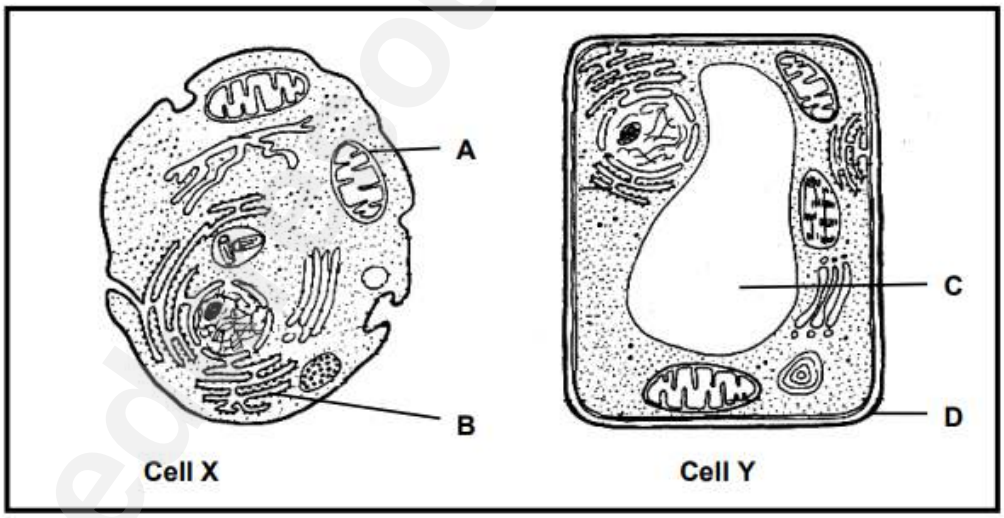
3.2.1 Give the aim of the investigation. (2)

3.2.2 What is the purpose of the sodium hydroxide? (1)

3.2.3 Before any investigation into photosynthesis is carried out, the plant should be kept in a dark cupboard for 24 – 48 hours. Explain the purpose of this step. (2)

[5]

3.3 Study the diagrams below representing two cells and their organelles



3.3.1 Label parts **A** and **B**. (2)

3.3.2 Structure **C** plays an important role in cell **Y**, one of which is support. Explain how structure C provides support for cell **Y**. (2)

[4]

{20}

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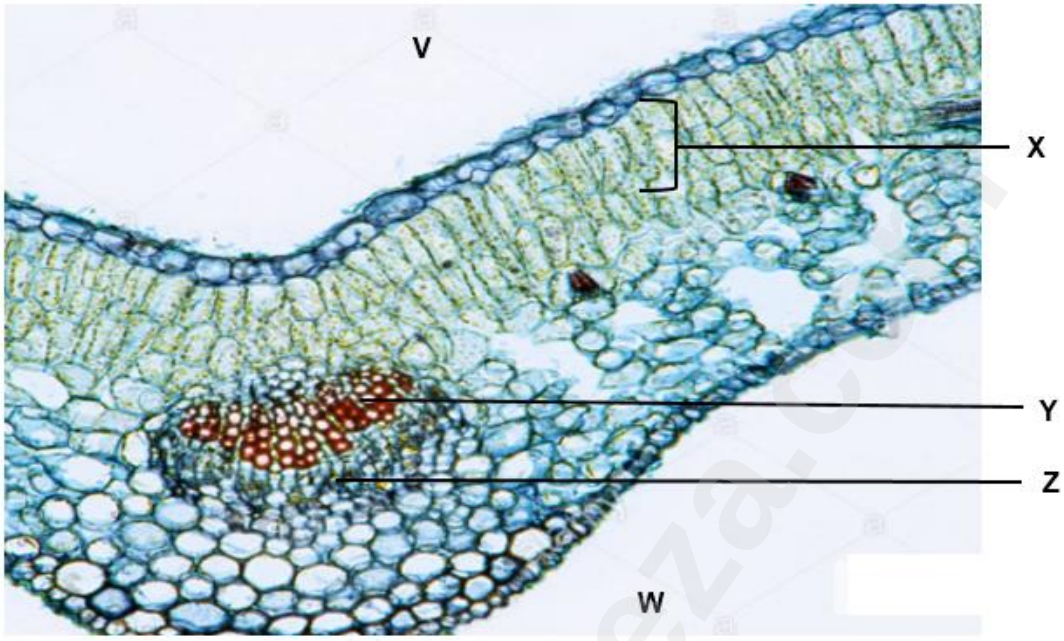
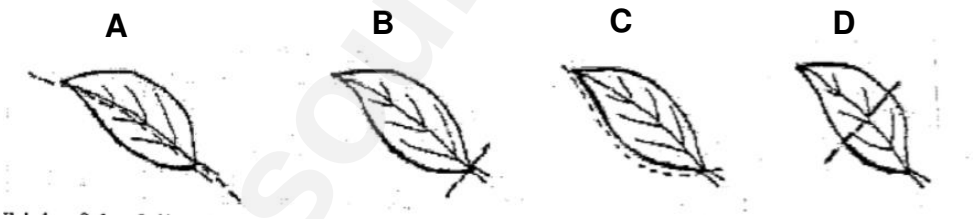
4.1 Study the micrograph below showing a portion of a cross section through a dicotyledonous leaf and answer the questions that follow.



