| مسابقة في الثقافة العلميّة – مادة علوم الحياة	الاسم:
المدة: ساعة واحدة	الرقم:

Exercise 1 (7points)   Multiple Sclerosis, a Neurological Disease

Multiple sclerosis is a neurological disease that begins with visual troubles, partial paralysis, clumsiness, or walking problems. This disease is due to a progressive destruction of the myelin sheath by white blood cells.

Document 1

1- Pick out from document 1:
   1-1- the symptoms of multiple sclerosis.
   1-2- the cause of this disease.

Document 2 shows the aspect of a myelinated neuron of an affected individual at the early phase A (beginning of the disease) and at the late phase B.
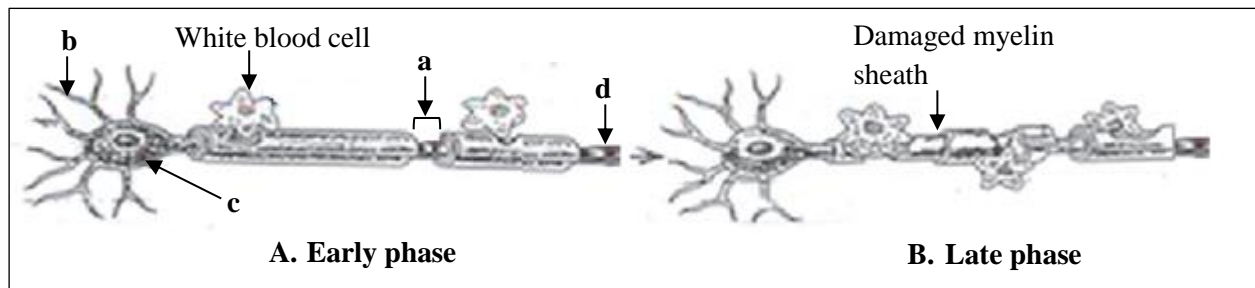
Document 2

2- Label the structures a, b, c and d of document 2.

Document 3 represents the speed of conduction of the nervous message recorded at the level of a myelinated nerve fiber during the two phases mentioned in document 2, as well as in a healthy individual.

3- Construct a histogram that shows the results presented in document 3.
4-1- Analyze the obtained results.
4-2- What can you conclude?
5- Name two other neurological diseases.

|	Healthy individual (Control)	Affected individual (Early phase)	Affected individual (Late phase)
Speed of conduction of nerve message (in m/s)	100	70	10

Document 3

Exercise 2 (6 points)   Obesity

Obesity, a state characterized by an abnormal or excessive accumulation of body fat, can lead to dangerous consequences on health. Three individuals A, B and C consult a dietitian. These persons are of the same age (30 years) and have the same height (1.7m), but they differ in their body masses:
A = 70 kg, B = 90 kg and C = 105 kg.

The body mass index (BMI) is used to measure the degree of obesity (document 1). This index is obtained by applying the formula:

$$\text{BMI} = \frac{mass\ (kg)}{(Height\ m)^2}$$
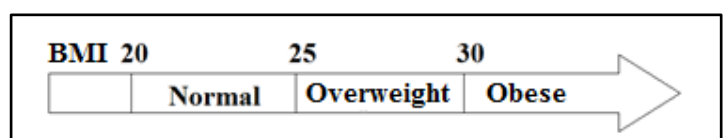
Document 1

1- Calculate the BMI of each individual.

2- Identify, by referring to document 1, the category to which each individual belongs.

Document 2 reveals the life style and the food ration of each of the individuals A, B, and C.

.	Individual **A**	Individual **B**	Individual **C**
Life style	Moderate activity	Sedentary (no activity)	Moderate activity
Food ration (g) Carbohydrates	117		117
Proteins	27		27
Lipids	31.5		64

Document 2

3- Compare the life styles and the food rations of these three individuals.

4- Draw out the cause (s) of the excess of the body mass in the concerned individuals.

**5-** Name two diseases that obese people might suffer from.

Exercise 3 (7 points)   Origin of Coronary Diseases

Coronary diseases are a major cause of deaths encountered mostly in the developed countries. Document 1 represents the relation between the frequency of these diseases and the blood cholesterol level.

1- Draw a table presenting the results obtained in document 1.

2-1- Analyze the obtained results.

2-2- What can you conclude?

A man is hospitalized as a result of a heart attack. The medical analyses of this man show three narrowed coronary arteries which are almost blocked.
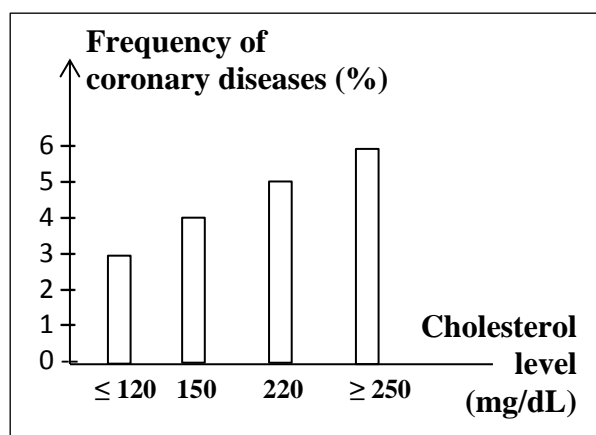
Document 1

3- Name the disease that causes the narrowing of these arteries in this man.

