

الاسم:
الرقم:

مسابقة في الثقافة العلمية - مادة علوم الحياة
المدة: ساعة واحدة

Answer the following exercises

Exercise 1 (7 points)

Respiratory Reflex

Respiration is an automatic activity. The experiments below allow to determine the different structures involved in this activity.

Experiment 1 : The destruction of the cerebrum doesn't modify respiration.

Experiment 2 : The destruction of the medulla oblongata leads to respiratory arrest.

1- Specify the location of the respiratory center.

Experiment 3: The sectioning of vagus nerves leads to apnea (respiratory arrest).

Experiment 4: The sectioning of phrenic nerves (innervating the diaphragm) and intercostal nerves (innervating the rib cage muscles) leads to apnea.

2- What can you draw out from experiments 3 and 4?

The stimulation of the central end of a sectioned fiber leads to a reaction only in case of sensory fibers. The stimulation of the peripheral end of a sectioned fiber leads to a reaction only in case of motor fibers.

Experiment 5: The stimulation of the central ends of sectioned vagus nerves leads to an acceleration of the respiratory rate. The stimulation of their peripheral ends doesn't lead to any modification in the respiratory rate.

Experiment 6: The stimulation of the peripheral ends of sectioned phrenic nerves leads to an acceleration of the respiratory rate. The stimulation of their central ends doesn't provoke any modification in the respiratory rate.

3- Determine the nature (sensory or motor) of the nervous message transmitted through the vagus nerves on one hand and through the phrenic nerves on the other hand.

Experiment 7: When lungs are artificially inflated or deflated, a respiratory movement is triggered.

4- Draw out the location of sensory receptors involved in respiration.

5- Draw a scheme that presents the different elements involved in this respiratory reflex.

Exercise 2 (6 points)

Stress and Frustration

Animals are conditioned to get their food by applying their muzzle on a movable plate in a cage.

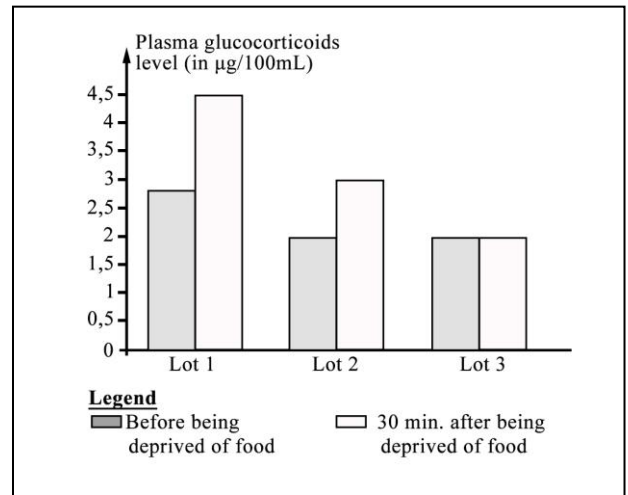
- 1- Explain how animals can acquire this conditioned reflex.

Animals which have been conditioned are deprived of food and are placed in different conditions. Their behavior is observed after being deprived of food (document 1), and their amount of plasmatic glucocorticoids (stress hormones) is measured before and 30 minutes after being deprived of food (document 2).

Conditions	Behavior after being deprived of food
Lot 1 : an animal alone	It scratches the ground and bites its tail.
Lot 2 : two animals of different breedings	They attack each other.
Lot 3 : two animals of the same breeding	They don't present any aggressive behavior.

Document 1

- 2- Determine, by referring to document 1, the factors that favor stress.
- 3- **3-1-** Analyze the results presented in document 2.
3-2- Conclude the cause of stress.
- 4- Name:
 - 4-1 - The organ that secretes glucocorticoids.
 - 4-2 - Another hormone involved in stress.



Document 2

Exercise 3 (7 points)

Binge Drinking

The « binge drinking » consists of a quick ingestion of high quantities of alcohol in order to reach drunkenness rapidly. A national authority examines a law project concerning binge drinking and aiming to make arrangements to alert the young population and to forbid the alcoholization among adolescents.

Document 1 shows the evolution of this habit in young people in a population during the last ten years. Document 2 shows the consequences of alcoholization on health.

	Drunkenness	
	1 time /year	3 times /year
2004	33%	15%
2014	46%	29%

Document 1

- 1- Draw a histogram showing the variation of the percentages of drunkenness as function of years.
- 2- Pick out the definition of the “binge drinking” and that of the ethylic coma.
- 3- Draw out the cause of the cerebral damage.
- 4- Justify, referring to documents 1 and 2, the alert raised by the national authority.