4.1.1 Which dotted line below (**A** – **D**) shows the correct plane in which this leaf was sectioned?



(1)

4.1.2 The layer labelled **X** is the palisade mesophyll layer. Give TWO ways in which the cells in this layer are structurally suited to their function of photosynthesis. (2)

4.1.3 The tissue labelled **Y** is xylem tissue. Use ONE visible feature from the micrograph to explain how the xylem vessel is suited to its function of water transportation. (1)

4.1.4 Name the tissue labelled **Z** and name TWO cells of which this tissue is composed. (3)

4.1.5 Which surface (**V** or **W**) is the abaxial surface of the leaf? Provide a visible reason for your answer. (2)

4.1.6 Provide ONE way in which the leaf reduces water loss. (1)

[10]

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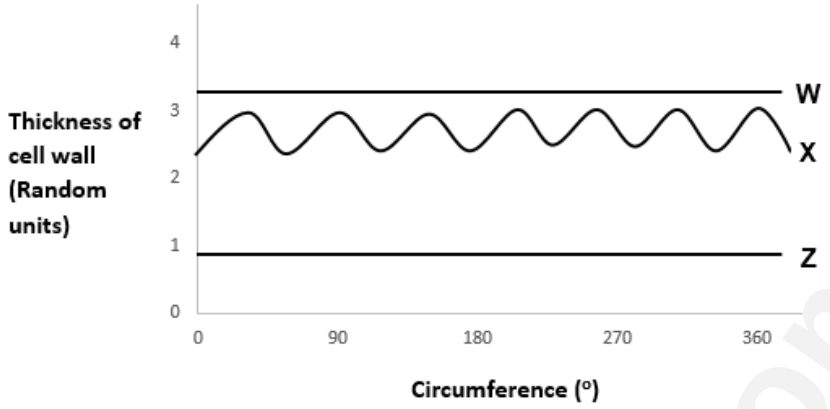
different types of plant cells (circumference = 360° around the edge of the plant cell.)



4.2.1 Which line **W, X** or **Z** would represent the wall of a cell from each of the following tissues a), b) or c)? In each case, briefly explain your answer.

a) Sclerenchyma (2)

b) Parenchyma (2)

c) Collenchyma (2)

[6]

4.3 The root length of a germinating kidney bean seed was measured every two days. The results are shown in the table below.

Time (days)	Root length (mm)
0	0
2	4
4	8
6	18
8	27

4.3.1 Between which two days was there the greatest increase in length? (1)

4.3.2 Which tissue is responsible for the increase in length of the root? (1)

4.3.3 Give ONE structural feature of the tissue mentioned in Question 4.3.2. (1)

4.3.4 Name ONE other place in the plant where the tissue mentioned in Question 4.3.2 would be found. (1)

[4]

{20}

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QUESTION 5

The Banting Diet proposes that people should eat a very low amount of carbohydrates in their diet, and increase their protein and fat intake. If a person were to follow this diet, they would have to carefully consider which type of carbohydrates that they would be able to eat in order to adhere to the low carbohydrate intake suggested for this diet.

