وزارة التربية والتعليم العالي
المديرية العامة للتربية
دائرة الامتحانات الرسمية

امتحاناتللشهادة المتوسطة

دورة العام 2016 العادية
الأربعاء1حزيران 2016

مسابقة في مادة علوم الحياة والارض
المدة ساعة واحدة

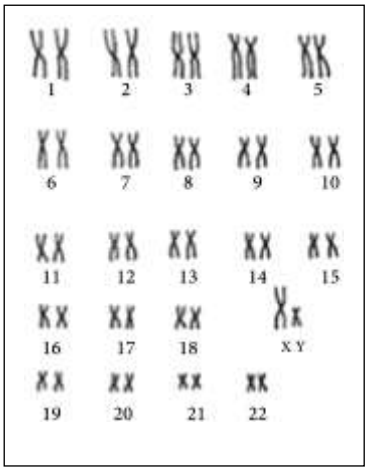
الاسم:
الرقم:

Answer the four following exercises.

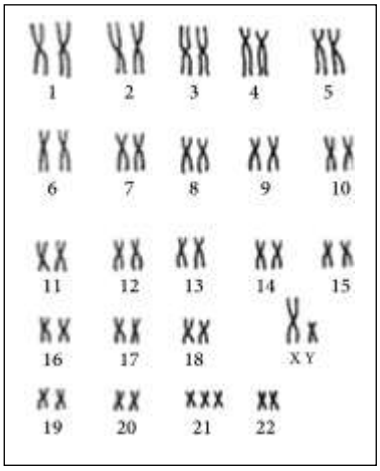
Exercise 1 (5points)

A pregnant woman is expecting twins.Her doctor suspects the presence of a chromosomal abnormality. He suggestedperforming a karyotype on the fetal cells of each of the twins A and B. The obtained results are represented in documents 1 and 2.

1- Indicate one criterion to arrange the chromosomes in a karyotype.
2- Specify the sex of each of the two fetuses.
3-Write the chromosomal formula offetus A.
4-Determineif the doubts of the doctor are verified.



Document 1
Karyotype of fetus A

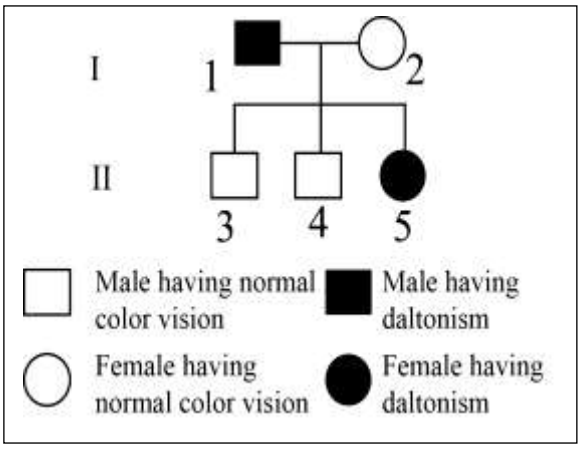


Document 2
Karyotype of fetus B

Exercise 2 (5points)

The gene responsible for the normal color vision in man is localized on chromosome X butnot on chromosome Y.
The allele responsible for normal color vision,**N** is dominant over the allele responsible for daltonism, **d**.

1- Indicate the genotype of a malehaving:
a.daltonism
b. normal color vision.



The adjacent document reveals the pedigree of a family whose certain members are daltonian.
2-Specify the genotype of female II-5.

Female II-5 marries a man withnormal color vision.

3-Make the necessary factorial analysis to determine the phenotypic proportions of the descendants of this couple.

Exercise3 (5points)

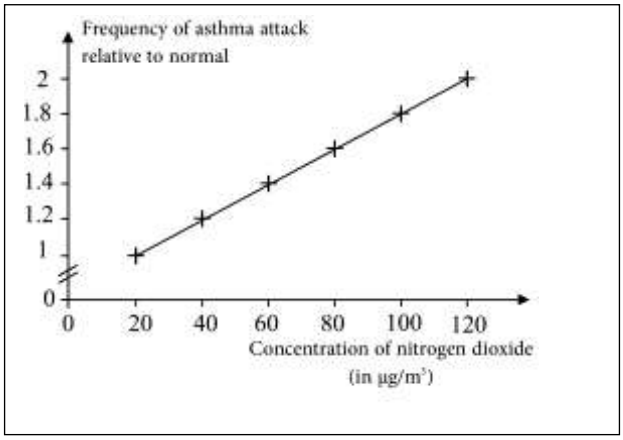
Asthma is a disease due to the inflammation of bronchi and bronchioles. Asthma attack is manifested by: difficulty of respiratory movements, a whistle during expiration and an irritating cough.

1-Pick out from the text:

a-the cause of asthma

b-the symptoms which characterize an asthma attack.

A study is performed to determine the effect of the air polluted by nitrogen dioxide on the frequencyof asthma attack.The results are represented in the adjacent document.



2- Draw a table showing the variation of the frequency of asthma attack as a function of the concentration of nitrogen dioxide

3- Justify that nitrogen dioxide favors asthma attack.

