

مسابقة في مادة علوم الحياة والأرض
المدة: ساعة واحدة

الاسم:
الرقم:

Answer the following questions.

Question I (3 points)

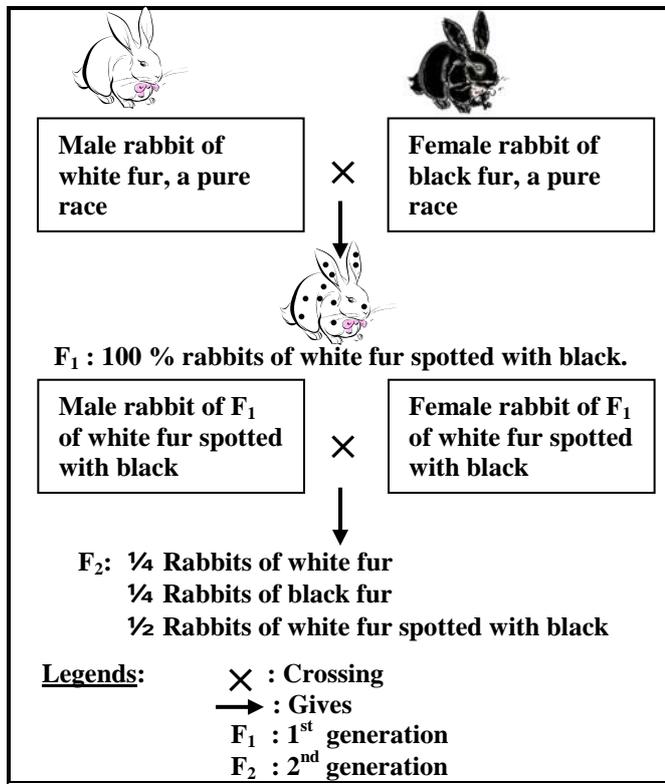
Indicate the true statement(s) and correct the false one(s).

- a- The genetic information is found in the cytoplasm of a cell.
- b- In metaphase, each chromosome is formed of two chromatids.
- c- The two chromatids of a chromosome carry the same genetic information.
- d- In the human species, a sperm cell possesses 46 chromosomes.

Question II (6 points)

In studying the transmission of fur color in rabbits, we do the crosses revealed in the adjacent document.

- a- Translate the adjacent document into a text using the given legends.
- b- Is this the case of dominance or codominance? Justify the answer.
- c- Designate by symbols the corresponding alleles.
- d- Write the genotype of each parent of the F₁ generation.
- e- Make a factorial analysis that permits to verify the result obtained in F₂.



Question III (5½ points)

The adjacent document reveals the amount of oxygen in different parts of the respiratory system during inhalation.

- a- Knowing that the amount of oxygen is 21 ml in 100 ml of inhaled air, indicate the respiratory parts :
 - through which oxygen is conducted.
 - that are the sites of exchange of this gas.

Parts of the respiratory system	Amount of oxygen in mL / 100 mL of inhaled air
Nasal cavities	21
Trachea	21
Bronchus	21
Bronchioles	21
Pulmonary alveoli	14

Justify the answer in each case.

