

دورة 2013 العادية	امتحانات الشهادة المتوسطة	وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات
الاسم : الرقم :	مسابقة في علوم الحياة والارض المدة : ساعة واحدة	

Answer the following four exercises.

Exercise 1 (5 points)

Parents and a deaf child

In humans, deafness can be caused by the abnormal development of the auditory system which is controlled by an autosomal gene.

Designate by **N** the dominant allele of the gene that determines the normal development of the auditory system (not deaf) and by **d** the recessive allele of the gene that favors abnormal development of this system (deaf).

- 1- Pick out from the text the cause of deafness.
- 2- Indicate the genotype of the deaf child. Justify the answer.

Parents who have normal auditory system and are heterozygous have a deaf child.

- 3 - Make a factorial analysis to verify the birth of the deaf child.

Exercise 2 (5 points)

Chromosomal abnormality and meiosis

The diagrams in **document 1** represent only chromosomes 21 and 13 in the somatic (body) cells of two children A and B.

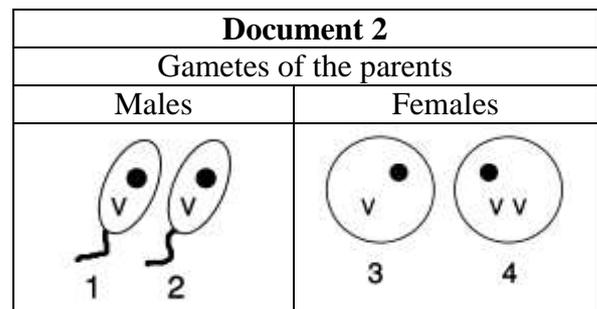
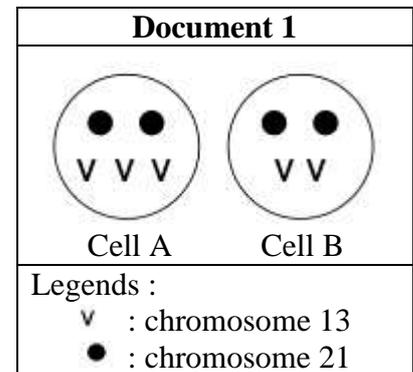
1 – Compare:

- a- The number of chromosomes 13 in cells **A** and **B**.
- b- The number of chromosomes 21 in cells **A** and **B**.

- 2 - Indicate the child that presents the chromosomal abnormality. Justify the answer.

The diagrams in **document 2** represent the same chromosomes 21 and 13 in some gametes of the parents of the child with this chromosomal abnormality.

- 3 - Indicate the abnormal parental gamete at the origin of this abnormality. Justify the answer.
- 4 – Name the phase of meiosis at the origin of this abnormal gamete.



Exercise 3 (5 points)

Blood vessels and organs irrigation

The blood circulates in the body through blood vessels.

The **table** below represents the surface areas of the different types of blood vessels in the body and the average speed of blood circulation in each type of these vessels.

1 – Compare:

a- The total surface area of the arteries and arterioles to that of the capillaries.

b- The total surface area of the veins and venules to that of the capillaries.

2– Pick out from the table the type of blood vessels where the average speed of blood circulation:

a- is the highest

b- is the lowest.

3- Draw out from what precedes the characteristics that make the capillaries a place for exchange between the blood and organs.

Type of blood vessels	Arteries and Arterioles	Capillaries	Venules and Veins
Total surface area (in cm ²)	1300	2400	1300
Average speed of blood circulation (in cm/s)	40 to 10	0.1	5 to 23

Exercise 4 (5 points)

Digestion of lipids

In the framework of studying the importance of mechanical digestion, we realize an experiment on in vitro digestion of lipids: sheep fat.

The conditions of this experiment are shown in **document 1**.

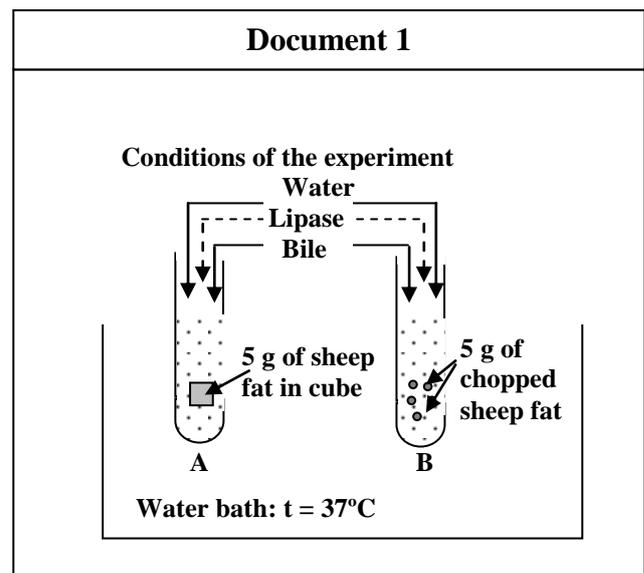
The mass of sheep fat is measured at the beginning of the experiment and at the end of the experiment. The results are shown in **document 2**.

