

الدورة الإستثنائية للعام 2011	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:

### First exercise (5 points)

#### Transmission of a hereditary character in tomato plants

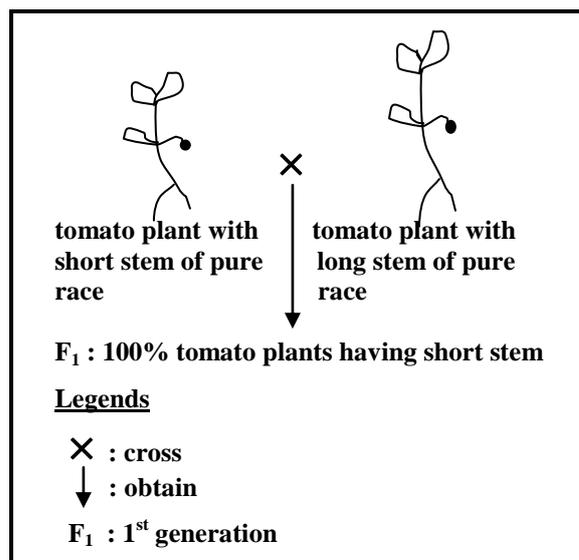
The opposite **document** represents the cross between tomato plants that differ in one character : size of stem (short stem and long stem).

- 1- Translate into a text the cross represented in the **document** by using the given legends.
- 2- Indicate the dominant allele. Justify your answer.
- 3- Designate by symbols the corresponding alleles.

Upon crossing a tomato plant of  $F_1$  having short stem with a tomato plant having long stem, we obtain in  $F_2$  :

- 50% tomato plants with short stem
- 50% tomato plants with long stem.

- 4- Make a factorial analysis that permits to verify the experimental result obtained in  $F_2$ .



### Second exercise (5 points)

#### Cellular oxidation

*"Neither oxygen nor nutrients accumulate inside the cells, rather they are consumed. The degradation of nutrients such as glucose is linked to the consumption of oxygen gas. This degradation is a chemical reaction that produces wastes, for example carbon dioxide..."*

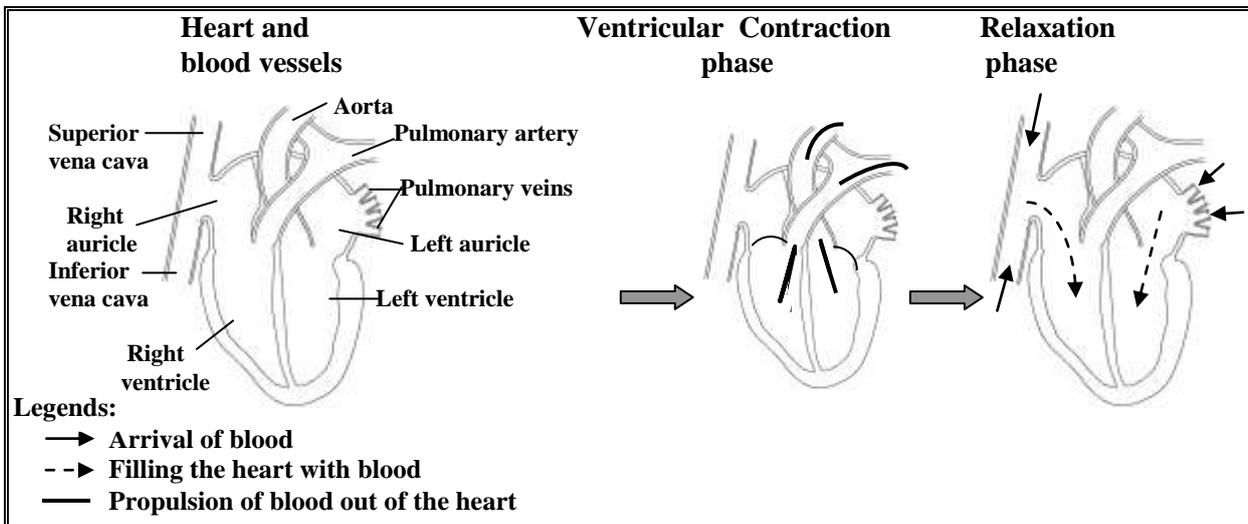
*The water produced during this degradation, is not considered as waste since it is necessary for the life of the cell, it is the same as the liberated energy that has different uses."*