Exercise 4 (5 points)

Pineapple juice contains the protease Bromeline. To verify if this enzyme has the same efficiency as the proteases secreted by the pancreas, the following experiment is performed.

Three test tubes A, B and C are placed in a water bath at 37^0C for a convenient period of time. The tubes contain:

Tube A: water + chopped coagulated albumin

Tube B: water + chopped coagulated albumin + Pineapple juice

Tube C: water + chopped coagulated albumin + Pancreatic juice

At the beginning of the experiment, the aspect of the three tubes is turbid. At the end of the experiment, the aspect of tube A stays turbid, but the aspect of tubesB and C becomes clear.

1- Name the protease present in the pine apple juice and a protease present in the pancreatic juice.

2- Pose the problem at the origin of thisperformed experiment.

3- Interpret the obtained results.

At the end of the experiment, the quantity of amino acids measured in both tubes B and C is the same.

4- Show that Bromeline and pancreatic protease have the same efficiency.

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مشروع معيار التصحيح

مسابقة في مادة علوم الحياة والارض
المدة ساعة واحدة

Exercise 1 (5 points)

Part ofthe Q	Answer	Mark
1	The chromosomes are arranged in homologous pairs: depending on the following criteria: the size of the chromosome; the position of centromere; and the banding patterns. **OR:** The homologous pairs of chromosomes are arranged in decreasing order of length.	1
2	Both fetuses are males since their karyotypes reveal the presence of the sex chromosomes or gonosomes X & Y.	1 1/2
3	Chromosomic formula of fetus A: 46,XY or 44+XY	1
4	In a normal karyotype chromosomes exist in pairs. However in fetus B there exists 3 chromosomes 21 instead of 2 and this is not normal. Thus, the doubts of the doctor are verified..	11/2

Exercise 2 (5 points)

Part of the Q	Answer	Mark
1.a	Genotype of a male having daltonism : $\mathbf{X^dY}$ **or** $\mathbf{X^d// Y}$	3/4
1-b	Genotype of a male having normal color vision : $\mathbf{X^NY}$ or $\mathbf{X^N// Y}$	3/4
2	The genotype of female 5 is X^dX^dsince female 5is color blind and the allele responsible for color blindness is recessiveandis only expressed phenotypically when it is present in two copies (homozygous state).	11/2
3	**Parent's phenotype:** ♀Daltonian X ♂ Normal Female Male **Parent's genotype:** ♀X^dX^d X ♂X^NY **Gametes:** X^d ½ X^N½ Y **Table of cross:** ♂ / ♀ | ½ X^N | ½ Y 1 X^d | ½ X^NX^d | ½ X^dY Phenotypic proportions: All females are normal and all males are daltonic OR ½ of the descendants are normal females ½ of the descendants are daltonian males	2

Exercise 3 (5 points)

<table>
<tr><th>Part ofthe Q</th><th>Answer</th><th>Mark</th></tr>
<tr><td>1a</td><td>Asthma is due to an inflammationof bronchi and bronchioles</td><td>1/2</td></tr>
<tr><td>1b</td><td>The symptoms are : difficulty of respiratory movements, a whistle during expiration, irritating cough</td><td>1</td></tr>
<tr><td>2</td><td>.
<table><tr><td>Concentration of nitrogen dioxide (in µg/m^3)</td><td>20</td><td>40</td><td>60</td><td>80</td><td>100</td><td>120</td></tr><tr><td>Frequency of asthma attackrelative to normal</td><td>1</td><td>1.2</td><td>1.4</td><td>1.6</td><td>1.8</td><td>2</td></tr></table>Variation of the frequency of asthma attack as a function ofthe concentration of nitrogen dioxide</td><td>21/2</td></tr>
<tr><td>3</td><td>Nitrogen dioxide favorsasthmaticattackbecause the frequency of asthmatic attackincreases from 1till 2relative to normal when the concentration of nitrogen dioxide increases from 2 to 120 µg/m^3 .</td><td>1</td></tr>
</table>

Exercise 4 (5 points)

<table>
<tr><th>Part of the Q</th><th>Answer</th><th>Mark</th></tr>
<tr><td>1</td><td>The protease found in pineapple juice is Bromeline
The protease found in pancreatic juice is Trypsin</td><td>2</td></tr>
<tr><td>2</td><td>DoesBromeline have the same efficiencyas the protease secreted by the pancreas?</td><td>1</td></tr>
<tr><td>3</td><td>The aspect remains the same, turbid, in tube A containing water with chopped coagulated albumin; on the contrary, it becomes clear in the tubes B and C containing respectively pineapple juice and pancreatic juices. This shows that, protease in pineapple juice and pancreatic protease are responsible for the transformation of proteins.</td><td>1</td></tr>
<tr><td>4</td><td>The same quantity of amino acids in both tubes B and C shows that the digestion of albumin is complete in the presence of Bromeline or pancreatic protease. Thus Bromeline has the same efficiency as the pancreatic protease.</td><td>1</td></tr>
</table>