مسابقة في الثقافة العلميّة – مادة علوم الحياة

المدة: ساعة واحدة

(إنكليزي)

الاسم: .....

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

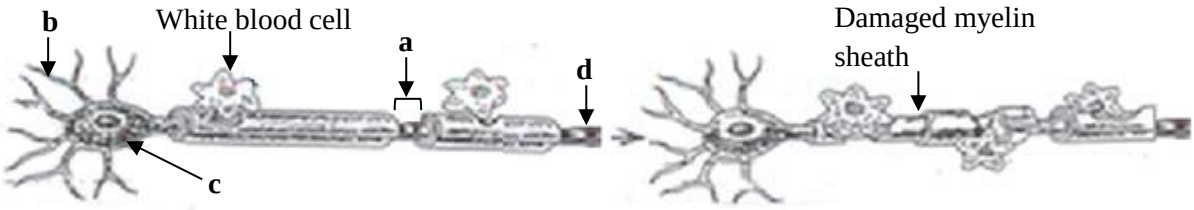
1- **Pick out** from document 1:

1-1- the 4 symptoms of multiple sclerosis.

1-2- the cause of this disease.

Document 2 shows the aspect of a myelinated neuron of an affected individual during **two successive phases of the disease**:

- at the **early** phase (A) (beginning of the disease)
- and at the **late** phase (B).



Document 2

2- **Match** each of the structures a, b, c and d of 'document 2' to the suitable number:

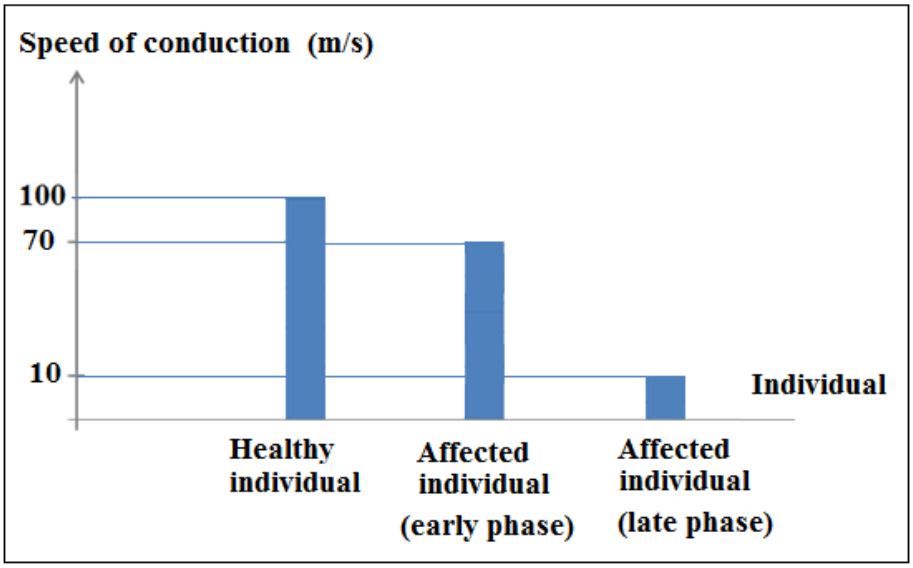
1- Axon

2- Node of Ranvier

3- Cell body

4- Dendrite

Document 3 represents the speed of conduction of the nervous message recorded at the level of a myelinated nerve fiber in a healthy individual and in an affected individual during the two phases early and late.



Document 3

3- Recopy and **complete** the table below based on the histogram in document 3.

	Healthy individual (Control)	**Affected individual (Early phase)**	**Affected individual (Late phase)**
Speed of conduction of nerve message (in m/s)			

Document 3

4-

4-1- Analyze, based on document 3, the variation in the speed of conduction of nervous message for each individual (healthy and affected).

4-2- What can you **conclude** concerning the effect of the disease on the speed of conduction of nervous message?

5- Name two other neurological diseases.