- 1- By referring to the text, pick out :
  - a- a sentence which indicates that nutrients and oxygen gas are consumed inside the cell
  - b- the sentence which explains that "**Water is not considered as waste.**"
- 2- a- Name the chemical reaction where the degradation of glucose requires the consumption of oxygen gas.
  - b- Write the corresponding chemical equation of this reaction.
- 3- Explain the following expression : "**The liberated energy during this degradation has different uses.**"

### Third exercise (5 points)

#### The heart, motor organ of blood circulation

The heart contracts and relaxes in a rhythmic way. It ensures the circulation of blood. The **document** below shows the organization of the heart, the principle blood vessels and two phases of cardiac activity.



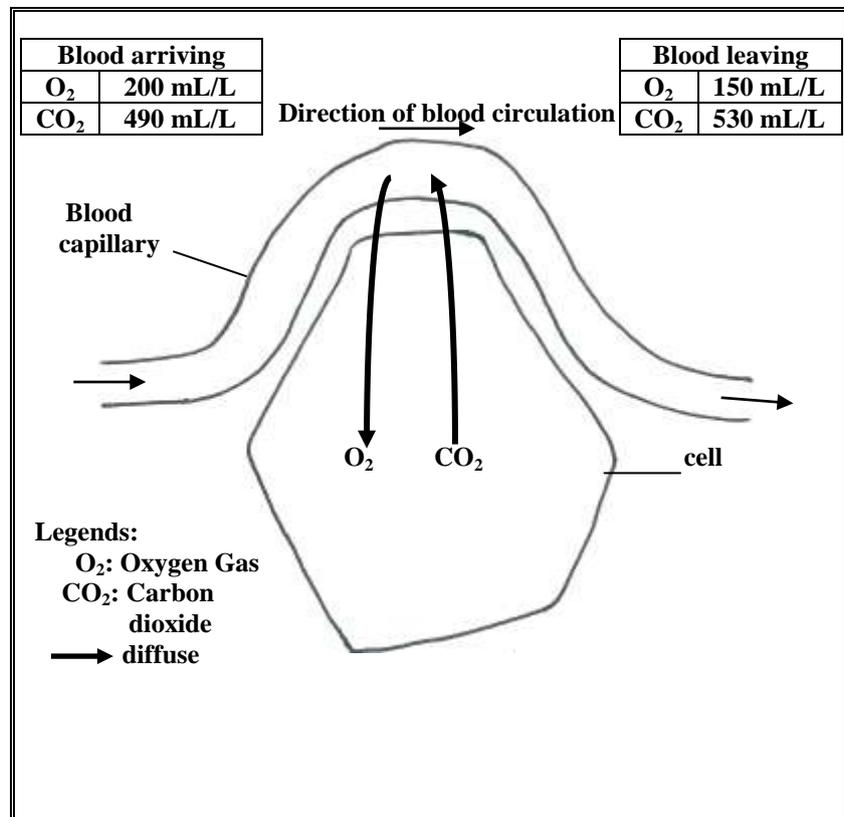
- By referring to the above **document**, indicate :
  - the blood vessels that ensure the arrival of blood to the heart and those that ensure its exit out of the heart
  - what happens during the ventricular contraction and relaxation phases of the heart.
- Name the valves that open during the ventricular contraction and relaxation phases.

### Fourth exercise (5 points)

#### Gaseous exchange at the cellular level

The opposite **document** represents the gaseous exchange at the cellular level.

- Compare the composition of  $O_2$  and  $CO_2$  gases in the blood arriving to a cell and in the blood leaving it.
  - Draw out of this comparison, the gas consumed and the gas released by the cell.
- Using the legends (opposite **document**), describe the direction followed by  $O_2$  and  $CO_2$  gases at the level of this cell.
- Explain why  $O_2$  gas and  $CO_2$  diffuse in such directions.





