وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات الرسميّة	امتحانات الشهادة الثانوية العامة فرع الاجتماع والاقتصاد	دورة العام ٢٠١٦ الاستثنائية الإثنين ٨ آب ٢٠١٦

مسابقة في الثقافة العلمية : مادة علوم الحياة الاسم:
المدة: ساعة واحدة الرقم:

Exercice 1 (7 points) **Stress**

According to World Health Organization (WHO), the cost of stress on the society is increasing due to the increase of sickness indemnities (medical expenses) and that of the lost working days. A recent study reveals that one third of the workers complain from stress at work which is manifested by various health problems: headaches 13%, muscular pain 17% and back pain 30%.

1- Pick out the cause of the increase in the cost of stress on society.
2- Draw a histogram showing the percentage of workers affected by stress as a function of the different types of health problems.
3- State the different phases of stress indicating one characteristic for each of them.

Certain persons assume that stress may spread among individuals. In order to verify this hypothesis, two experiments were conducted.

Experiment 1: Pregnant ewes were submitted to stress (shearing of wool…). After birth, their youngsters become hyperemotional. The reactions of these youngsters were improved when they were raised in contact with a calm mother.

Experiment 2: New born mice which are subjected to stress show an increase in their cortisol level (stress hormone). Once they become adult, these mice show difficulties in facing various situations. The transfer of these mice into a non-stressful environment eliminates the negative effects due to stress.

4- Indicate if the hypothesis is validated. Justify the answer.
5- Justify, referring to experiments 1 and 2, if stress can be cured.

Exercise 2 (7 points) **Addiction and Pollution**

The faculty of medicine at the Lebanese University conducted a study where they measured the level of pollutant gases from tobacco smoke in 28 coffee shops and restaurants in Beirut. This study showed that the average concentration of these pollutant gases is 306µg/m^3, when the standard concentration admitted by the World Health Organization (WHO) is 15µg/m^3. In certain coffee shops where there are two zones, the first one is for smokers and the second one is for non-smokers, the level of pollutant gases from tobacco smoke in the second zone was lower than that in the first one, but still above the standard concentration admitted by WHO. The non-smokers or passive smokers are thus exposed, just like the addicted smokers, to 172 harmful chemical substances 67 of which are carcinogenic.

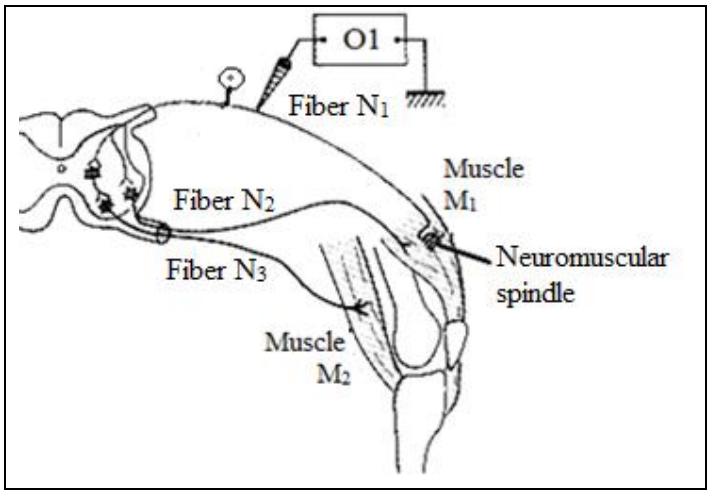
1- Show that certain places in Lebanon are highly polluted by tobacco smoke.
2- Specify if dedicating "non-smokers" zones is sufficient to protect the non-smokers against the negative effects of tobacco.

Nicotine found in tobacco stimulates directly the production of dopamine. The latter is the neurotransmitter of certain neurons involved in the control of movements, the emotional behavior and pleasure. Hence, nicotine induces a flow of this neurotransmitter in the cerebrum. Consequently, the smoker becomes a slave to tobacco: it becomes difficult for him to quit smoking despite its dangers on health.

3- Formulate a hypothesis explaining the mode of action of nicotine.
4- Determine the origin of the pleasure sensation in a smoker.
5- Explain how a young adolescent becomes addicted to nicotine.
6- Suggest two measures to be adopted in Lebanon in order to reduce the problem of tobacco addiction.

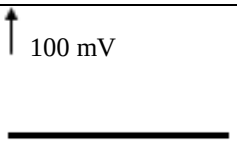
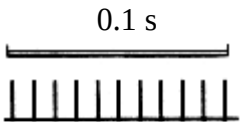
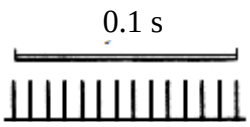
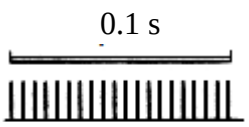
Exercise 3 (6 points) **Sensory Nervous Message**

In all striated muscles there exist receptors sensitive to stretching. They are called neuromuscular spindles.
The neuronal circuits connected to one of these neuromuscular spindles are shown in document 1.
In order to study the characteristics of the sensory nervous message, the following experiment is performed.



Document 1

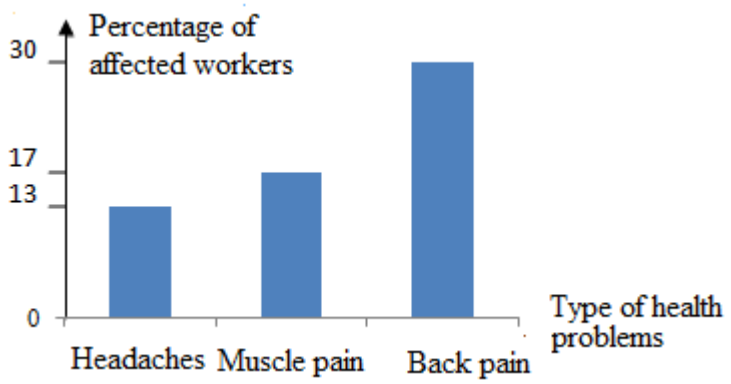
Muscle M1 of a cat is stretched by objects of increasing masses. Using the oscilloscope O1, the activity of the nerve fiber N1 issued form the neuromuscular spindle of muscle M1 is recorded and the state of this muscle is also registered. The obtained results are shown in document 2.