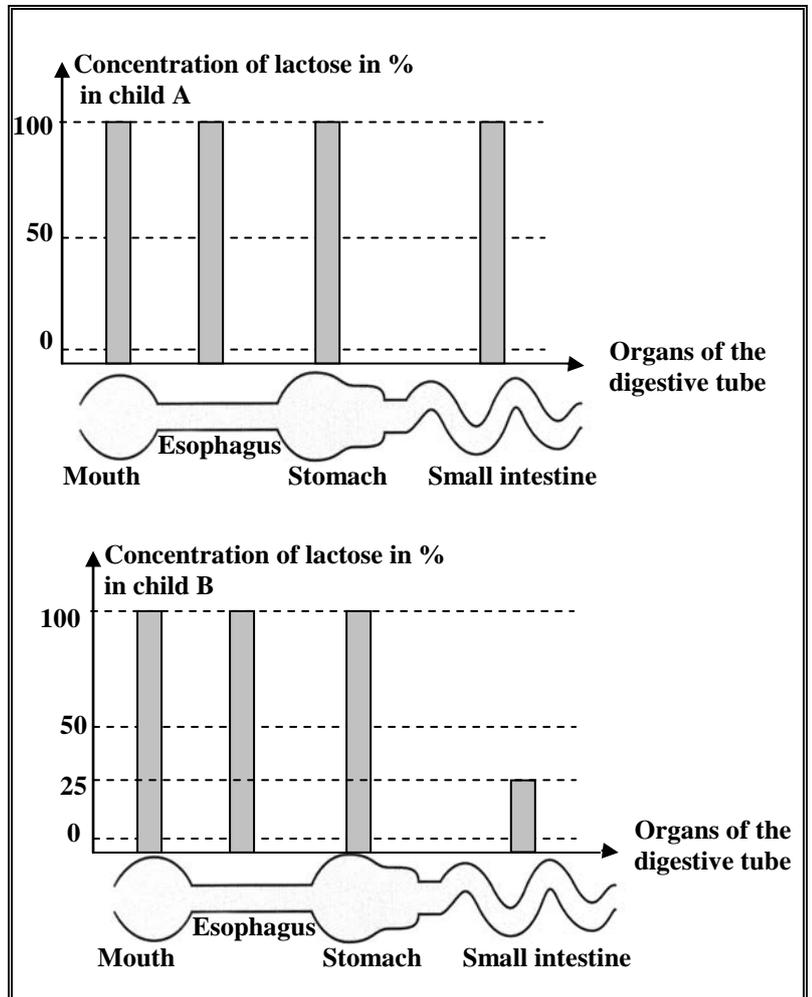
- b- List the characteristics of the sites of this exchange.
- c- Emphysema is a respiratory disease where some alveoli do not function due to the destruction of their walls. In this case, how would the amount of oxygen vary at the level of these alveoli?

Question IV (5½ points)

Lactose, the milk sugar, is digested in the presence of an enzyme called lactase. Some children suffer, since birth, from a digestive trouble due to the absence of lactase.

We give milk to two children A and B. Then, we measure the lactose concentration in certain digestive organs in each child. The results of the measurements are shown in the adjacent document.

- a- Represent, in the same table, the different values of the lactose concentration in each digestive organ in the two children A and B.
- b- Analyze the results. What do you deduce?



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Answer the following questions.

Question I (4 points)

Indicate the true statement(s) and correct the false one(s).

- a- The genetic information is found in the cytoplasm of a cell.
- b- In metaphase, each chromosome is formed of two chromatids.
- c- The two chromatids of a chromosome carry the same genetic information.
- d- In the human species, a sperm cell possesses 46 chromosomes.

Question II (6 points)

In studying the transmission of fur colour in rabbits, we do the following crosses:

First cross: The cross between a male rabbit of white fur of a pure race with a female rabbit of black fur and of pure race, gives in F₁ generation : 100% rabbits of white fur spotted with black.

- a- Is this the case of dominance or codominance? Justify the answer.
- b- Designate by symbols the corresponding alleles.
- c- Write the genotype of each parent of the F₁ generation and that of F₁ offspring.

Second cross: The cross between a male and a female rabbits of the F₁ generation having white fur spotted with black gives in the second generation:

- F₂: $\frac{1}{4}$ rabbits of white fur
 $\frac{1}{4}$ rabbits of black fur
 $\frac{1}{2}$ rabbits of white fur spotted with black.

- d- Make a factorial analysis that permits to verify the result obtained in F₂.

Question III (6 points)

The amount of oxygen is 21 ml in 100 ml of air. During inspiration, the amount of oxygen is 21 ml in the nasal cavities, trachea, bronchus, bronchioles, and 14 ml in the pulmonary alveoli.