The consumption of a high quantity of alcohol can provoke an ethylic coma. It is a toxic or a metabolic coma that encompasses muscle weakness, respiratory difficulties, reduction of arterial pressure and reduction of body temperature. Ethylic coma is dangerous and may lead to death!

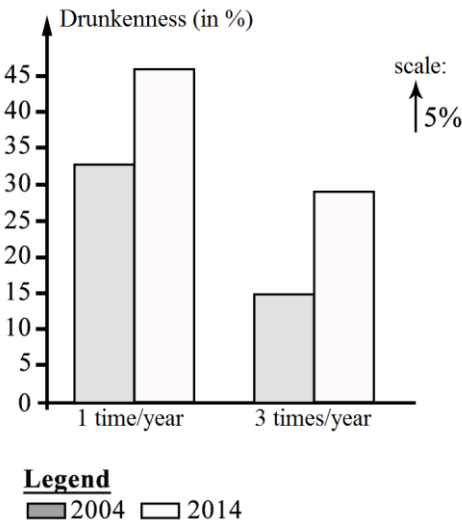
Chronic alcoholization leads to deficiencies in two vitamins, B1 and PP. This deficiency provokes the degeneration of neurons that will finally be destroyed. This cerebral damage is irreversible. The intellectual capacities are definitely reduced.

Document 2

مسابقة في الثقافة العلمية
مادة علوم الحياة
اسس التصحيح

Part of the ex	Exercise 1 Respiratory Reflex	Mark 7 pts
1	The respiratory center is located at the level of medulla oblangata since a respiratory arrest is observed after the destruction of medulla oblangata. On the contrary, there's no modification of respiration after the brain destruction.	1
2	The vagus nerves as well as the phrenic nerves and the intercostal nerves are involved in respiration	1
3	There is an acceleration of the respiratory rate only after the stimulation of central ends of the vagus nerves. Since the stimulation of the central end of a sectioned fiber leads to a reaction only in case of sensory fibers, thus the nervous message transmitted through the vagus nerves is a sensory message. There is an acceleration of the respiratory rate only after the stimulation of the peripheral ends of the phrenic nerves, and since the stimulation of the peripheral end of a sectioned fiber leads to a reaction only in case of motor fibers, thus the nervous message transmitted through the phrenic nerves is a motor message.	2
4	The sensory receptors are localized at the level of lungs	1
5		2

Part of the ex	Exercise 2 Stress and Frustration	Mark 5 pts
1	Animals can acquire this conditioned reflex by associating the two stimuli: applying the muzzle on the movable plate and getting food. Then the experiment should be repeated for many times while preventing any distraction of the animal. After that, the animal gets used to apply its muzzle on the plate to get satisfied.	11/2
2	After being deprived of food, the animal scratches the ground and bites its tail when placed alone and the two animals attack each other when they come from different breedings. On the contrary, when the two animals come from the same breeding no aggressive behavior is shown. Thus the factors that favor stress are: isolation and belonging to different breedings.	11/2
3-1	The amount of glucocorticoids increases in the isolated animal after being deprived of food, from 2.8 to 4.5 $\mu\text{g}/100\text{mL}$; this increase is higher than that observed in animals of different breedings which is from 2 to 3 $\mu\text{g}/100\text{mL}$. On the contrary, in animals of the same breeding, this amount remains constant at 2 $\mu\text{g}/100\text{mL}$.	1
3-2	Thus, being deprived of food doesn't cause stress unless there is isolation.	1/2
4-1	Adrenal cortex.	3/4
4-2	Adrenalin or CRH or ACTH or thyroxin or vasopressin or TSH	3/4

Part of the ex	Exercise 3 Binge drinking	Mark 7 pts
1	<p>Histogram showing the variation of the percentages of drunkenness as function of years</p>  <p>Legend 2004 2014</p>	2
2	<p>Binge drinking: consists of a quick ingestion of high quantities of alcohol in order to reach drunkenness rapidly. Ethylic coma: It is a toxic or a metabolic coma that encompasses muscle weakness, respiratory difficulties, reduction of arterial pressure and reduction of body temperature.</p>	2
3	<p>The cerebral damage is due to the degeneration of neurons by lack of vitamins B1 and PP</p>	1
4	<p>Drunkenness has increased from 15% to 29% between 2004 and 2014 for three drunkenness/year and 33% to 46% for one drunkenness/year (document 1). Thus there is an increase in excessive alcoholization in young people. Since alcoholization leads to ethylic coma and to irreversible brain damages (document 2), therefore the alert raised by the national authority to forbid the binge drinking is justified.</p>	2