With reference to the suggestion made by the Banting Diet, would it be advisable for people to remove carbohydrates from their diet?

Using the source material (Sources A-H) provided, as well as your own knowledge, discuss your opinion on the above statement in the form of a 2½–3-page essay.

To answer this question, you are expected to:

• Read the source material carefully and present a debated argument to illustrate your point of view.
• Select relevant information from sources A to H.
• It is important to integrate your own relevant biological knowledge.
• Take a definite stand on the question and arrange the information to best develop your argument.
• Write in a way that is scientifically appropriate and communicates your point of view clearly.
• Provide a clear plan of your essay before you start writing. Note that the plan will be marked as part of the assessment of this question. **[40]**

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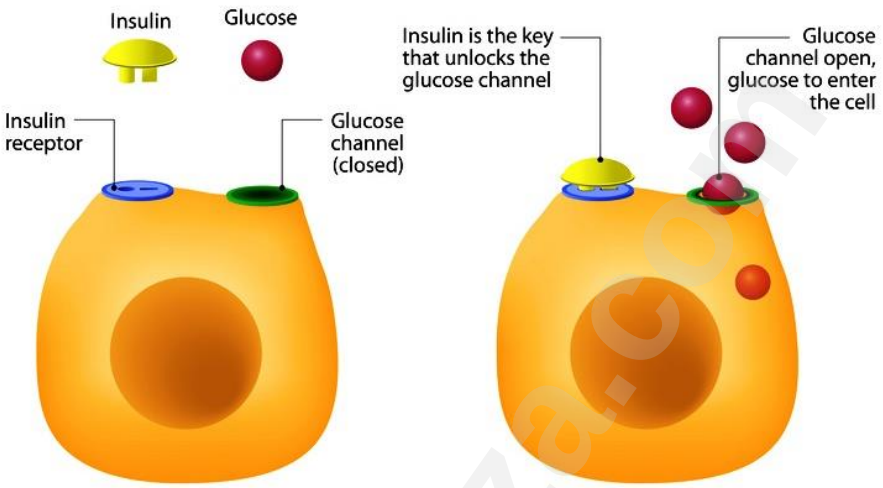
CELLS TO BE USED FOR ENERGY

Insulin helps control blood glucose levels by signalling the cells to take in glucose from the blood. Insulin therefore helps cells to take in glucose to be used for energy. If the body has sufficient energy, insulin signals the liver to take up glucose and store it as glycogen. *http://diabeteslibrary.org/function-of-insulin/*



SOURCE B OVER-EATING CARBOHYDRATES LEADS TO INSULIN-RESISTANCE

Over-eating carbohydrates will lead to body cells resisting the action of insulin, therefore leaving the glucose in the bloodstream to be stored as fat and to not be available for energy in the cells. The symptoms are fatigue, hunger and obesity.
https://www.dietdoctor.com/why-insulin-resistance-is-bad

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https://www.slideshare.net/JustForHearts/good-carbohydrates-vs-bad-carbohydrates

SOURCE D **THE GOOD, THE BAD AND THE BETTER**

Some complex carbs are more beneficial than others. Whole grains are not only more nutritious, they are digested more slowly and are less likely to cause a rush of glucose. White flour and white rice are complex carbs, but during processing, have had all the fibrous goodies stripped out. And while French fries are made from nutritious potato, deep-frying it in oil sabotages any health benefits.

Keep these tips in mind when consuming carbohydrates:

- Skip refined and processed foods altogether.
- Read the label to see if there is added sugar.
- Choose whole grains (oats, some cereals, rye, millet, quinoa, whole wheat and brown rice), beans, legumes, fruits and vegetables.
- Try to have 40% of your total caloric intake come from complex carbohydrates.

http://www.doctoroz.com/article/good-carbs-vs-bad-carbs?