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### First exercise (5 points)

Part of the Q	Answer	Mark								
1	We cross a tomato plant having short stem of pure race with a tomato plant having long stem of pure race. We obtain in the 1 <sup>st</sup> generation 100% tomato plants having short stem.	1.5								
2	The allele determining short stem is dominant over the allele determining long stem, because all plants obtained in F <sub>1</sub> have only one phenotype : short stem.	0.75								
3	Symbols of alleles: S : short stem- dominant allele l : long stem- recessive allele	0.5								
4	Factorial analysis: P: ♂ S l × ♀ l l γP :  50% 50% 100% Table of cross : <table border="1" data-bbox="399 1086 1005 1243"> <tr> <td></td> <td>♂</td> <td>S 50%</td> <td>l 50%</td> </tr> <tr> <td>♀</td> <td>l 100%</td> <td>S l 50%</td> <td>l l 50%</td> </tr> </table> From the table we obtain 2 phenotypes: 50% [S] 50% [ l ] Thus, the experimental result is confirmed.		♂	S 50%	l 50%	♀	l 100%	S l 50%	l l 50%	2.25
	♂	S 50%	l 50%							
♀	l 100%	S l 50%	l l 50%							

### Second exercise (5 points)

Part of the Q	Answer	Mark
1-a	Neither oxygen nor nutrients accumulate inside the cells, rather they are consumed. <b>Or</b> Degradation of nutrients such as glucose requires the consumption of oxygen gas.	1
1-b	Water is necessary for the life of the cell.	1
2-a	The cellular oxidation is the chemical reaction where the degradation of glucose requires the consumption of oxygen gas.	0.5
2-b	Glucose + oxygen → carbon dioxide + water + energy	1
3	The liberated energy during this degradation has different uses, because part of it dissipates in the form of heat and part is used in cellular activity.	1.5

**Third exercise (5 points)**

<b>Part of the Q</b>	<b>Answer</b>	<b>Mark</b>
<b>1-a</b>	The blood vessels that ensure the arrival of blood to the heart are : superior and inferior vena cava and pulmonary veins. The blood vessels that ensure the exit of blood out of the heart are : aorta and pulmonary arteries.	<b>2</b>
<b>1-b</b>	During the ventricular contraction phase, blood is propelled out of the heart. During the relaxation phase, blood arrives and fills the heart.	<b>2</b>
<b>2</b>	The sigmoid valves open during the ventricular contraction phase. The tricuspid and the bicuspid valves open during the relaxation phase,	<b>1</b>

**Fourth exercise (5 points)**

<b>Part of the Q</b>	<b>Answer</b>	<b>Mark</b>
<b>1-a</b>	The quantity of <b>O<sub>2</sub></b> gas in the blood arriving to a cell is 200 mL/L which is higher than the quantity of <b>O<sub>2</sub></b> gas in the blood leaving it which is 150 mL/L; but the quantity of <b>CO<sub>2</sub></b> in blood arriving to a cell is 490 mL/L which is lower than the quantity of <b>CO<sub>2</sub></b> in blood leaving it which is 530 mL/L.	<b>1.5</b>
<b>1-b</b>	The consumed gas is <b>O<sub>2</sub></b> gas and the released gas is <b>CO<sub>2</sub></b> gas.	<b>1</b>
<b>2</b>	<b>O<sub>2</sub></b> gas diffuses from blood (or blood capillary) to the cell and <b>CO<sub>2</sub></b> diffuses from the cell to the blood (or blood capillary).	<b>1</b>
<b>3</b>	A gas diffuses from a medium of high concentration (or high pressure) to a medium of low concentration (or low pressure). This is why <b>O<sub>2</sub></b> gas diffuses from blood having a high concentration of <b>O<sub>2</sub></b> gas to the cell having a low concentration of <b>O<sub>2</sub></b> gas. Similarly, <b>CO<sub>2</sub></b> diffuses from the cell having high concentration of <b>CO<sub>2</sub></b> to the blood having low concentration of <b>CO<sub>2</sub></b> .	<b>1.5</b>