	مسابقة في الثقافة العلميةمادة علوم الحياة	الاسم:
	المدة: ساعة واحدة	الرقم:

Answer the following exercises:

Exercise1(7 points)   **Cholesterolemia**

Cholesterol is a substance that is indispensable for cells. It is transported in blood by two lipoproteins. Its normal bloodlevel ranges between 1.8 g/L and 2 g/L.

Hypercholesterolemia is a nutritional disease characterized by an excessive amount of cholesterol in blood. In order to determine the food diet that leads to the development of this disease, the amount ofsaturated and unsaturated fatty acids in the food dietof two populations A and Bas well as the amount of cholesterol in their blood or cholesterolemiaarestudied. Document 1 shows the obtained results.

Population	Consumed monounsaturated fatty acids (in %)	Consumed saturated fatty acids (in %)	Cholesterolemia (g/L)
A	25	10	2
B	15	20	2.6

Document 1

1- State two roles of cholesterol in the organism.
2- **2-1-**Name the lipoproteins that transport cholesterol.
   2-2- Indicate the role of each of them.
3- **3-1-** Analyze the results of document 1.
   3-2- What can you conclude?

The composition of certain lipidsin saturated and monounsaturated fatty acids is evaluated. The histogram of document 2 represents the obtained results.

4- Draw out the lipid that is the richest in monounsaturated fatty acids and the one that is the richest in saturated fatty acids (document 2).

5- Specify the lipid in document 2 that can be recommended to prevent hypercholesterolemia.
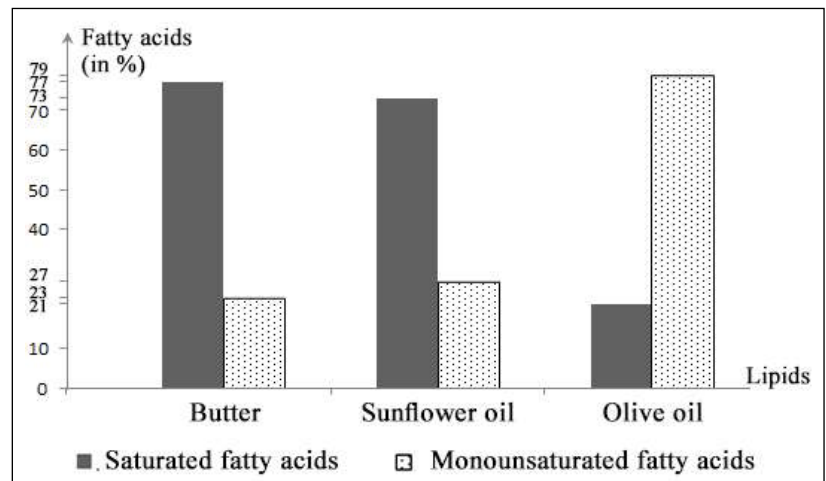
Document 2

Exercise 2(6 points) **Obesity**

Obesity isn't a disease in the commonly understood sense of the term; it's rather a risk factor for certain diseases such as cardiovascular diseases and diabetes. Moreover, obese people suffer frequently from breathing troubles;they show rapid short breath during physical activity.

A person is considered obese when his BMI exceeds 30 kg/m^2. We are actually convinced that the excessive food intake and the absence of physical activity are not the only factors responsible for obesity.

1- Pick out from the text:
   1-1- two dangers that an obese person faces.
   1-2- two factors responsible for obesity.
2- Sarah is a womanhaving a height of 175cm and weighing 80 kg.
   2-1- Calculate the BMI of Sarah.
   2-2- Determine whether Sarah is obese or not.

In order to identify other factors responsible for obesity, the following experiments are performed:

Experiment 1:
Balanced meals are given to two lots of rats A and B.The tails of the rats of lot B are pinched to induce anxiety every time they get their meals. After a certain time, rats of lot A have a normal weight and rats of lot B become obese.

Experiment 2: We give the same amount of balanced food diet to two lots of rats C and D for several weeks. Every day, lot C receivesthis food diet distributed on four meals and lot D receives the same food dietin only one meal. Rats of lot C have a normal weight. Rats of lot D show obesity signs.

3- Deduce, from each of the experiments 1 and 2, the factors that favor obesity.
4- Suggest one nutritional recommendation in order to prevent obesity.

Exercise 3 (7 points) **Thermal Sensory Message**

We study the nervous message in two fibers A and B issued from two types of thermal sensory receptors of the skin. These two types of receptors are stimulated by increasing temperatures; the responses of each of these two fibers are recorded by two oscilloscopes. The table of document 1 shows the obtained results.
Note that the amplitude of the obtained action potentials (AP) is the same for all temperatures and for the two fibers.

