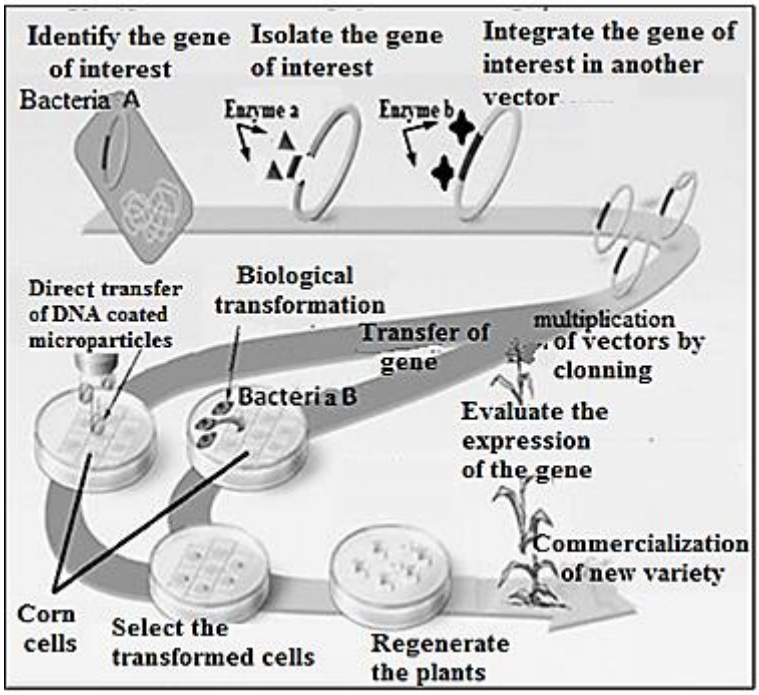
المركز التربوي للبحوث والإنماء	الهيئة الأكاديميّة المشتركة قسم العلوم	**المادة: علوم الحياة** **الشهادة: الثانوية** **الفرع: الإجتماع والإقتصاد** **نموذج رقم -١-** **المدة : ساعة واحدة**

نموذج مسابقة (يراعي تعليق الدروس والتوصيف المعدل للعام الدراسي ٢٠١٦-٢٠١٧ وحتى صدور المناهج المطورة)

Exercise 1 (6 points) Transgenesis, a Tool of Progress

Genetic engineering allows the introduction of a gene into a cell which doesn't have it originally. It also allows the deletion of a gene or the modification of the expression of a gene which is already present in the genome of a cell. The adjacent document presents transgenesis in maize (or corn), one of the first genetically modified organisms (GMO)that are cultivated on a large scale. The first commercialized GMO varieties were resistant to insects, and these were later followed by successful development of maize or corn that are resistant to herbicides, pathogenic microorganisms as well as to water stress and saline conditions.



1. Name the enzymes: a and b.
2. Draw out, by referring to the adjacent document, the benefit of the produced GMOs.
3. State another two benefits of GMOs.

Gene therapy is another technique which tends to cure diseases such as Retinitis Pigmentosa or Thalassemia.

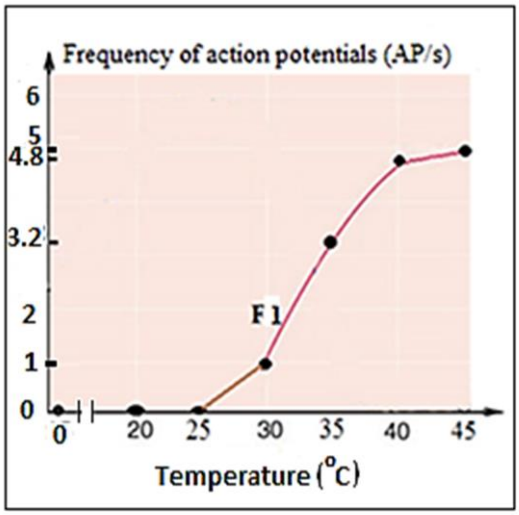
4. Indicate one difference between GMO production and gene therapy.

Exercise 2 (7 points) Cutaneous Sensitivity

The skin has various receptors that can be sensitive to hot or cold stimuli or pain stimuli (nociceptors). In order to identify the types of certain cutaneous receptors, the following experiments are carried out.