- a- By referring to the above information, indicate the respiratory parts:

- through which oxygen is conducted.
- that are the sites of exchange of this gas.

Justify the answer in each case.

- b- List the characteristics of the sites of the exchange of this gas.
- c- Emphysema is a respiratory disease where some alveoli do not function due to the destruction of their walls. In this case, how would the amount of oxygen vary at the level of these alveoli?

Question IV (4 points)

Lactose, the milk sugar, is digested in the presence of an enzyme called lactase.

Some children suffer, since birth, from a digestive trouble due to the absence of lactase.

Two children A and B are given milk having a lactose concentration of 100 %. Then, we measure the lactose concentration in the mouth, esophagus, stomach and small intestine in each child. The results of the measurements of lactose concentration in these digestive organs are:

- 100% in the mouth, esophagus, stomach and small intestine in child A.
- 100% in the mouth, esophagus, stomach and 25% in the small intestine in child B.

Analyze the results. What do you deduce?

اسس التصحيح
مسابقة في علوم الحياة والارض**Question I (3 points)**

- a- False. Genetic information is found in the nucleus of the cell. (1 pt)
 b- True (1/2 pt)
 c- True (1/2 pt)
 d- False. In the human species, a sperm cell includes 23 chromosomes. (1 pt)

Question II (6 points)

- a- Crossing the male rabbit of whit fur of a pure race with a female rabbit of black fur and of pure race gives in the first generation 100% rabbits of white fur spotted with black.
 Crossing a male and a female rabbits of the first generation of white fur spotted with black gives in the second generation 1/4 rabbits of white fur, 1/4 rabbits of black fur, and 1/2 rabbits of white fur spotted with black. (1 1/2 pts)

- b- This is a case of codominance (1/2 pt)
 Because the two colours, white and black, appear in the F₁ (1/2 pt)

- c- Symbols of the alleles

W : white

B : Black (1/2 pt)

- d- P : ♂ WW (1/4 pt) ♀ BB (1/4 pt)

- e- ♂ WB × ♀ WB (1/2 pt)
 γ : ♂ (W 1/2, B 1/2) ♀ (W 1/2, B 1/2) (1 pt)

Table of the cross :

	♂	W 1/2	B 1/2
♀			
	W 1/2	WW 1/4	WB 1/4
	B 1/2	WB 1/4	BB 1/4

(1/2 pt)

Phenotypes :
 1/4 [W]
 1/4 [B]
 1/2 [WB]

Therefore, the experimental given is verified. (1/2 pt)

Question III (5½ points)

a-. The parts through which oxygen is conducted are nasal cavities, trachea, bronchus, and bronchioles. Because the amount of oxygen remained 21 mL /100mL of inhaled air.

(1½ pts)

The sites of exchange are the alveoli. Because, at this level the amount of oxygen decreased 7 mL (from 21 mL to 14 mL). (1½ pts)

b- The wall of alveoli is very thin, (½ pt)
they are many (big surface area), (½ pt)
they are rich with blood vessels.(½ pt)

c- In this case, the amount of oxygen does not vary, or slightly varies, or it remained 21 mL. (1 pt)

Question IV (5½ points)

a-(1½ pts)

	Concentration of lactose in % in each organ			
	Mouth	Esophagus	Stomach	Small intestine
Child A	100	100	100	100
Child B	100	100	100	25

Title: Lactose concentration in each digestive organ in two children A and B

b-.In child A, the concentration of lactose remains 100% in the mouth, the esophagus, the stomach, and the small intestine. In child B, it remains the same, 100% in the mouth, the esophagus and in the stomach, but it decreases in the small intestine to 25%. (1½ pts)
.Therefore, lactose digestion did not take place in child A, while in child B, it took place in the small intestine. (1½ pts)

c-1º- Child A (½ pt)

2º-. Small intestine (½ pt)