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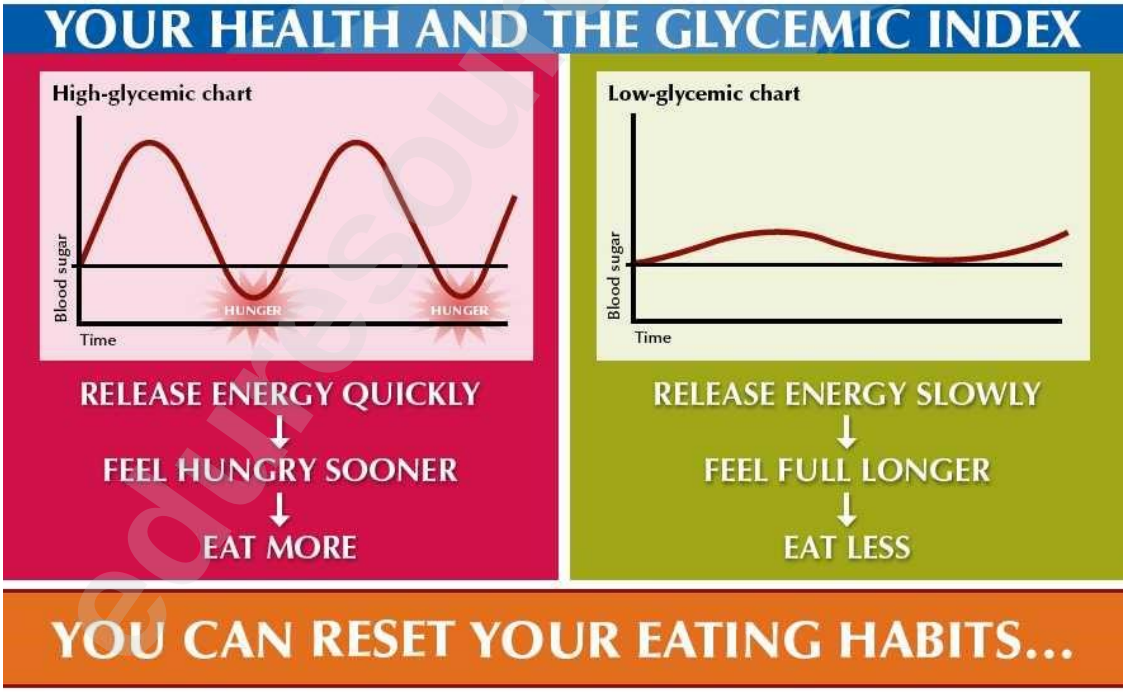

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Carbohydrates provide energy in the form of glucose, or blood sugar. Glucose is necessary to support your body's everyday needs and performance. But not just any old carb will do; choosing wisely among starches, sugars and fibers helps you maintain your energy levels, avoid weight gain and combat sugar crashes. Your body sees carbs as its preferred energy source. In the body, carbs are broken down and converted to glucose and other sugars needed to supply tissues and organs with the fuel they need to perform necessary functions. If your body doesn't get enough glucose, you can experience low blood sugar, or hypoglycemia. This may make you feel physically and mentally fatigued, shaky, dizzy or lightheaded, and it can decrease your performance during exercise or everyday tasks. If no carbohydrates are supplied in the diet, the body looks to other sources, including proteins and fats. This occurs during low-carb diets, for example. While carbs are the body's most efficient energy source, fats are the least efficient. Protein has more important work to do; its main role is to supply amino acids to support muscle. If proteins are instead forced to work as glucose providers, they are not able to feed muscles. Starches, sugars and fibers make up the carb family. Starches and fibers are healthy sources and are also known as complex carbohydrates.

Sugars are referred to as simple carbohydrates. Although these foods technically offer carbs, they're not ideal versions. They have much less nutrition than whole complex carbs, leading to possible weight gain, diabetes and heart disease. *https://www.livestrong.com/article/414187-why-do-we-need-carbohydrates-in-our-diet/*

SOURCE G GOOD CARBS, BAD CARBS, HOW TO MAKE THE RIGHT CHOICES

Carbs are highly controversial these days. The older dietary guidelines suggest that we get about half of our calories from carbohydrates. On the other hand, some claim that carbs cause obesity and type 2 diabetes, and that most people should be avoiding them. There are good arguments on both sides, and it appears that carbohydrate requirements depend largely on the individual. Some people do better with a lower carb intake, while others do just fine eating plenty of carbs. The main purpose of carbohydrates in the diet is to provide energy. Most carbs get broken down or transformed into glucose, which can be used as energy. Carbs can also be turned into fat (stored energy) for later use.