Experiment 1: An isolated cutaneous receptor (r1) is placed in ice water (0^0C). The temperature of water is changed and the frequency of the action potentials propagating along the nerve fiber F1, originating from the receptor (r1), are recorded.
The obtained results are presented in document 1.

1. Deduce the type of the sensory receptor involved in the cutaneous sensitivity shown in document 1.



Document 1

Experiment 2: The previous experimental protocol is repeated on another sensory receptor (r2). The results are presented in document 2.

Temperature (°C)	0	5	10	20	30	40	45
Frequency of AP (AP/s)	5	2	0	0	0	0	2
Amplitude of AP (mV)	90	90	0	0	0	0	90

Document 2

2. Draw the curve which represents the variation of the frequency of AP as a function of temperature.

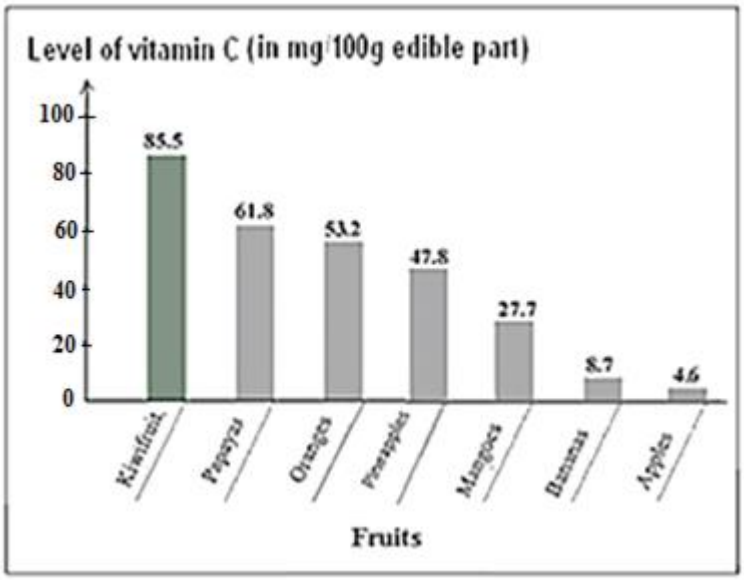
3. Show, by referring to documents 1 and 2, that this cutaneous receptor is nociceptor, a receptor sensitive to pain.

4. Determine, by referring to document 2, the type of coding of nervous message along a nerve fiber.

Exercise 3 (7 points) **Vitamin C Deficiency**

Scurvy is a disease caused by a food diet poor in vitamin C (ascorbic acid). Patients suffering from this disease may develop anemia, exhaustion, and sometimes mouth ulcer (ulcer in the gums) and loss of teeth.

Human can not synthesize vitamin C. This vitamin is destroyed under heat or extensive exposure to light. Consequently, we have to obtain it from external sources, like fresh fruits and vegetables, or some foods which are enriched in vitamin C. The adjacent document shows the level of vitamin C in the edible part of certain fruits.



1. Pick out:
   - **1.1** The cause of Scurvy.
   - **1.2** Two symptoms of Scurvy.
   - **1.3** The fruit which is the poorest and the one which is the richest in vitamin C.
2. Represent in a table the level of Vitamin C in the edible part of certain fruits in the above document.
3. Indicate, by referring to the above document, the fruit that you would suggest to be part of the food diet of a patient suffering from scurvy in Lebanon? Justify your answer by giving two reasons.
4. Justify the statement: " Patients are advised to eat fresh fruits"

