

دورة سنة ٢٠٠٨ العادية	الشهادة المتوسطة	وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات
الاسم: الرقم:	مسابقة في مادة علوم الحياة والأرض المدة: ساعة واحدة	

**Answer the four following exercises:**

**Exercise I (5 points)**

**Role of some structures of the circulatory system**

Precise the principle role of each of the following structures:

- 1- Artery.
- 2- Vein.
- 3- Blood capillaries.
- 4- Sigmoid valves.
- 5- Hemoglobin of red blood cells.

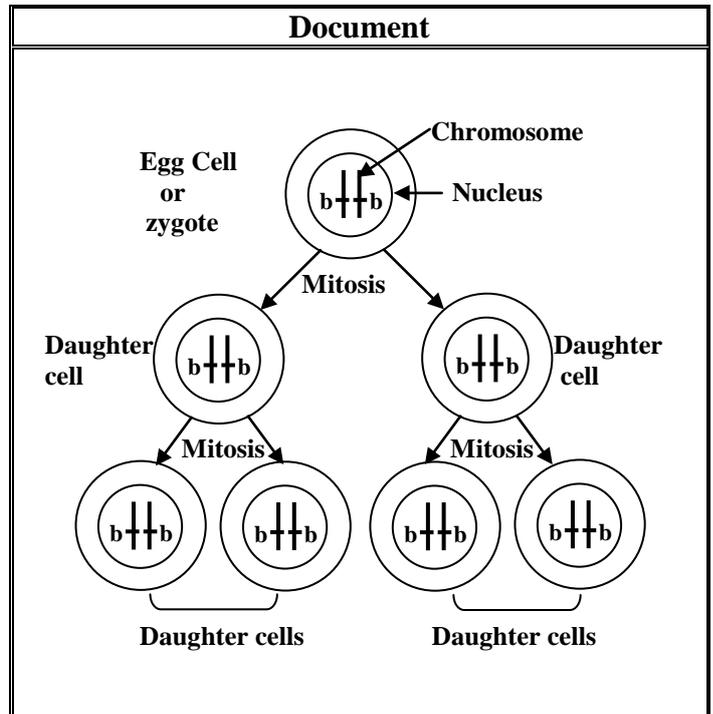
**Exercise II (5 points)**

**Mitosis and conformed reproduction**

The number of chromosomes contained in the nucleus of an egg-cell or a zygote and the genetic information carried by these chromosomes are conserved at each mitotic division, **opposite document**.

To simplify the diagram, we present a pair of homologous chromosomes that carries information "b".

- 1- Indicate the origin of each chromosome of this pair contained in the nucleus of the egg-cell.
- 2- By referring to the **opposite document** :
  - a- Precise the number of cells obtained at the end of each mitosis.
  - b- Compare the number of chromosomes and the genetic information of the egg-cell to those of each of the daughter cells.  
Draw out a conclusion.



### Exercise III (5 points)

#### Transmission of a hereditary characteristic in minks

In minks, fur color is determined by a gene located on an autosome.

We cross a mink having white fur of pure race with another mink having black fur of pure race. All minks obtained in the first generation  $F_1$  have black and white striped fur.

- 1- Is this the case of dominance or codominance ? Justify the answer.
- 2- Designate by symbols the corresponding alleles.
- 3- Write the genotypes of parents and that of  $F_1$ .

The cross of  $F_1$  minks among themselves gives in  $F_2$  generation:

- 50% minks of white and black striped fur
- 25% minks of white fur
- 25% minks of black fur.

- 4- Construct a histogram (bar graph) that represents the results obtained in  $F_2$ .

### Exercise IV (5 points)

#### Digestion of sucrose

Sucrase is an intestinal enzyme that acts on sucrose (double sugar) and permits its digestion.

To verify this hypothesis, we perform an

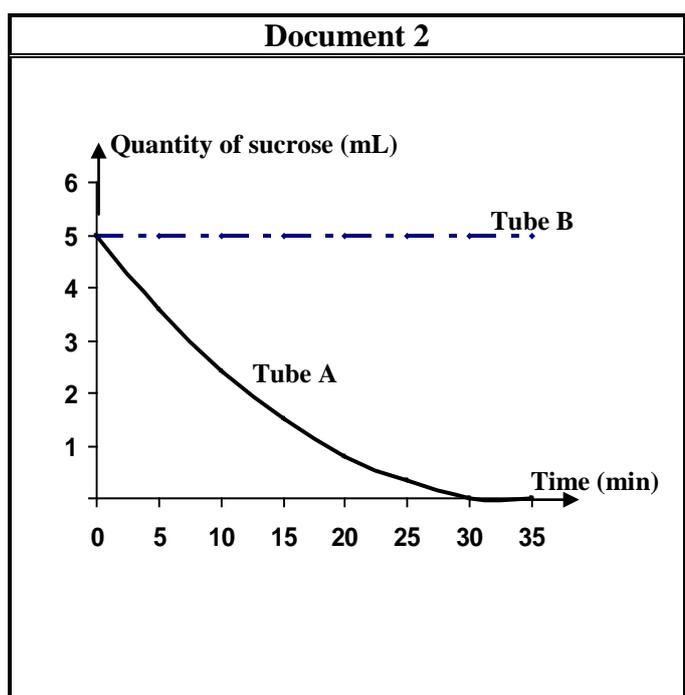
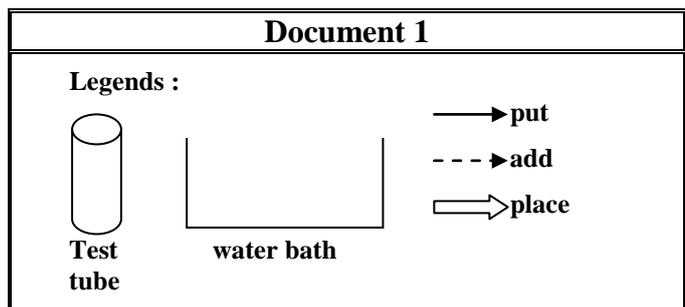
in vitro digestion of sucrose as follows :

