وزارة التربية والتعليم العالي
المديرية العامة للتربية
دائرة الامتحانات

امتحانات الشهادة المتوسطة — دورة سنة 2005 الاستثنائية

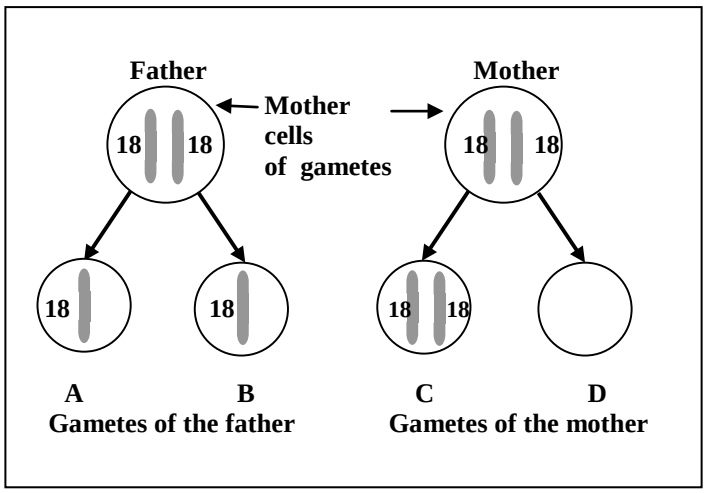
مسابقة في علوم الحياة والارض
المدة : ساعة واحدة

الاسم :
الرقم :

Answer the following questions.

Question I (4 ½ pts.)

The adjacent document shows an error in the segregation of chromosome pair 18 during gamete formation in a given couple.



a- Compare the gametes of the father with the gametes of the mother.

b- Determine the number of chromosomes 18 in the zygotes that may result from the union of these gametes. Justify the answer.

c- Name the abnormality that results from the union of gamete **C** with one of the father's gametes.

Question II (3 pts.)

Fadi and Ziad meet at a restaurant for lunch. Each one of them chooses a menu as presented in document 1.
Four hours after lunch, we remove a sample of the contents of the small intestine of Fadi and another sample from the intestine of Ziad.
Document 2 reveals some of the nutrients of these contents.

Name	Menu
Fadi	Fish + carrots + grapes
Ziad	Chicken + Salad + apple

Document 1

Nutrients of the contents of the small intestine of each of Fadi and Ziad
Glucose, Amino acids, Fatty acids, glycerol …

Document 2

a- Determine the organic material which is at the origin of each nutrient shown in document 2.

b- Explain why the nutrients of the small intestine of each of Fadi and Ziad are the same, although the two menus are different.

After this meal, the analysis of blood that leaves the small intestine of each of Fadi and Ziad shows an increase in the quantity of glucose, amino acids…

c- Formulate a hypothesis that explains this increase.

Question III (6 pts.)

The gene that controls blood clotting is located on the sex chromosome X. The presence of an allele "N" leads to normal blood clotting if it is alone in a man, or associated with another allele "N" or an allele "h" in a woman. The allele "h" causes the absence of normal clotting if it is alone in a man, or associated with another allele "h" in a woman. The absence of blood clotting is a sickness known as haemophilia.
The alleles of this gene "N" and "h" have the same location on chromosome X.

a- In reference to the text, write the different possible combinations of these alleles in a man and a woman, knowing that the sex chromosomes in a woman are XX and in a man are XY.

A normal heterozygote woman for this gene is married to a normal man.
b- Is this couple in risk of having a haemophiliac child?
Justify the answer by making the necessary factorial analysis.

