

**First Exercise (3 points)**

**Indicate the true statement(s) and correct the false one(s).**

1. All nutrients pass in the blood across the wall of the intestinal villi.
2. Salivary amylase acts in neutral medium while pancreatic amylase acts in basic medium.
3. Amino acids are the nutrients resulting from the digestion of lipids.
4. The activity of an enzyme decreases when the temperature is less than 37<sup>0</sup>C and increases when the temperature is higher than 37<sup>0</sup>C.

**Second Exercise (7.25 points)**

A) The secretion of a digestive juice necessitates the intervention of a chemical substance called **hormone**. The secretion of a hormone is also controlled by the nervous system.

For example, when we eat a meal rich in proteins, small glands in stomach produce a hormone called **gastrin**. Gastrin ensures the secretion of a big quantity of pepsin in the stomach.

1. Give the name of the digestive enzyme mentioned in the above paragraph.
2. To prevent the secretion of gastrin, we destroy the glands which secrete it. Deduce the effect of this destruction.

B) We introduce 2g of coagulated ovalbumin (protein) in the digestive tube of a person for whom we destroyed the glands that secrete gastrin.

Samples are taken from its small intestine at times 10, 30 and 60 minutes to measure the quantity of proteins and amino acids in them.

The obtained results are shown in the following table.

Time in Minutes	10	30	60
Quantity of Proteins in g	2	1	0
Quantity of Amino Acids in g	0	1	2

3. **Give** the name and **describe** the test which permits to identify the presence of proteins.
4. Analyze the obtained results.
5.
  - a) Explain how, in the absence of gastrin, proteins are simplified.
  - b) Draw a functional diagram that shows the molecular simplification of ovalbumin taking place.
  - c) State the conditions of this digestion.(4 conditions)

### Third Exercise (9.75 points)

Emphysema is a respiratory disease. This disease is due to the inhalation (penetration through respiratory pathways) of irritating substances which can cause an infection at the level of bronchioles. This infection is at the origin of narrowing (closing) many air pathways.

The narrowing of the air pathways makes the exhalation difficult and the air is trapped in the alveoli. This causes the destruction of the alveolar elastic walls.

So the alveoli are inflated and their thickness increases to lead progressively to a perturbation in gaseous exchanges.

- Trace, using arrows, the steps that lead to emphysema.
- Indicate the property of the alveolar wall that is affected by this disease.
- Indicate the phase of the respiratory movement affected by this disease.

The following tables show the pressure of carbon dioxide in the alveolar air and in the blood entering the alveolus in 2 persons A and B where one is healthy and the other has emphysema.

	Alveolar Air	Blood Entering the Alveolus
Pressure of CO <sub>2</sub> in mm Hg	40	45

Person A

	Alveolar Air	Blood Entering the Alveolus
Pressure of CO <sub>2</sub> in mm Hg	45	45

Person B

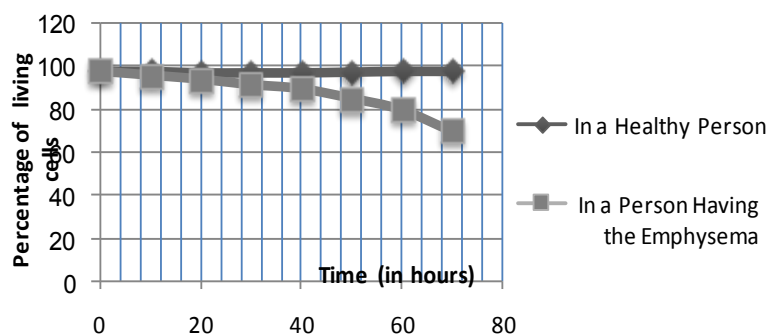
- Compare the pressure of carbon dioxide in the alveolar air to that in the blood entering the alveolus in person A.
  - Draw out a conclusion concerning the behavior (fate) of CO<sub>2</sub>.
- Compare the pressure of carbon dioxide in the alveolar air to that in the blood entering the alveolus in person B.
  - Draw out a conclusion concerning the behavior (fate) of CO<sub>2</sub>.
- Using the answers of the questions 4 and 5, indicate which of the two persons (A or B) has emphysema. Pick up from the paragraph the expression that justifies the answer.

The following table shows the pressure of oxygen gas in the blood entering the cells of a healthy person and of another person having emphysema.

	Blood Entering the Cells of a Healthy Person	Blood Entering the Cells of a Person Having Emphysema
Pressure of O <sub>2</sub> in mm Hg	95	70

- Compare the pressure of O<sub>2</sub> in the two persons. Deduce the effect of emphysema on the amount of O<sub>2</sub> transported by the blood.

The following graph represents the variation of the amount (%) of living cells in a healthy person and in a person having emphysema.



- Interpret the graph.
- Deduce, using the answers of parts 7 and 8, the necessary substance for the life of cells.