- We put 5 mL of sucrose solution in each of two test tubes **A** and **B**.
- We add a very small quantity of sucrase enzyme to tube **A** only.
- Then, we place the two tubes **A** and **B** in a water bath at a temperature of  $37^\circ\text{C}$  for thirty minutes.

- 1- Using the legends of **document 1**, translate the above text into a diagram showing the conditions of this experiment.

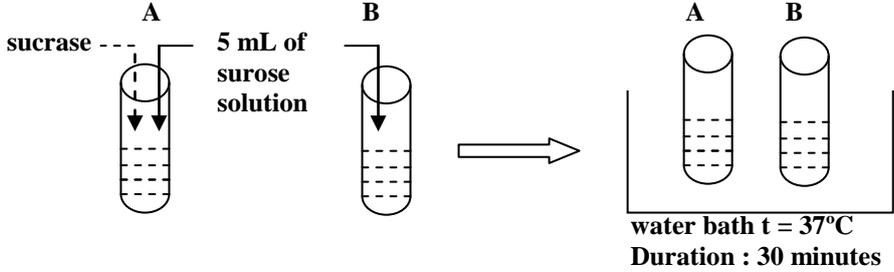
After 30 minutes, we measure the quantity of sucrose in each of the two tubes **A** and **B**. The measured results are revealed in **document 2**.

- 2- Pick out from the text the tested hypothesis.
- 3- Is this hypothesis validated? Justify the answer based on the analysis of the results, **document 2**.
- 4- Name the test that permits to verify the presence of simple sugars resulting from this digestion of sucrose.



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Part of the Q	Answer	Mark								
I.1	An artery carries blood from heart to organs.	1								
I.2	A vein brings back blood from organs to heart.	1								
I.3	Blood capillaries are vessels where the exchanges (of respiratory gases, nutrients and wastes) between the cells and blood take place.	1								
I.4	Sigmoid valves prevent the reflux of blood from arteries into ventricles.	1								
I.5	Hemoglobin assures the transport of respiratory gases.	1								
II.1	In the nucleus of an egg-cell, one chromosome of this pair is of paternal origin and its homologue is of maternal origin.	1								
II.2-a	The number of cells obtained at the end of each mitosis is two.	1								
II.2-b	The number of chromosomes that is two in the nucleus of the egg-cell remains two in the nucleus of each of the daughter cells obtained at the end of each mitosis. Similarly, information "b" carried by each of the two chromosomes of the egg-cell remains the same in each of the daughter cells. Thus, mitosis allows for the conservation of the number of chromosomes and consequently the genetic information.	3								
III.1	It is the case of codominance, because all the minks obtained in F <sub>1</sub> have black and white striped fur. In this new phenotype the two alleles white and black are equally expressed.	1.5								
III.2	Symbol of alleles : W : white B : black	0.5								
III.3	Genotypes of F <sub>1</sub> parents : White : WW Black : BB Genotype of F <sub>1</sub> : WB	1.5								
III.4	<p style="text-align: center;"><b>Histogram showing the results of F<sub>2</sub></b></p> <table border="1"> <caption>Data for Histogram showing the results of F<sub>2</sub></caption> <thead> <tr> <th>Mink's fur</th> <th>percentage</th> </tr> </thead> <tbody> <tr> <td>white</td> <td>25</td> </tr> <tr> <td>black</td> <td>25</td> </tr> <tr> <td>white and black</td> <td>50</td> </tr> </tbody> </table>	Mink's fur	percentage	white	25	black	25	white and black	50	1.5
Mink's fur	percentage									
white	25									
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<b>V.1</b>	 <p><b>Title : Diagram showing the conditions of the experiment.</b></p>	<b>1.5</b>
<b>V.2</b>	<b>Tested Hypothesis :</b> Sucrase is an intestinal enzyme that acts on sucrose and permits its digestion.	<b>1</b>
<b>V.3</b>	<p>Yes.</p> <p><b>Justification:</b></p> <p>In tube <b>A</b> containing sucrase, the quantity of sucrose is 5 mL at the beginning of the experiment. This quantity decreases progressively with time and becomes nul after 30 minutes; while in tube <b>B</b> lacking sucrase, the quantity of sucrose remains 5 mL during the whole experiment. This shows that sucrase permits the digestion of sucrose.</p>	<b>2</b>
<b>V.4</b>	It is fehling test.	<b>0.5</b>