Numerous scientific studies show that refined carbohydrate consumption is associated with health problems like obesity and type 2 diabetes. They tend to cause major spikes in blood glucose levels, which leads to a subsequent crash that can trigger hunger and cravings for more high-carb foods.

However, it makes no sense to demonize all carbohydrate-containing foods because of the health effects of their processed counterparts. Not all carbs are created equal. Refined carbs are associated with obesity and metabolic diseases, but unprocessed carbohydrate foods are very healthy. No discussion about carbs is complete without mentioning low-carb diets. These types of diets restrict carbohydrates, while allowing plenty of protein and fat.

https://authoritynutrition.com/good-carbs-bad-carbs/

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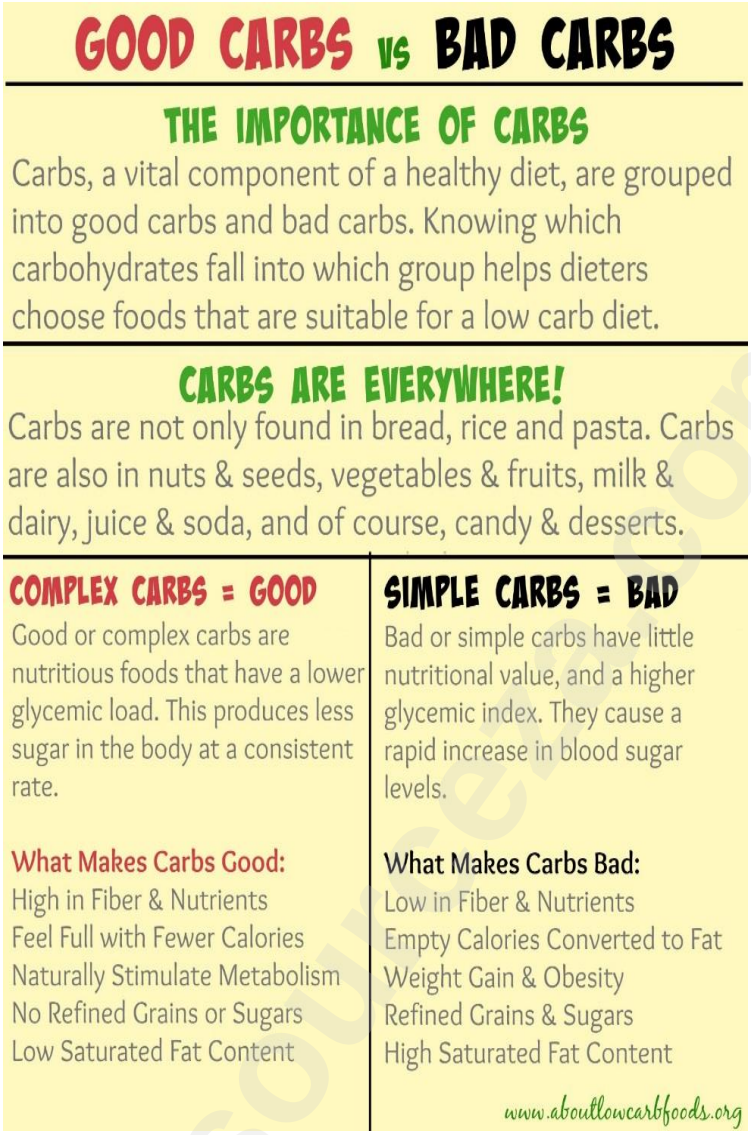

http://www.aboutlowcarbfoods.org/wp-content/uploads/2015/02/GoodCarbsBadCarbs2.jpg

TOTAL: 150

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