مسابقة في الثقافة العلمية: مادة الكيمياء
المدة ساعة واحدة

الاسم:
الرقم:

This Exam Includes Two Exercises. It Is Inscribed On Two Pages Numbered From 1 To 2. The Use of A Non-Programmable Calculator Is Allowed.

Answer The Two Following Exercises:

First Exercise (10 points)
Denaturation of Proteins

When the egg white and the egg yolk are heated, we can observe that the liquid becomes solid. We say that the egg is coagulated, or even it is cooked. Proteins of egg (yolk and white) are at the origin of this coagulation.
Proteins coagulate under the action of various physical and chemical agents.
It is noted that the temperature of coagulation of the egg white starts at 57°C and that of the egg yolk at 65°C.
At the beginning, proteins are long ribbons formed of more than sixty amino acids. They are macromolecules chemically bounded to each other by hydrogen bonds which are not very resistant bonds. When the temperature becomes close to 60°C, the weakest bonds - like the hydrogen bonds – are broken: this is the denaturation.
Protein is held and becomes a long amino acids chain. Consequently, certain parts of the chain can combine with other protein molecules. Proteins can then be bounded by disulphides bridges: it is coagulation.

***According to FYA Pascal biologie*.**

Questions

1- Referring to the text, answer the following questions:
   1.1- Give the name of the bonds that are broken during the denaturation of proteins and those that are formed during coagulation.
   1.2- Justify the coagulation of egg white before the egg yolk.
2- List the four structures of proteins. Indicate the one which is not affected by denaturation.
3- Classify the following denaturing agents as chemical and physical agents: heat, acid, ethanol and radioactive rays.
4- Proteins are classified into two classes: simple and conjugated proteins. Give one example on each class.
5- The better the quality of a protein, the higher its biological value.

Source of Protein	Egg	Meat	Rice	Wheat
Biological value (%)	97	82	67	49

   5.1- Plot a bar graph that represents the percentages of biological values given in the above table.
   5.2- Draw out a conclusion about the biological value of proteins as a function of their sources (plant and animal).

Second Exercise (10 points)
Orelox®

Orelox® children and infants 40mg/ 5 mL

Composition

5 mL of the reconstituted solution contains 40 mg of cefpodoxime.

Excipients: sodium chloride, sodium glutamate, aspartame …

Pharmaco-therapeutic class

Antibacterial antibiotics

Therapeutic indications

This medicine is indicated in children treatment of: acute otitis, sore throat, sinusitis and lower respiratory tract infections.

Contraindications

This medicine should not be used in the following cases:

In case of known allergy to antibiotics belonging to cephalosporin family;

In case of phenylketonuria because of the presence of aspartame.

Dosage

The usual dosage in children is 8 mg per kg (of weight) per day, in two intakes separated by 12 hours.

Duration of treatment

The duration of treatment for sore throat is 5 days.

Side effects

Like all medicines, this drug can cause side effects, although not everybody gets them.

Common side effects :

- Diarrhea, vomiting, abdominal pain.
- An extensive cutaneous rash, angio-oedema (rapid swelling of the face and the neck).

Questions

1- Give the general composition of a medicinal drug.

2- Referring to the text, answer the following questions:

   2.1- Name the active ingredient of Orelox®.

   2.2- Indicate the pharmaceutical action of this drug.

   2.3- Pick up two side effects and two cases in which this drug should not be used.

3- Give one disadvantage of using a broad spectrum antibiotic.

4- Define bactericidal antibiotic and fungicidal antibiotic.

5- A child, weighing 20 kg, suffers from sore throat. The physician prescribes Orelox® to treat his disease.

   5.1- Determine the volume of Orelox® solution that the child should take daily.

   5.2- Deduce the volume of each intake.