Document 2 shows the blood levels of certain substances in this man and the corresponding normal levels.

4- Indicate the role of LDL and that of HDL.

5- Compare the obtained results.

6- What additional information does document 2 provide concerning the origin of the disease in this man?

	Blood levels in the patient (mg/dL)	Normal blood levels (mg/dL)
LDL	180	108-155
HDL	30	40-80

Document 2

| أسس التصحيح | مسابقة في الثقافة العلميّة ــ مادة علوم الحياة
المدة: ساعة واحدة | |

Part of the ex	Exercise 1 (7points) Multiple Sclerosis, a Neurological Disease	Mark
1.1	The symptoms of multiple sclerosis are visual troubles, partial paralysis, clumsiness, or walking problems.	0.75
1.2	The cause of this disease is the progressive destruction of the myelin sheath by white blood cells.	0.75
2	a : Ranvier's node b : dendrite c : cell body d : axon	1
3	A histogram representing the speed of conduction of the nervous message in two individuals, a healthy one and another one affected by multiple sclerosis during two phases. Scale : 1 cm = 20 m/s 	1.5
4.1	The speed of conduction of the nervous message recorded at the level of a myelinated nerve fiber in the healthy individual is 100 m/s more than that in the early phase of the affected individual which is 70 m/s. However, this speed decreases to 10 m/s in the late phase of the same affected individual.	1
4.2	I conclude that, multiple sclerosis reduces (decelerates) the speed of conduction of the nervous message. Or it decelerates the propagation of the nervous message. Or the destruction of myelin sheath decelerates the nervous message. Or the nervous message in the affected individuals by multiple sclerosis is slow.	0.5
5	Parkinson and Alzheimer	1.5

Part of the ex	Exercise 2 (6 pts) Obesity	Mark
1	BMI of A = 70 /(1.7)^2 = 24.2 kg/m^2 BMI of B = 90 /(1.7)^2 = 31.1 kg/m^2 BMI of C = 105 /(1.7)^2 = 36.3 kg/m^2	1.5
2	The BMI of A is 24.2 kg/m^2 which is in the normal range (20 and 25), thus individual A belongs to the category « normal ». The BMI of B is 31.1, a value higher than 30 which corresponds to the category of obesity, thus individual B is considered obese. The BMI of B is 36.3, which is also higher than 30 corresponding to obesity, thus individual B belongs also to the category «obesity».	1.5
3	The two individuals A and C have the same moderate activity, but B has a sedentary life style. The quantities of carbohydrates (117 g) and proteins (27 g) are the same in the food ration of the three individuals A, B and C. However, the quantity of lipids in the food ration of individual C (64 g) is greater than that in the food ration of B and C which is 31.3g.	1
4	The cause of the excess of the body mass in individual B is the sedentary life style. The cause of the excess of the body mass in individual C is the food rich in lipids.	1
5	Hypertension, atherosclerosis, cardiovascular diseases, diabetes…	1

Part of the ex	Exercise 3 (7 points) Origin of Coronary Diseases	Mark
1	The variation of the frequency of the coronary diseases as a function of level of cholesterol. <table><tr><td>Level of cholesterol (mg/dL)</td><td>≤ 120</td><td>150</td><td>220</td><td>≥ 250</td></tr><tr><td>Frequency of the coronary diseases (%)</td><td>3</td><td>4</td><td>5</td><td>6</td></tr></table>	1.5
2-1	The frequency of the coronary diseases is 3% for a blood cholesterol level ≤ 120mg/dL. When the blood cholesterol level increases to be ≥ 250, the frequency of the coronary diseases increases to 6%.	1
2-2	I conclude that the increase in the blood cholesterol favors the development of coronary diseases. Or, blood cholesterol is a risk factor for the development of the coronary diseases.	0.5
3	Atherosclerosis	1
4	LDL transports cholesterol to the body cells. HDL transports cholesterol from the tissues to the liver, preventing, thus its accumulation in the blood.	2
5	The blood level of LDL in the patient (180 mg.dL^{-1}) is greater than that in the normal individuals (108 – 130 mg.dL^{-1}) but that of HDL, in the patient (30mg.dL^{-1}) less than that in the normal levels (40 – 80 mg.dL^{-1}).	0.5
6	The origin of the disease in this man is the high level of LDL and the low level of HDL.	0.5