

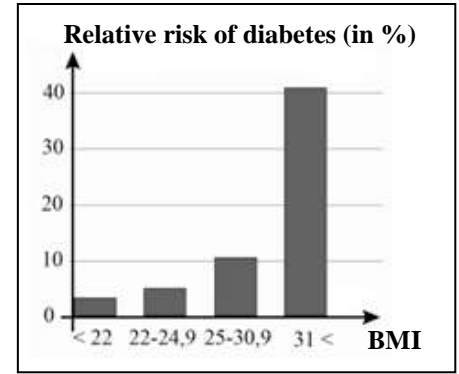
Answer the following exercises:

Exercise 1 (5 points)

Obesity and its Causes

Obesity was recognized in 1997 by WHO (World Health Organization) as a chronic disease. This organization defines « the overweight and obesity as an abnormal or excessive accumulation of body fat that may affect health ». Its prevention is considered as a major public health problem in developed countries. In most cases, multiple factors contribute to the evolution of this disease: heredity, diet, environmental factors...

A study was performed in order to determine the consequences of overweight and obesity on health. The results are shown in document 1 and in document 2. The body mass index (BMI) is calculated by dividing the body mass (in kg) by the square of the height (in m²). It allows classifying people as normal, having overweight or obese.



Document 1

- Pick out from the text :
 - The definition of obesity.
 - The causes of obesity.
- Calculate the BMI of an individual having a mass of 90 kg and a height of 1.6 m. Indicate the category to which he belongs.
- Analyze the results presented in each of the documents 1 and 2. What can you draw out?
- Suggest a nutritional advice to avoid obesity.

BMI	Multiplication of the risk factor for heart diseases	Categories
< 22	1	Normal
22-24,9	1.146	Overweight of Class I
25-30,9	2.06	Overweight of Class II
> 31	3.56	Obese

Document 2

Exercise 2 (5 points)

Osteoporosis and Calcium

Osteoporosis is a disease that affects the entire skeleton thus weakening the bones by decreasing their resistance. Hence affected individuals will have a higher risk of bone fracture. A deficiency in vitamin D and /or in calcium is a risk factor of this disease.

A sufficient supply of calcium and vitamin D has to be provided to young people, who are in the age of building their bone mass. The calcium helps building and maintaining the bone mass. Moreover, vitamin D favors the absorption of calcium at the level of the small intestine and its fixation in the bones.

The best way to preserve the good bone structure is to consume at least three milk products per day (one at each meal) knowing that in case of milk rejection or milk intolerance, it's possible to find calcium in mineral water and green cabbage....

- Pick out from the text:
 - The definition of osteoporosis.
 - The risk factors of osteoporosis.
 - Food to be consumed in case of milk intolerance.
 - The role of vitamin D.
- Name:
 - Two food sources rich in vitamin D.
 - Another disease affecting children which is due to deficiency in vitamin D and in calcium.

Exercise 3 (5 points)

Dangers of Tobacco

A statistical study performed in a certain country has shown that every year tens of thousands of individuals die from tobacco. Approximately, two thirds of these deaths occur due to cancer. Such cases of cancer provoked by tobacco occur at the level of the lungs and the higher respiratory tracts (mouth, pharynx, larynx), as well as at the level of other organs such as the urinary bladder and the pancreas. Tobacco smoke (cigarettes and narghile...) contains many carcinogenic compounds such as tar, nicotine derivatives...

Also, non-carcinogenic respiratory troubles related to tobacco consumption are the cause of thousands of supplementary deaths.

Moreover, tobacco is a major risk factor for cardiovascular diseases and is responsible for 11000 deaths per year due to these diseases. Document 1 and document 2 show the percentages of tobacco smokers as a function of age intervals and gender.

Age interval	Percentage of smokers
14-15 years	20%
16-17 years	50%
18-24 years	65%
25-34 years	50%
35-44 years	40%

Document 1

Percentage of smoker by gender	
Adult men	46%
Adult women	35%

Document 2

- Draw out from the text :
 - Two carcinogenic compounds contained in the tobacco smoke.
 - Two consequences of tobacco smoking on health other than cancer.
- Draw a histogram showing the variation of the percentage of smokers as a function of age intervals.
- Justify, by referring to documents 1 and 2, the following statement: "Heavy smokers are young adult males".
- Suggest 2 measures to be adopted by a country to fight against smoking.

Exercise 4 (5 points)

Botox and Expression Wrinkles

Botox is a protein extracted from *Clostridium botulinum*, a bacterium that provokes severe food intoxication which is often deadly. It is used to attenuate the expression wrinkles which are caused by muscular contraction.

When Botox is administered in very small quantities to certain facial muscles, these muscles stop receiving nervous messages that command their contraction and thus relax.

In order to determine the mode of action of Botox at the level of a neuro-muscular synapse, an effective stimulation is applied on the presynaptic neuron with or without Botox injection. The results are shown in the document below.