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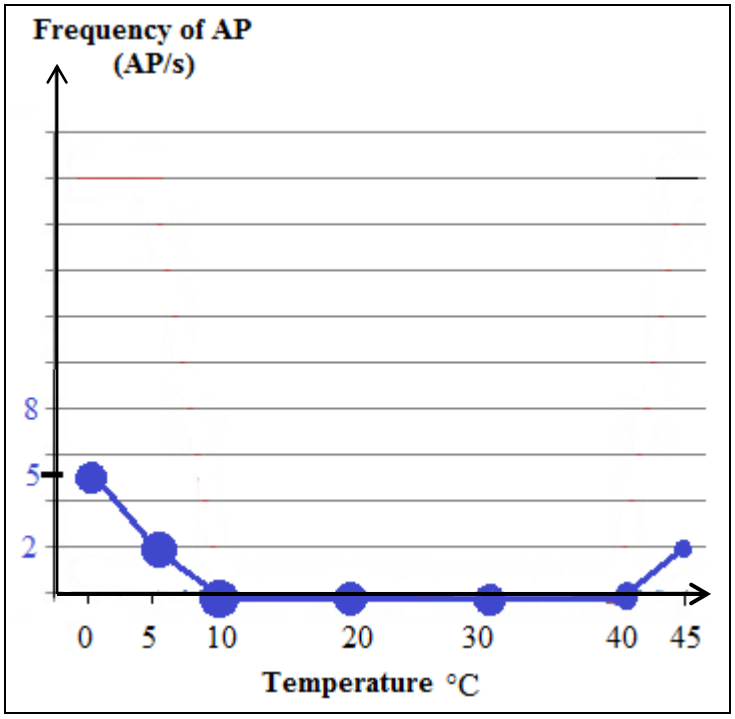
أسس التصحيح (تراعي تعليق الدروس والتوصيفّ المعدل للعام الدراسي 2016 - 2017 وحتى صدور المناهجّ المطورة)

Part of the Ex	Correction	Grade
	Exercise 1 (6 points)	
1	Enzyme a : Restriction enzyme Enzyme b : Ligase enzyme	**1.5**
2	GMOs present agronomic benefits.	**1**
3	GMOs can be beneficial for health and for protecting the environment.	**2**
4	Gene therapy is generally intended to cure individuals (or allows to treat diseases) with an abnormality, while the production of GMOs is intended to cure individuals or prevent diseases.	**1.5**

Part of the Ex	Exercise 2 (7 points)	Score
1	The frequency of action potentials along the nerve fiber F1remains null when the temperature increases from 0 to 25 ^{o}C. On the other hand, it increases to 5 AP/s when the temperature increases from 25 to 45^{o}C. Thus the sensory receptor (r1) is only sensitive to high temperatures (above 25^{o}C). Hence, (r1) is a heat sensitive thermal receptor.	**2**
2	Title: The variation of the frequency of AP in a nerve fiber F1, originating from the receptor (r2) as a function of temperature.  	**1.5**

3	The frequency of AP, recorded on the nerve fiber issued from (r2) only at a very high temperature of 45°C, or at very low temperatures below 5°C, is 2 AP/s. On the other hand, the frequency of AP propagating along F1 issued from the sensory receptor (r1) (document 1) are only recorded at high temperatures, above 25°C. Therefore, (r2) is not a thermal sensory receptor for the warm or cold, it is a sensory receptor for very low temperatures as well as for very high temperatures, so it is a nociceptor.	**2**
4	The frequency of AP increases from 2 to 5AP/s, but the amplitude of AP stays constant at 90 mV as the temperature decreases from 5 to 0^{o}C. Therefore, at the level of a nerve fiber, the nerve message is coded by modulation of frequency of AP and not by amplitude	**1.5**

Part	**Exercise 3 (7 points)**	**Mark**
1.1	Scurvy is caused by a food diet deficient in vitamin C	**1**
1.2	The symptoms of scurvy are: Anemia, exhaustion, and sometimes mouth ulcer and loss of teeth (choose 2 symptoms).	**1**
1.3	The fruit which is the poorest in vitamin C is the apple. The fruit which is the richest in vitamin C is the kiwi.	**1**
2	<table><tr><td>Fruits</td><td>Kiwi</td><td>Papaya</td><td>Orange</td><td>Pineapple</td><td>Mango</td><td>Banana</td><td>Apple</td></tr><tr><td>Level of vitamin C (mg/100g of edible part)</td><td>85.5</td><td>61.8</td><td>53.2</td><td>47.8</td><td>27.7</td><td>8.7</td><td>4.6</td></tr></table> **Title:** the variation of the level of vitamin C in mg/100g of edible part in different fruits	**1**
3	It is advisable to include kiwi in the food diet of a scurvy patient because its vitamin C content is the highest (85.5 mg / 100g of edible part) and it is available in Lebanon. or It is advisable to include orange because orange is one of the fruits which are rich in vitamin C, it constitutes 53.2 mg / 100g of the edible part. Also, since it is commonly cultivated in Lebanon it is available for all the population at a low price.	**1.5**
4	Fresh fruits are recommended to patients because they retain their nutritional value, especially vitamin C, a vitamin which is destroyed by heat or prolonged exposure to light.	**1.5**