

الاسم: مسابقة في الثقافة العلمية (الكيمياء)
الرقم: المدة: ساعة واحدة

This Exam Consists of Two Exercises on Two Pages Numbered 1 and 2.
The Use of a Non-programmable Calculator is Allowed.

Answer the Two Following Exercises:

**First Exercise (10 points)
Under Nutrition “Protein Energy Malnutrition”**

... The main symptoms and signs of protein-energy malnutrition are *Marasmus* and *Kwashiorkor*. The Nutritional Marasmus results from prolonged starvation or from chronic or recurring infections with marginal food intake, and Kwashiorkor syndrome is due to a qualitative and quantitative protein deficiency.

“MULTIMISTURA”, (made up of non-conventional ingredients/food and/or agroindustrial by products rich in nutrients.) is used as food supplement in institutional programs to prevent malnutrition by means of the department of the Wealth and Social Affairs of the city of Natal, Brazil. The product was elaborated by employing the following formulation: wheat bran 30%, wheat flour 30%, corn bran 30%, powder from cassava leaves 3%, pumpkinseeds powder 4% and egg shell powder 3%. The analysis of micronutrient minerals revealed the products as being a potential source of calcium, phosphorous, magnesium, iron and zinc. It represents a significant content of vitamins: A, B1, B2, and B3.

The information below represents the chemical analysis of “Multimistura”:

Average nutritional value for 100 g		Energy value for 1 g of nutrient
Proteins	12.7 %	Proteins: 17 kJ
Carbohydrates	67.0 %	Carbohydrates: 16 kJ
Lipids	8.3 %	Lipids: 38 kJ
Mineral ions	12.0 %	Mineral ions: 0 kJ
Fibers	traces	Fibers: 0 kJ

Questions

- 1- Indicate the difference between Marasmus and Kwashiorkor.
- 2- State three functions of proteins in human body.
- 3- Write the general formula of an α -amino acid. Represent a chain of two α -amino acids and give The name of the bond that links these two α -amino acids.
- 4- Specify the role of calcium and that of zinc in the human body.
- 5- Calculate, in kJ, the energy value of 100 g of this food.
- 6- Wheat bran and corn bran are excellent sources of fibers. Indicate why fibers are important in our diet.

Second Exercise (10 points)

An Antibiotic: Propolis

Propolis is a kind of a resinous glue, made up by bees from balms essentially collected on trees and shrubs buds....It's a bactericidal antibiotic... and an anti-inflammatory drug.

Propolis accelerates and also enhances cellular metabolism, it renew cells, cleans blood from staphylococci that are able to resist to antibiotics.

What are its advantages?

- Propolis is as powerful as main antibiotics (*penicillin, streptomycin, terramycin, etc...*).
- It acts indifferently on each of the following germs: *staphylococcus aureus, staphylococcus albus, streptococcus faecalis, streptococcus haemolyticus, salmonella typhi...*
- It does not cause any disorder. It is eliminated without disturbing kidneys, liver or intestinal flora...

The efficiency of this natural antibiotic is mainly due to the flavonoids of which it is composed. These flavonoids are antiseptics produced by plants ...in order to protect themselves against bacteria and fungi.

Propolis thus exists, first of all, as a dry resin, or as more or less big grains or even as powder. It can also be packed :

- As hydro alcoholic extracts with antiseptic, disinfecting effects...
- As capsules to increase defenses....
- As tonic to soften sensitive throats, to stimulate respiratory tracts and natural resistances.

By Jeanne Dumont

Questions

1- Referring to the passage, answer the following questions:

- 1.1- Justify that Propolis is a natural antibiotic.
 - 1.2- Identify the active ingredient of Propolis.
 - 1.3- List four formulations of Propolis.
 - 1.4- Extract the favorable effects of Propolis on human body compared to current antibiotics.
- 2- Indicate the difference between fungicidal and bactericidal antibiotics. Specify to which class Propolis belongs.
- 3- Antibiotics are classified according to two spectrums.
- 3.1- State the two spectrums of antibiotics.
 - 3.2- Explain in which case, the physician prescribes each one of them.
- 4- Propolis is also an anti-inflammatory drug. Indicate the therapeutic effect of an anti-inflammatory drug. Justify, whether in case of infection by a bacterium, an anti-inflammatory drug would be advised.

First Exercise (10 points)

Part of the Q	Answer	Mark
1	Kwashiorkor is due to a qualitative and quantitative protein deficiency. Marasmus results from prolonged starvation or from chronic or recurring infections with marginal food intake.	2
2	The functions of proteins in human body are: - Enzymatic activities. - Nutritive proteins. - Storage proteins. - Proteins for contraction and defense. - Structural proteins.	1.5
3	The general formula of α -amino acid: $\begin{array}{c} R - CH - COOH \\ \\ NH_2 \end{array}$ The chain of two acids: $\begin{array}{c} R - CH - CO - NH - CH - COOH \\ \qquad \qquad \qquad \\ NH_2 \qquad \qquad \qquad R \end{array}$ CO - NH => Peptide bond	1.5
4	Role of calcium: forms and maintains bones and teeth. Involved in blood clotting. Regulates nerve transmission and muscle contraction. Role of zinc: it is present in the composition of insulin and a great number of enzymes.	2
5	Energy value = $(12.7 \times 17) + (67.0 \times 16) + (8.3 \times 38) = 1603.3$ kJ.	2
6	Fibers prevent constipation, facilitate digestion.	1

Second Exercise (10 points)

Part of the Q	Answer	Mark
1.1	Propolis is a natural antibiotic because it is built by bees from balms essentially collected on trees and shrubs buds ...	0.5
1.2	The active ingredient of propolis is the flavonoids.	0.5
1.3	It exists as dry resin, as more or less big grains, as powder, as capsules, as tonic, or hydro alcoholic.	1
1.4	Propolis does not cause any disorder. It is eliminated without disturbing kidneys, liver or intestinal flora, accelerates and also enhances cellular metabolism, it renew cells, cleans blood ...	1.5
2	A fungicidal antibiotic destroys fungi, whereas a bactericidal antibiotic destroys bacteria. The propolis is fungicidal and bactericidal because flavonoids fight against fungi and bacteria at the same time..	1.5
3.1	The two spectrums of antibiotics are :	1

	Antibiotics with broad spectrum and antibiotics with narrow spectrum.	
3.2	<p>Antibiotics with broad spectrum act against a variety of micro-organisms. Antibiotics with narrow spectrum act only on one type of micro-organisms.</p> <p>The physician prescribes an antibiotic with broad spectrum when the bacterium is not identified whereas an antibiotic with narrow spectrum is prescribed when the infection is caused by an identified bacterium. Antibiotic with narrow spectrum is advised the most because the other can destroy useful bacteria like intestinal flora.</p>	2.5
4	An anti-inflammatory drug is prescribed when there is an inflammation which is a kind of defense of the body against an external aggression and not prescribed in the case of a bacterium. Therefore, the anti-inflammatory drug is not effective in this case.	1.5