Mass of object (a.u)	**3**	**4**	**5**	**6**
Recording in O1 (number of AP/0.1s)				
State of muscle M1	No contraction	Contraction	Contraction	Contraction

Document 2

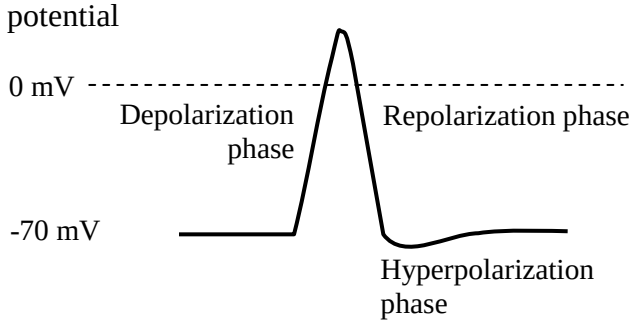
1- Specify for each of the fibers, N1, N2 and N3 (doc.1), if it is sensory or motor.
2- Indicate two characteristics of the nervous message at the level of a nerve fiber revealed by document 2. Justify the answer.
3- State, by referring to document 1 and to acquired knowledge, the different elements involved in the activity of muscle M1.
4- Draw a labeled figure of an action potential.

مسابقة في الثقافة العلمية : مادة علوم الحياة
اسس التصحيح

Q.	Exercise 1 (7 points)	Grade
1	The cost of stress on the society is increasing due to the increase of sickness indemnities (medical expenses) and that of the lost working days.	3/4
2	Variation of the percentage of workers affected by stress as a function of the different types of health problems. Scale for the ordinate: 1 cm for 10%  	2 1/2
3	**Alarm phase**: immediate, brief, triggered by nervous messages of the hypothalamus, increase of the secretion of adrenaline by the adrenal medulla. **Resistance phase**: slow, long duration, triggered by the hormones of hypothalamus and the pituitary gland, increase of the secretion of cortisol by the adrenal cortex. **Exhaustion phase**: slow, loss of K^+.	1 1/2
4	Yes it is validated, since the youngsters of a stressed mother are hyperemotional (experiment 1). Thus, stress in the mother has been transmitted to her youngsters during pregnancy.	3/4
5	The reactions of these youngsters were improved when they were raised in contact with a calm mother (Experiment 1). Similarly the negative effects due to stress are eliminated by the transfer into a non-stressful environment (Experiment 2). This shows that a non-stressful environment eliminates the negative effects of stress. Thus, stress may be cured.	1 1/2

Q.	Exercise 2 (7 points)	Grade
1	The level of pollutants from tobacco smoke in some coffee shops and restaurants in Beirut is 306µg/m^3 which is 20 times higher than the standard admitted by World Health Organization, 15µg/m^3. This shows that certain places in Lebanon are highly polluted by tobacco smoke.	1
2	Dedicating “non-smokers” zones is not sufficient to protect the non-smokers against the negative effects of tobacco since the study shows that the level of pollutant gases from tobacco smoke in these zones is always superior to the WHO standards. The non-smokers or passive smokers are exposed to 172 harmful chemical substances 67 of which are carcinogenic.	1
3	Hypothesis: Nicotine stimulates the exocytosis of dopamine. Or Nicotine stimulates the neuron that releases dopamine in a synapse.	1

4	The origin of the pleasure sensation in a smoker is the flow of dopamine in the cerebrum which is provoked by nicotine, and dopamine is the neurotransmitter responsible for the emotional behavior and pleasure.	**1**
5	The young adolescent starts smoking influenced by his environment. He gets used to smoking and searching for tobacco, this is **psychological dependency**. Then he will pass through a phase of physical **dependency** characterized by a state of withdrawal; he can't quit smoking anymore despite its dangers on health. When the desired sensation isn't reached anymore by the smoked quantity, the young adolescent increases the dose; this is **tolerance**.	**1 1/2**
6	- Implement the law that forbids smoking in public places. - Forbid selling tobacco to teenagers. - Organize anti-smoking campaigns. - Forbid tobacco advertising. - Increase the price of tobacco.	**1 1/2**

Q.	**Exercise 3 (6 points)**	**Grade**
1	Fiber N1 is sensory since it is connected to a sensory receptor and transmits messages toward the spinal cord (centripetal conduction). Fibers N2 and N3 are motor since each one is connected to an effector organ, the muscle: N2 is connected to M1 and N3 is connected to M2 and transmit the messages from the spinal cord to the effector muscles respectively M1 and M2 (centrifugal conduction).	**1**
2	- The fiber responds only starting from threshold intensity since there's always a resting potential with an intensity of 3 a.u whereas there are a series of action potentials when the stimulation intensities are superior or equal to 4 a.u. - The nervous message in a fiber is modulated in frequency of Aps and not in amplitude, since the frequency of 11 AP /0.1s increases up to 20 AP/0.1 sec keeping the same amplitude 100 mV when the stretching increases from 4 a.u to 6 a.u.	**2 1/2**
3	The elements involved in this activity are : Receptor: the neuromuscular spindle Sensory fiber: N1 Nervous center: the spinal cord Motor fiber: N2 Effector organ: muscle M1.	**1 1/4**
4	Scheme of an action potential  	**1 1/4**