

Answer the following exercises:

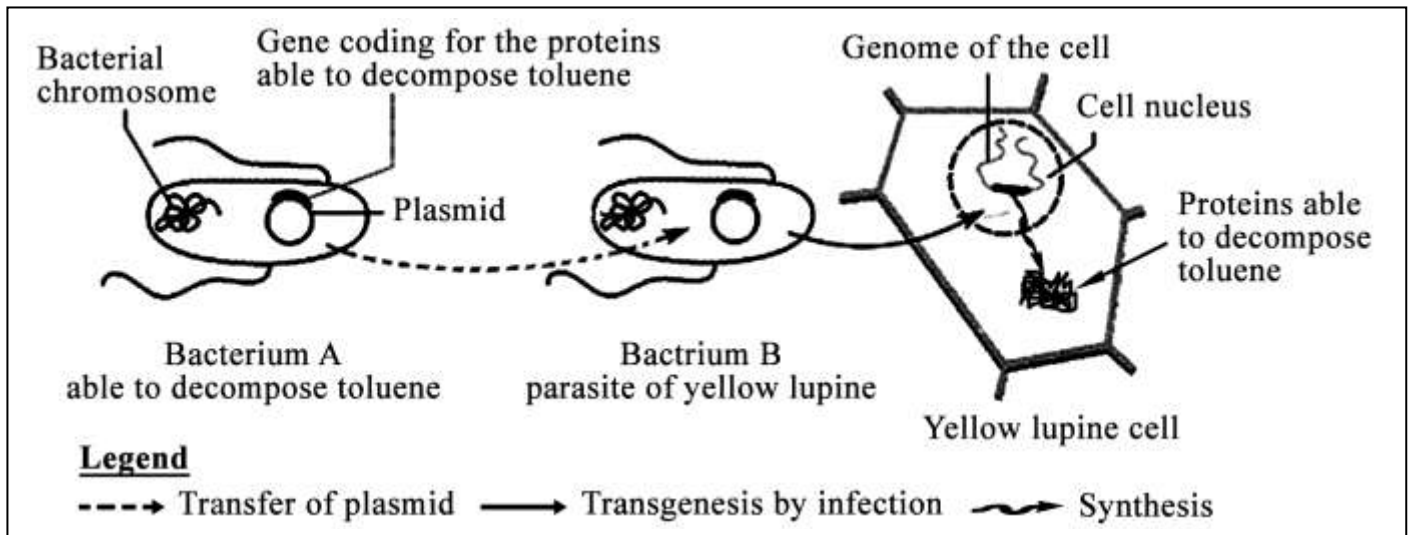
Exercise 1 (6 points)

Another Way to Depollute Soils

Some agricultural soils are contaminated by chemicals, such as pesticides or heavy metals. The presence of pollutants in soils is in general fatal for living things: these pollutants eventually accumulate in plant tissues. Once the latter are consumed by humans, they may be harmful to health.

The traditional decontamination methods usually render soils non fertile for many years. For this reason, scientists seek to find other methods like phytoremediation, which is culturing depolluting plants like the transgenic yellow lupine.

A research team has found a solution for a pollutant, the toluene, and that by adopting the technique schematized in document 1.



Document 1

- Pick out :
 - 1-1- the definition of the term: « phytoremediation ».
 - 1-2- the bad effect of the traditional decontamination methods.
- Draw out:
 - 2-1- a consequence of soils pollution regarding health.
 - 2-2- a characteristic of the lupine that is infected by the bacterium.
- Name the technique schematized in document 1. Justify the answer.
- Indicate two benefits of the technique « phytoremediation »: one on the environment and another on humans' health.

Exercise 2 (7 points)

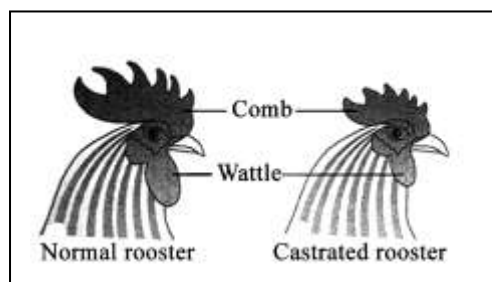
Study of Secondary Sexual Characteristics

The secondary sexual characteristics allow differentiating between males and females. In order to understand the mechanisms that determine them, the following experiments are performed.

Experiment 1:

Rooster A of « normal aspect » presents the following secondary sexual characteristics: singing, aggressiveness towards the other roosters, and developed comb and wattle.

Rooster B is submitted to the ablation of its testicles. This rooster shows the « castrated aspect » characterized by a little developed comb and wattle, absence of singing, and absence of aggressiveness towards the other roosters.



Document 1

- 1- Pick out two secondary sexual characteristics in rooster A.
- 2- Justify the following statement: « Testicles are responsible for the appearance of secondary sexual characteristics ».

Experiment 2:

Certain treatments are performed on castrated roosters X, Y and Z. The experimental conditions and results are presented in document 2.

Treatments performed on castrated roosters	Rooster X: Graft of testicles	Rooster Y: Implantation of a capsule that releases testosterone	Rooster Z: Implantation of a capsule that releases estradiol
Results	Rooster with a normal aspect	Rooster with a normal aspect	Rooster with a castrated aspect
	Presence of mating behavior	Presence of mating behavior	Absence of mating behavior

Document 2

- 3- Show that testicles act through blood.
- 4- Determine which of the two hormones is responsible for the appearance of the secondary sexual characteristics in roosters.
- 5- 5-1- Name two other hormones secreted by two different endocrine glands.
5-2- Indicate the role of each of these hormones.