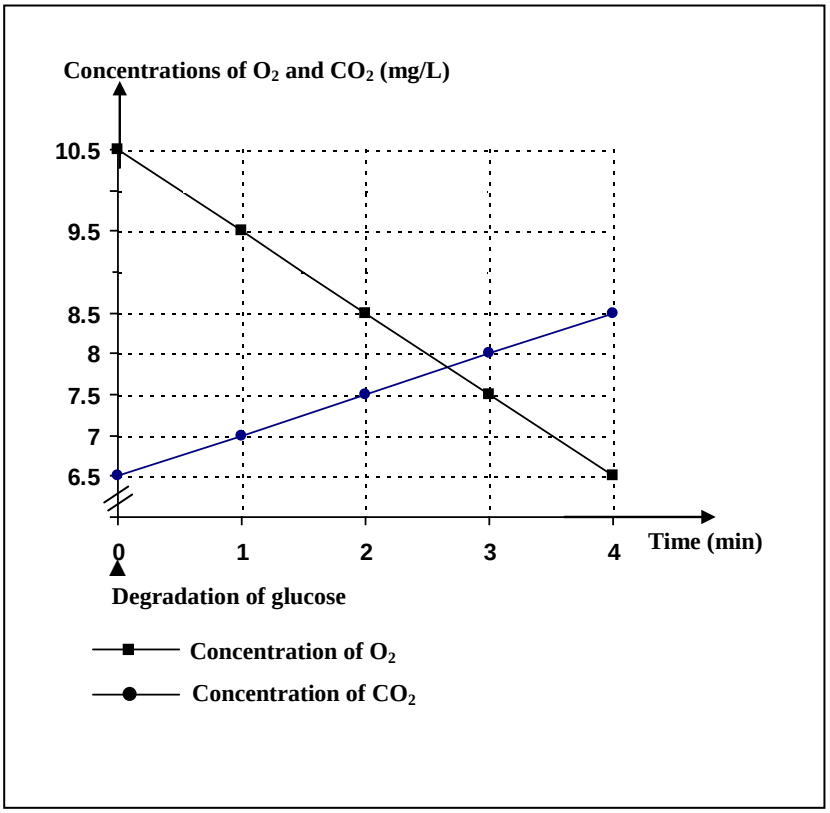
Question IV (6 ½ pts.)

The graph in the adjacent document shows the variation of the concentrations of oxygen and carbon dioxide during the degradation of glucose in an animal cell.

a- Based on the document, represent, in the same table, the different values that show the variation of the concentrations of O_2 and CO_2 in function of time.

b- Analyze the graph. What can you conclude?

c- Name the reaction of the degradation of glucose in the presence of O_2.



اسس التصحيح
مسابقة في علوم الحياة والارض

Question I (4 ½ pts.)

a- Each of the father's gamete A and B contains one chromosome 18, While gamete C of the mother contains two chromosomes 18 and gamete D does not contain any. **(2 pts.)**

b- The number of chromosomes 18 is 3 or 1 **(½ pt + ½ pt)**

- 3: in the zygote which results from the union of the gametes A or B of the father having one chromosome 18 with the gamete C of the mother having two chromosomes 18. **(½ pt)**
- 1: in the zygote which results from the union of the gamete A or B of the father having one chromosome 18 with the gamete D of the mother that does not contain any chromosome 18. **(½ pt).**

c- Trisomy 18 **(½ pt).**

Question II (3pts)

a- The origin of glucose is carbohydrates **(½ pt)**
The origin of amino acids is proteins **(½ pt)**
The origin of fatty acids and glycerol is lipids **(½ pt)**

b- The two menus have similar composition in organic materials (carbohydrates, proteins, and lipids) that is why the nutrients of the contents of the small intestine of Fadi and Ziad are the same. **(1 pt).**

c- Hypothesis: There is a passage of glucose, amino acids… from the small intestine into the blood. **(½ pt.)**

Question III (6 pts.)

a- The possible combinations are:

- In a female : $X^N X^N$ **(½ pt)**
  $X^N X^h$ **(½ pt)**
  $X^h X^h$ **(½ pt)**
- In a male : $X^N Y$ **(½ pt)**
  $X^h Y$ **(½ pt)**

b- Yes **(½ pt)**
$P : X^N X^h \times X^N Y$ **(½ pt)**

$\gamma P : X^N , X^h \quad X^N , Y$ **(1 pt)**
½ ½ ½ ½

Table of the cross:

♀ \ ♂	X^N ½	Y ½
X^N ½	$X^N X^N$ ¼	$X^N Y$ ¼
X^h ½	$X^N X^h$ ¼	$X^h Y$ ¼

(1 pt)

From the table of the cross : ¼ haemophiliac children **(½ pt.)**

<u>Question IV</u> (6 ½ pt)

a-

Time (min)	**0**	**1**	**2**	**3**	**4**
Concentration of O_2 (mg/L)	**10.5**	**9.5**	**8.5**	**7.5**	**6.5**
Concentration of CO_2 (mg/L)	**6.5**	**7**	**7.5**	**8**	**8.5**

Table showing the variations of the concentration of O_2 and CO_2 in function of time **(3 pts)**

b- At time 0 minutes, the time at which glucose degradation begins, the concentration of O_2, which was 10.5 mg/L decreases to reach 6.5 mg/L at minute 4; while the concentration of CO_2, which was 6.5 mg/L at time 0 minute increases to reach 8.5 mg/L at minute 4. **(2 pts.)**

This shows that during the degradation of glucose there is a consumption of O_2 and a release of CO_2.

Therefore, the animal cell needs O_2 for the degradation of glucose. **(1 pt)**

c- This is an oxidation reaction. **(½ pt)**