1 - Draw a histogram (bar graph) showing the variation of the mass of sheep fat in each of the tubes **A** and **B** at the beginning and at the end of the experiment.

2 – **a-** Analyze the obtained results (**doc.2**).

b- Based on the analysis, derive a conclusion.

3 – Name the products obtained at the end of the complete digestion of lipids.



Document 2		
Mass of sheep fat (in g)		
Tube	Beginning of the experiment (at 0 hr)	End of the experiment (after 3 hrs)
A	5	2
B	5	0

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	اسس التصحيح مسابقة في علوم الحياة والارض	

Exercise 1 (5 points)

Part of the Q	Answer	Mark																
1	Deafness can be caused by an abnormal development of the auditory system. Or Deafness is due to a recessive allele d that favors abnormal development of the auditory system.	1																
2	Genotype of the deaf child is: dd The recessive allele d is expressed in case of homozygosity	0.5 0.75																
3	Genotypes of the parents : ♂ Nd × ♀ Nd γ^P : $\frac{1}{2} \text{N} \frac{1}{2} \text{d}$ $\frac{1}{2} \text{N} \frac{1}{2} \text{d}$ Table of cross : <table border="1" style="margin-left: 20px;"> <tr> <td style="border: none;"></td> <td style="border: none;">♂</td> <td style="border: none;"></td> <td style="border: none;"></td> </tr> <tr> <td style="border: none;">♀</td> <td style="border: none;"></td> <td style="border: none;">N $\frac{1}{2}$</td> <td style="border: none;">d $\frac{1}{2}$</td> </tr> <tr> <td style="border: none;"></td> <td style="border: none;">N $\frac{1}{2}$</td> <td style="border: none;">NN $\frac{1}{4}$</td> <td style="border: none;">Nd $\frac{1}{4}$</td> </tr> <tr> <td style="border: none;"></td> <td style="border: none;">d $\frac{1}{2}$</td> <td style="border: none;">Nd $\frac{1}{4}$</td> <td style="border: none;">dd $\frac{1}{4}$</td> </tr> </table> Based on the table, $\frac{1}{4}$ of the children have the phenotype [d], this confirms the birth of the deaf child. Or Phenotypic proportions: [N] $\frac{3}{4}$ [d] $\frac{1}{4}$		♂			♀		N $\frac{1}{2}$	d $\frac{1}{2}$		N $\frac{1}{2}$	NN $\frac{1}{4}$	Nd $\frac{1}{4}$		d $\frac{1}{2}$	Nd $\frac{1}{4}$	dd $\frac{1}{4}$	0.5 1.25 0.5
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♀		N $\frac{1}{2}$	d $\frac{1}{2}$															
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Exercise 2 (5 points)

Part of the Q	Answer	Mark
1-a	The number of chromosomes 13, is three in cell A which is higher than that in cell B which is two.	0.75
1-b	The number of chromosomes 21 is the same in both cells A and B : two chromosomes 21 in each of them.	0.75
2	Child A is the one that has a chromosomal abnormality; It has 3 chromosomes 13 instead of two.	1.5
3	The parental gamete 4 is at the origin of this abnormality. It has two chromosomes 13 instead of one. Or It has three chromosomes instead of two.	1.5
4	Anaphase I or anaphase II	0.5

Exercise 3 (5 points)

Part of the Q	Answer	Mark
1-a	The total surface area of arteries and arterioles (1300 cm ²) is less than that of the capillaries (2400 cm ²).	1
1-b	The total surface area of veins and venules (1300 cm ²) is less than that of the capillaries (2400 cm ²).	1
2-a	The average speed of blood circulation is the highest in the arteries and arterioles (40 to 10 cm/s)	1
2-b	The average speed of blood circulation is lowest in the capillaries (0.1 cm/s).	1
3	The capillaries have the largest surface area and the least speed of blood circulation.	1

Exercise 4 (5 points)

Part of the Q	Answer	Mark
1	<p>Title : Histogram showing the variation of the mass of sheep fat in each of the tubes A and B at the beginning and at the end of the experiment.</p>	2
2-a	The mass of sheep fat in cube in tube A, decreased from 5 g to 2 g within 3 hours. Similarly, in tube B placed under the same conditions as those of tube A, the mass of chopped sheep fat decreased more to become nil after 3 hours.	1
2-b	We conclude that, the chopped fat is digested more rapidly than the fat in cube. Or We conclude that mechanical digestion facilitates the chemical digestion	1
3	Fatty acids and glycerol.	1