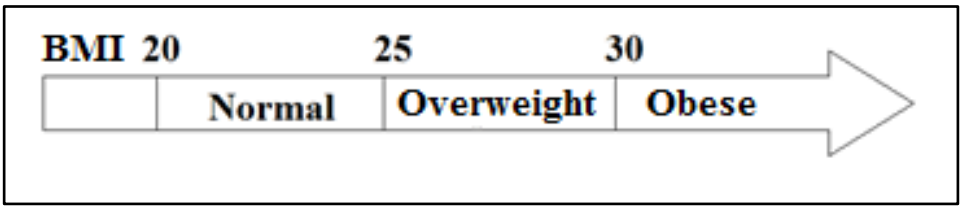
Exercise 2 (6 points) **Obesity**

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:

- They have **same age (30 years)**
- They have **same height (1.7m),**
- They have **different body masses**:
  - 70 kg for individual A
  - 90 Kg for individual B
  - 105 Kg for individual C

The body mass index (BMI) is used to measure the degree of obesity (document 1).



Document 1

1- Calculate the BMI of each individual (A, B and C) using the following formula:

$$\textbf{BMI} = \frac{\boldsymbol{mass\ (kg)}}{(\boldsymbol{Height\ m})^2}$$

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

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-

3.1- Compare the life styles of these three individuals (A, B and C).

3.2- Compare the food ration of these three individuals (A, B and C).

4- Draw out the causes of the excess of the body mass in the concerned individuals.

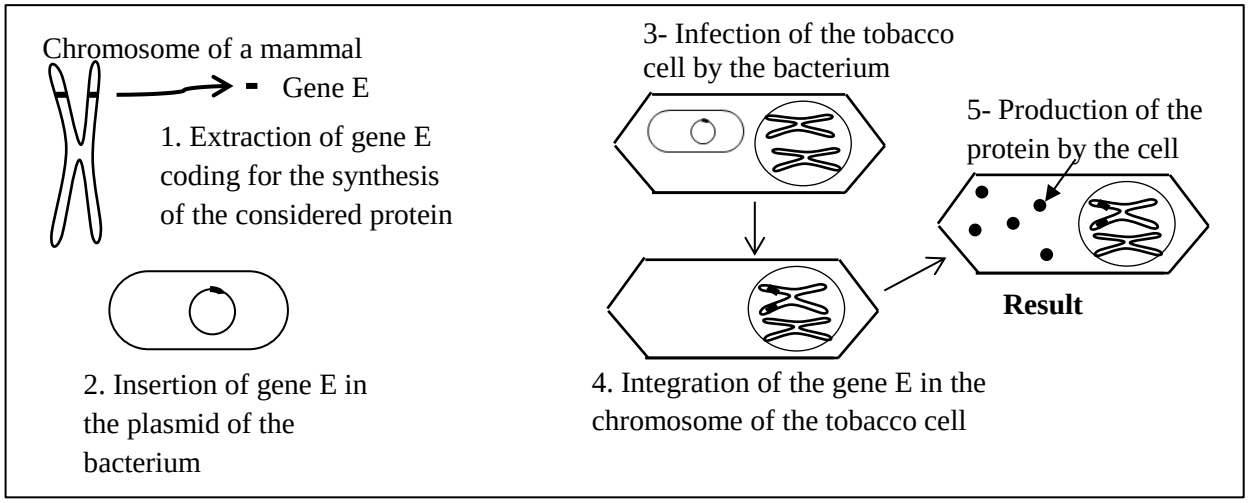
5- Name two diseases that obese people might suffer from.

Exercise 3 (7 points) **An Application of Biotechnology**

Referring to certain genetic manipulations, researchers could transform plants into factories producing useful substances for humans.

For instance, genetically modified cells of tobacco plants become able to produce a protein whose absence in humans provokes a severe disease: cystic fibrosis.

Document 1 shows some steps of the used technique.



Document 1

1- Describe in a short text the different steps of the technique presented in the document using the following steps:

- Extraction of gene E.
- Insertion of gene E.
- Infection of the tobacco cell by the bacterium.
- Integration of gene E.
- Production of the protein by the cell.

2- Choose the enzyme used in step 1 :

- Restriction enzyme
- Ligase

Choose the enzyme used in step 2:

- Restriction enzyme
- Ligase

3- Complete the following statement :

Bacterium …… gene E from chromosome of a mammal into ……...

4- Name the technique schematized in document 1. **Justify** the answer.

5- State <u>two other applications</u> of this technique:

- one in the agricultural field
- another one in the medical field.