	Stimulation without Botox	Stimulation with Botox
Recording at the level of the neuron (E1)	AP +30 mV -70 mV 	AP +30 mV -70 mV
Response of the muscle	Contraction	No contraction
Synaptic function		

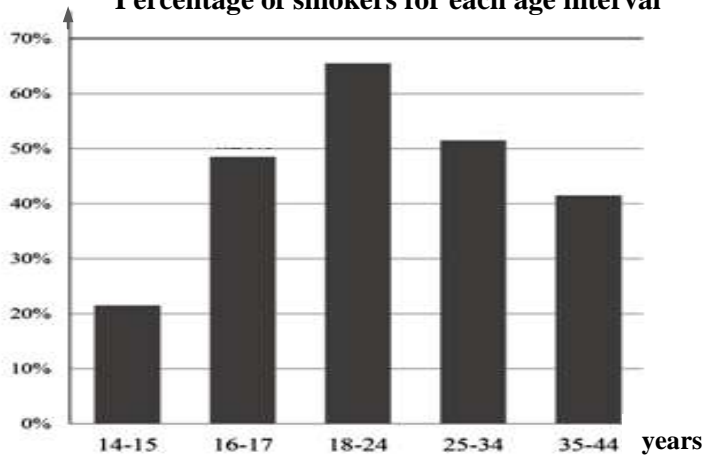
- Pick out from the text:
 - The aim of Botox use.
 - The origin of Botox.
 - The cause of expression wrinkles.
- Indicate whether this neuro-muscular synapse is excitatory or inhibitory. Justify the answer.
- List the steps of the synaptic transmission.
- Indicate the step of synaptic transmission at the level of which Botox act.
- Determine how Botox attenuates expression wrinkles.

اسس التصحيح

مسابقة في الثقافة العلمية
مادة علوم الحياة
المدة: ساعة واحدة

Part	Answer key	Mark
Exercise 1		
1.1	Obesity is defined as an abnormal or excessive accumulation of body fat that may affect health.	0,75
1.2	The causes of obesity are numerous. Multiple factors that contribute to the evolution of the disease: heredity, diet, environmental factors....	0.75
2.1	$BMI = \text{mass}/\text{height}^2 = 90 \text{ kg}/(1.6^2 \text{ m}) = 90/2,56 = 35.15 \text{ kg}/\text{m}^2$	1
2.2	He is obese since his BMI is more than 31	0.5
3	The percentage of risk for diabetes increases from 4 to 40 when BMI increases from 22 to 31. As well as the multiplication risk factor for heart disease which increases from 1 to 3,5 % when BMI increases from 21 to 31. This shows that obesity and overweight increase the risk of having heart diseases and diabetes.	1.5
4	Reducing fat or sugar consumption, or having a low calorie diet.	0.5

Part	Answer key	Mark
Exercise 2		
1.1	Osteoporosis is a disease that affects the entire skeleton thus weakening the bones by decreasing their resistance, which leads to an increased risk of fractures.	0.75
1.2	A vitamin D deficiency and/or calcium deficiency is a risk factor of osteoporosis.	0.75
1.3	Mineral water, green cabbage.	0.75
1.4	Vitamin D favors the absorption of calcium at the level of the small intestine and its fixation in the bones.	0.75
2-1	Sources of vitamin D : meat , fish and eggs	1
2-2	Rickets	1

Part	Answer key	Mark												
	Exercise 3													
1	Two carcinogenic compounds: tar and nicotine derivatives.	0,5												
2	Respiratory troubles (0.25pt). Cardiovascular diseases (0.25pt).	0,5												
3	<p style="text-align: center;">Percentage of smokers for each age interval</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data for Percentage of smokers for each age interval</caption> <thead> <tr> <th>Age Interval (years)</th> <th>Percentage of Smokers</th> </tr> </thead> <tbody> <tr> <td>14-15</td> <td>20%</td> </tr> <tr> <td>16-17</td> <td>48%</td> </tr> <tr> <td>18-24</td> <td>65%</td> </tr> <tr> <td>25-34</td> <td>51%</td> </tr> <tr> <td>35-44</td> <td>41%</td> </tr> </tbody> </table> <p>Histogram showing the variation of smoker's percentages as a function of age intervals.</p>	Age Interval (years)	Percentage of Smokers	14-15	20%	16-17	48%	18-24	65%	25-34	51%	35-44	41%	1,5
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4	The highest smoker's percentage (65%) corresponds to the age interval of 18-24 years, which means that young adults are the heavy smokers. (0.75pt) The percentage of adult male smokers 46 % is higher than that of adult female smokers 35%, which means that adults' males are the heavy smokers. (0.75pt) Therefore "Heavy smokers are young adult males".	1,5												
5	Launch an awareness campaign about the risks associated to smoking (0.5pt) Implement the laws that forbid smoking in public areas (0.5pt) Raise the price of cigarettes...	1												

Part	Answer key	Mark
	Exercise 4	
1	1-1- It is used to attenuate the expression wrinkles (0,5 pt)	1.5
	1-2- Botox is a protein extracted from <i>Clostridium botulinum</i> (0,5pt)	
	1-3- Muscular contraction. (0,5)	
2	It's an excitatory synapse since it transmits the nervous message from the presynaptic neuron to the muscle provoking its contraction.	1
3	- Arrival of the nervous message through the presynaptic neuron. - Exocytosis of synaptic vesicles containing neurotransmitters. - Release of neurotransmitters into the synaptic cleft. - Binding of neurotransmitters to postsynaptic membrane receptors. - Generation of a PSP at the level of postsynaptic structure.	1.5
4	exocytosis of synaptic vesicles containing neurotransmitters.	0.5
5	Botox blocks the transmission of the nervous message at the level of the synapse. This provokes muscular relaxation and thus attenuates the wrinkles that are due to muscular contraction.	0.5