

اسم :  
رقم :  
مسابقة في الثقافة العلمية  
مادة " علوم الحياة "  
المدة : ساعة

Answer the following questions.

### Question I (5 pts)

For determining the effects of tobacco at the social level, studies were done and their results are shown in the following documents.

**Nicotine dissolves easily in saliva. It crosses the mucous membranes and passes into the blood, which transports it quickly throughout the body. Reaching the cerebrum, nicotine produces exciting effects and accelerates the liberation of natural euphoriant substances. In addition to the exciting effect of tobacco, there is a feeling of relaxation. These effects lead to the repeated consumption of tobacco, without obvious inconveniences. But at a certain stage, stopping tobacco leads to troubles: the person is not able to give it up and must increase the dose to get the wanted effect.**

#### Document 1

- Pick-up from the text the effect of nicotine on the cerebrum.
- Justify, in reference to the text and the acquired knowledge, that nicotine is a drug.

Document 2 shows the results of studies done on the risk of lung cancer and asthma in non-smoker women, as a function of the number of cigarettes consumed by their husbands.

- Analyze the obtained results. Draw out the effect of tobacco at the social level.

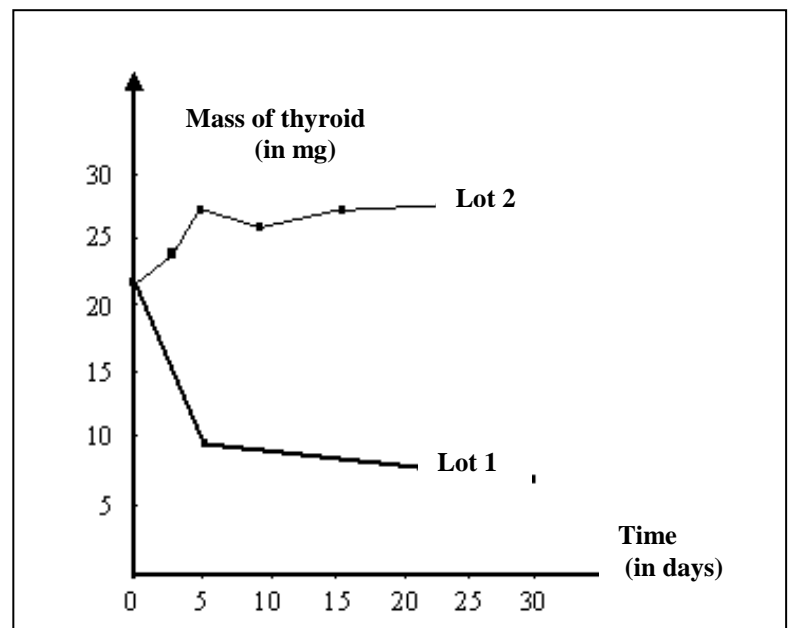
Diseases	Relative risk (in %) as a function of the number of cigarettes consumed by the husbands		
	Non-smokers	1-19 cigarettes per day	> 20 cigarettes per day
Lung cancer	1	1.61	2.1
Asthma	1	1.29	1.49

#### Document 2

### Question II (5 pts)

To determine the relation between the pituitary gland and the thyroid gland, we did the following experiment. We chose two lots of similar rats. We removed the pituitary glands of the 1<sup>st</sup> lot, and left the 2<sup>nd</sup> lot untreated, as a control. We measured the variation of the mass of the thyroid gland of both lots of rats as a function of time. The results are revealed in the adjacent document.

- Interpret the obtained results.
- By what means do the two glands communicate?
- Name the hormones secreted by the thyroid gland, and the chemical substances that enter into the composition of these hormones.



**Question III (6 pts)**

Document 1 shows the variation of the speed of conduction of a nervous message as a function of the diameter and the nature of the nerve fiber.

- a- Construct a table that includes the different values shown in document 1.
- b- Analyze the graph. What can you conclude?
- c- Specify the chemical nature of myelin and its location at the level of a neuron.

Document 2 reveals the relation between the diameter and the speed of conduction of the nervous message in two different nerve fibers: one from a squid and the other from a cat.

Nerve fiber	Diameter (in $\mu\text{m}$ )	Speed of conduction (in a.u)
Squid	650	24
Cat	4	26