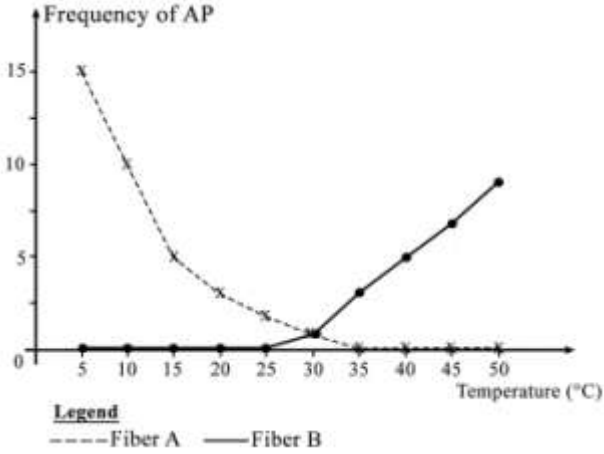| Temperature (°C)		5	10	15	20	25	30	35	40	45	50
Frequency of AP	**Fiber A**	15	10	5	3	2	1	0	0	0	0
	Fiber B	0	0	0	0	0	1	3	5	7	9

Document 1

1- Represent, on the same graph, the curves showing the frequency of AP for the two fibers A and B as a function of temperature.
2- Deduce which of the fibers A or B is issued from the receptor that is sensitive to cold.
3- Specify the threshold intensity of stimulation for fiber B.
4- Show, by referring to document 1, that the response in a fiber is modulated in frequency of AP.
5- **5-1-** State the different phases of the action potential.
   5-2- Indicate the ionic exchanges corresponding to each of them.

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		دائرة الامتحانات

مسابقة في الثقافة العلمية
مادة علوم الحياة
اسس التصحيح

Part of the exercise	Exercise 1 **Cholesterolemia**	Grade 7 pts
1	Cholesterol is a structural component of the cell membrane and a precursorof some hormones such as sexual hormones.	**1**
2.1	The lipoproteins that transport Cholesterol are :LDL and HDL	**1**
2.2	-LDL transports cholesterol towards the body cells in need. - HDL transports the cholesterol to be destroyed from tissuesto the liver,	**1**
3.1	Cholesterolemiaof 2 g/L is measured in population Awhichfood dietisricher in monounsaturated fatty acids(25%)than in saturated fatty acids (10%). Thecholesterolemiaof 2.60 g/Lmeasured in population Bwhichfood diet is richer in saturated fatty acids(20%)than in monounsaturated fatty acids(15%) is greater than 2g/l.	**1**
3.2	Thus, food that is rich in saturated fatty acids and poor in monounsaturated fatty acids favors hypercholesterolemia.	**1/2**
4	The lipid that is the richest in monounsaturated fatty acids is olive oil. The lipid that is the richest in saturated fatty acids is butter.	**1**
5	Olive oil, since hypercholesterolemia is related to a consumption of food that is rich in saturated fatty acids and poor in monounsaturated fatty acids, and sinceolive oil is rich in monounsaturated fatty acids and poor in saturated fatty acids: that is whythe lipid that can be recommended to prevent hypercholesterolemia is olive oil.	**11/2**

Part of the exercise	Exercise2 **Obesity**	Grade 7 pts
1-1	Cardiovascular diseases, breathing troubles, diabetes.	**3/4**
1-2	Excessive food intake, absence of physical activity.	**1/2**
2-1	BMI= Mass in Kg/height in m^2. BMI= 80Kg/ (1.75m X 1.75m) = 26.14 Kg/m^2.	**1 1/2**
2-2	A person is considered obese, when his BMI exceeds 30. Since Sara has a BMI that is equal to 26.14 Kg/ m^2< 30, so she is not obese.	**3/4**
3	Only rats of lot B which areanxious during meal time become obese even though they receive the same balanced food diet as rats of lot A which are not anxious. Thus stress triggers obesity. Rats of lot D that receive food in one meal become obese, while rats of lot C that receive the same food distributed on four meals maintain normal weight. This implies that food abstinencefor a long time per day induces obesity. Thus, risk factors for obesity are stress and prolonged food abstinence per day.	**2**
4	Avoid having one meal per day, avoid staying too long without eating during the day, eat healthyfood (balanced food diet) Consume food that provides energy which is equal to the energy expenditure. Escape stress.	**11/2**

Part of the exercise	Exercise 3 **Thermal Sensory Message**	Grade 7 pts
1	Graph representing the variation of frequency of AP in two types of fibers A and B as a function of temperature. Scale : Abs : 1cm for 5°COrd : 2cm for 5 AP	2
2	Fiber A is not active except, at low temperatures varying between 5 °C and 30°C showing a frequency of AP varying respectively between 15 and 1 .While fiber B is not active at these low temperatures. Thus fiber A is the fiber which is issued from the thermal sensory receptor sensitive to cold.	1
3	The threshold intensity for fiber B is 30°C, since we observe AP only starting from the temperature 30°C. OR since the activity of the fiber is nil for temperatures less than30 °C while AP are observed starting from 30°C.	1½
4	The frequency of AP increases from 1 to 9 AP of constant amplitude when temperature increases from 30°C up to 50°C for fiber B. OR : The frequency of AP increases from 1 to 15 of constant amplitude when this temperature decreases from 30°C to 5°C for fiber A. Thus the response is coded by the frequency of AP.	1
5.1	Depolarization. Repolarization. Hyperpolarisation.	1
5.1	Depolarization: massive entry of sodium ion. Repolarization: exit of potassium ions Hyperpolarisation: slight exit of potassium ions.	1/2