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

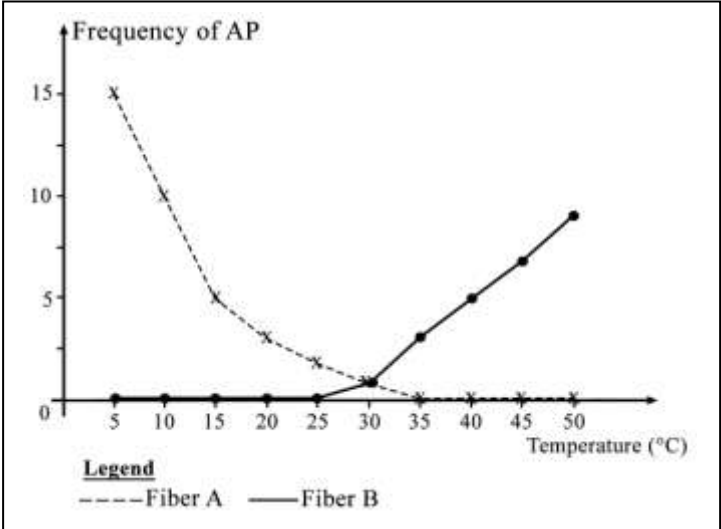
Document 1

- 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.

مسابقة في الثقافة العلمية
مادة علوم الحياة
اسس التصحيح

Part of the exercise	Exercise 1 Another Way to Depollute Soils	Grade 6pts
1-1	Phytoremediation is culturing depolluting plants.	1/2
1-2	The traditional decontamination methods usually render soils non fertile for many years.	1/2
2-1	The pollutants present in the soils eventually accumulate in plant tissues. Once the latter are consumed by humans, they may be harmful to health.	3/4
2-2	The lupine that is infected by the bacterium is able to synthesize proteins that can decompose toluene.	3/4
3	The used experimental technique is transgenesis since it consists of integrating in a plant, the yellow lupine, the gene coding for the proteins able to degrade toluene and which originates from another species, bacterium A.	1 1/2
4	-On the environment: It preserves soil fertility. -On the human's health: The toluene that has been decomposed by yellow lupine is no more accumulated in the consumed plants that become no more toxic to human health.	2

Part of the exercise	Exercise 2 Study of Secondary Sex Characteristics	Grade 7 pts
1	Singing, aggressiveness towards the other roosters, and developed comb and wattle	1
2	The secondary sexual characteristics, singing... are presented in rooster A that has his testicles. While, rooster B which is submitted to the ablation of its testicles shows little developed comb and wattle, absence of singing, and absence of aggressiveness towards the other roosters. This justifies that testicles are responsible for the appearance of secondary sexual characteristics	1
3	Following the graft of testicles, the aspect of the castrated rooster X becomes again normal showing presence of mating behavior. This implies that testicles act through blood.	1
4	The aspect becomes normal and showing the presence of mating behavior in the castrated rooster Y which is subjected to an implantation of a capsule that releases testosterone while it keeps the castrated aspect with absence of mating behavior in the castrated rooster Z which is subjected to an implantation of a capsule that releases estradiol. This shows that testosterone is the hormone responsible for the secondary sex characteristics in roosters.	1
5.1	Insulin T3 or T4 or thyroxin	1 1/2
5.2	Insulin: a hypoglycemic hormone. T3 or T4 or thyroxin: stimulates cellular oxidation.	1 1/2

Part of the exercise	<p style="text-align: center;">Exercise 3 Thermal Sensory Message</p>	Grade 7 pts																																	
<p>1</p> <p>Graph representing the variation of frequency of AP in two types of fibers A and B as a function of temperature.</p> <p>Scale : Abs : 1cm for 5°C Ord : 2cm for 5 AP</p>	 <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data points from the graph</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Fiber A Frequency (AP)</th> <th>Fiber B Frequency (AP)</th> </tr> </thead> <tbody> <tr><td>5</td><td>15</td><td>0</td></tr> <tr><td>10</td><td>10</td><td>0</td></tr> <tr><td>15</td><td>5</td><td>0</td></tr> <tr><td>20</td><td>3</td><td>0</td></tr> <tr><td>25</td><td>2</td><td>0</td></tr> <tr><td>30</td><td>1</td><td>1</td></tr> <tr><td>35</td><td>0</td><td>3</td></tr> <tr><td>40</td><td>0</td><td>5</td></tr> <tr><td>45</td><td>0</td><td>7</td></tr> <tr><td>50</td><td>0</td><td>9</td></tr> </tbody> </table>	Temperature (°C)	Fiber A Frequency (AP)	Fiber B Frequency (AP)	5	15	0	10	10	0	15	5	0	20	3	0	25	2	0	30	1	1	35	0	3	40	0	5	45	0	7	50	0	9	<p>2</p>
Temperature (°C)	Fiber A Frequency (AP)	Fiber B Frequency (AP)																																	
5	15	0																																	
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<p>2</p>	<p>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.</p> <p>Thus fiber A is the fiber which is issued from the thermal sensory receptors sensitive to cold.</p>	<p>1</p>																																	
<p>3</p>	<p>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 than 30 °C while AP are observed starting from 30°C.</p>	<p>11/2</p>																																	
<p>4</p>	<p>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.</p>	<p>1</p>																																	
<p>5.1</p>	<p>Depolarization. Repolarization. Hyperpolarisation.</p>	<p>1</p>																																	
<p>5.1</p>	<p>Depolarization: massive entry of sodium ion. Repolarization: exit of potassium ions Hyperpolarisation: slight exit of potassium ions.</p>	<p>1/2</p>																																	