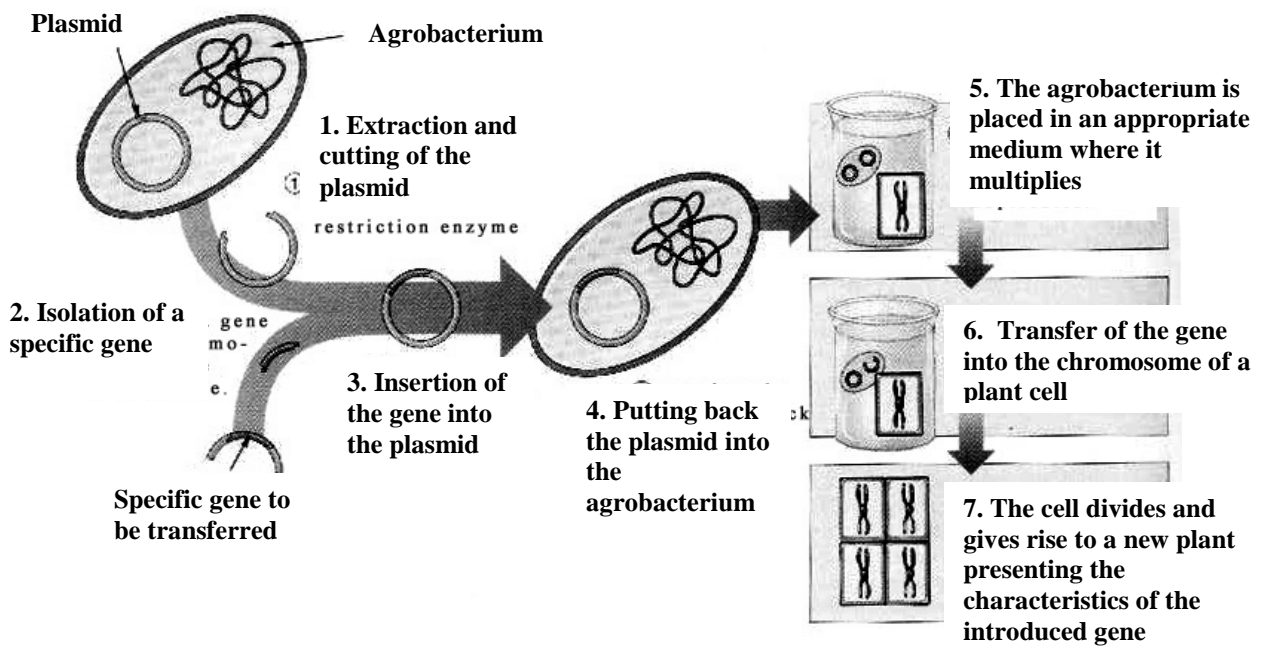
*Document 2*

- d- Formulate a hypothesis that explains the obtained results.

*Document 1*

**Question IV (4 pts)**

The following document shows the different steps of the production of a transgenic plant resistant to a certain insect.



- a- Describe, in a short text, the different steps of this production.
- b- Steps 1 and 3 necessitate the presence of enzymes, what are those enzymes?



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أسس التصحيح**Question I (5 pts)**

- a- Nicotine produces an exciting effect and accelerates the liberation of natural euphoriant substances. **(1 pt)**
- b- A substance is qualified as a drug when it causes dependence and tolerance. In fact, nicotine produces an exciting effect and relaxation, which leads to increased consumption of tobacco by the consumer without obvious inconveniences, and since the person needs to increase the dose to get the wanted effects (tolerance) and stopping tobacco causes troubles (dependence), we can say that nicotine is a drug. **(2 pts)**
- c- The risks for lung cancer and asthma in women whose husbands are nonsmokers are 1%. These risks increase when the husband consume 1 to 19 cigarettes per day to become 1.61% for cancer and 1.29% for the asthma, and they continue to increase with the increase of the cigarette consumption (> 20 cigarettes) to become 2.1% for lung cancer and 1.49% for asthma. **(1 ½ pts)**

From the preceding, we can say that tobacco increases the incidence of lung cancer and asthma in passive smokers, therefore one can say that it is harmful at the social level. **( ½ pt)**

**Question II (5 pts)**

- a- At the beginning of the experiment, the mass of the thyroid gland was 22 mg in the two lots of rats. This mass increased in the control rats to become 27 mg on the 5<sup>th</sup> day, after which it fluctuated between 26 mg and 28 mg until the 30<sup>th</sup> day. On the other hand, in the lot of rats that were subjected to the removal of the pituitary gland, the mass of the thyroid gland decreased quickly in 5 days to become 9 mg and continued to decrease but slowly to become 7 mg on the 30<sup>th</sup> day. This implies that the presence of the pituitary is necessary to the development of the thyroid gland. **(2 pts)**
- b- The two glands communicate by means of blood. **(1 pt)**
- c- Hormones: T3 and T4. **(1pt)**. The substances are: amino acids and iodine. **(1 pt)**

**Question III (6pts)**

a- (1pt)

Diameter of the nerve fiber (in $\mu\text{m}$ )	1	2	3	4
Speed of conduction of the nervous message (in a.u)				
Myelinated nerve fiber	1	5	8	15
Non-myelinated nerve fiber	0.1	0.5	1	1.5

**Variations of the speed of conduction of the nervous message as a function of the diameter and the nature of the nerve fiber**

- b- In a myelinated nerve fiber, the speed of conduction of the nervous message is 1 a.u for a diameter of  $1\mu\text{m}$ . This speed increases quickly with the increase in the diameter of the nerve fiber to become 15 a.u for a diameter of  $4\mu\text{m}$ . Similarly, in the non-myelinated nerve fiber the speed of conduction of the nervous message increases but slowly from 0.1 a.u for a diameter of  $1\mu\text{m}$  to become 1.5 a.u for a diameter of  $4\mu\text{m}$ . (1 pt)  
This implies that the speed of conduction of the nervous message increases with the increase in the diameter of the nerve fiber, and this increase is greater in a myelinated nerve fiber than that of a non-myelinated nerve fiber. We conclude that the speed of conduction depends on the diameter and the nature of the nerve fiber. (1pt)
- c- Myelin is a lipid substance (1pt) that surrounds the axon of a neuron. (1pt)
- d- Hypothesis: The nerve fiber of the cat is myelinated and the nerve fiber of the squid is non-myelinated. (1pt)

**Question IV (4pts)**

- a- We extract the plasmid of an agrobacterium and cut it. We isolate the specific gene to be transferred and we insert it into the plasmid, then we put it back into the agrobacterium. This latter is then placed in an appropriate culture medium where it multiplies. The gene is then transferred into a chromosome of a plant cell. This cell divides and gives rise to a new plant presenting the characteristics of the introduced gene. (2pts)
- b- Step 1 required a restriction enzyme (1pt) and step 3 a ligase. (1pt)