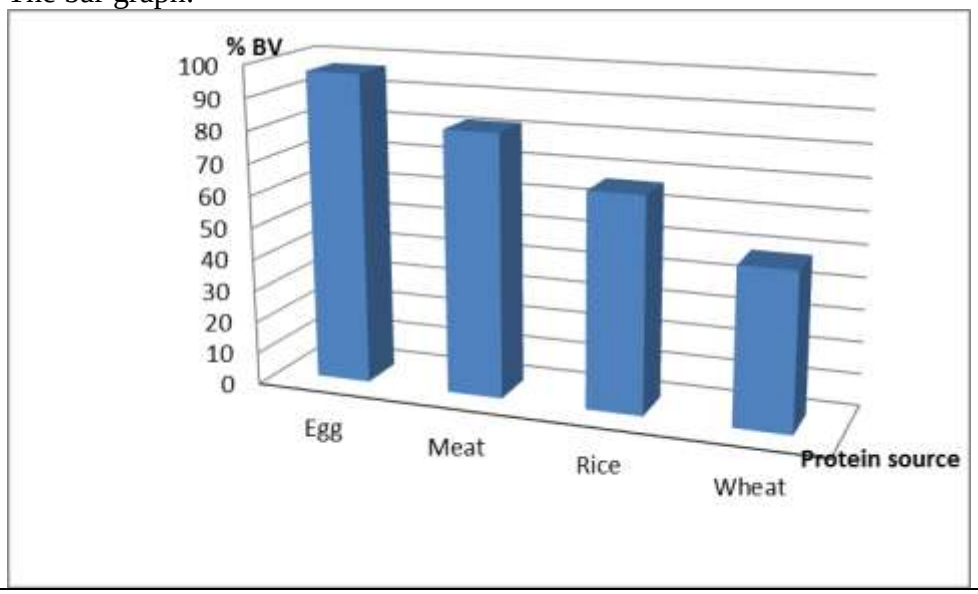
   5.3- Indicate the duration of treatment.

   5.4- After two days, the child begins to feel better. Specify whether the course of treatment can be finished.

Answer The Two Following Exercises:

First Exercise (10 points)

Denaturation of Proteins

Part of the Q	Answer	Mark
1.1	The bonds that are broken during denaturation are hydrogen bonds The bonds that are formed during coagulation are disulphides bridges.	1
1.2	The temperature of coagulation of the egg white (57 º C) is lower than that of the egg yolk (65°C). For this reason the egg white coagulates before the egg yolk.	1.5
2	The four structures of proteins are: • The primary structure. • The secondary structure. • The tertiary structure. • The quaternary structure. The primary structure is not affected by denaturation.	2 0.5
3	The chemical agents: acid and ethanol The physical agents: heat and radioactive rays.	1
4	Simple proteins: albumin, globulin…. Conjugated proteins: casein of milk, lipoprotein of blood, immunoglobulin…	1
5.1	The bar graph: 	2
5.2	Proteins of animal origin have a higher biological value than proteins of plant origin.	1

Second Exercise (10 points)
Orelox®

Part of the Q	Answer	Mark
1	A medicinal drug is composed of an active ingredient and inert ingredients.	1
2.1	The active ingredient of Orelox® is cefpodoxime.	0.5
2.2	This drug is an antibacterial antibiotic.	0.5
2.3	Two side effects: Diarrhea, vomiting, abdominal pain… Two cases in which this drug should not be used: allergy to antibiotics belonging to cephalosporin family and phenylketonuria.	2
3	Broad spectrum antibiotic may kill the beneficial bacteria in the intestinal flora.	1
4	Bactericidal antibiotic is a substance that kills bacteria And fungicidal antibiotic is a substance that kills fungi.	1
5.1	The usual dosage in children is 8 mg per kg per day in two intakes separated by 12 hours. For a child of 20 kg, usual dose is $8 \times 20 = 160$ mg. 160 mg corresponds to $\frac{160 \times 5}{40} = 20$ mL which is the volume that the child should take daily.	2
5.2	The volume in each intake = $\frac{20}{2} = 10$ mL.	0.5
5.3	The duration of treatment is 5 days.	0.5
5.4	The course of treatment cannot be finished in order to prevent the possibility of the emergence of resistant bacteria.	1