

Answer the following four exercises.

مسابقة في مادة علوم الحياة والأرض

المدة: ساعة واحدة

(انكليزي)

الاسم:

الرقم:

Exercise 1 (5 points)**Cell Division and Formation of Gametes**

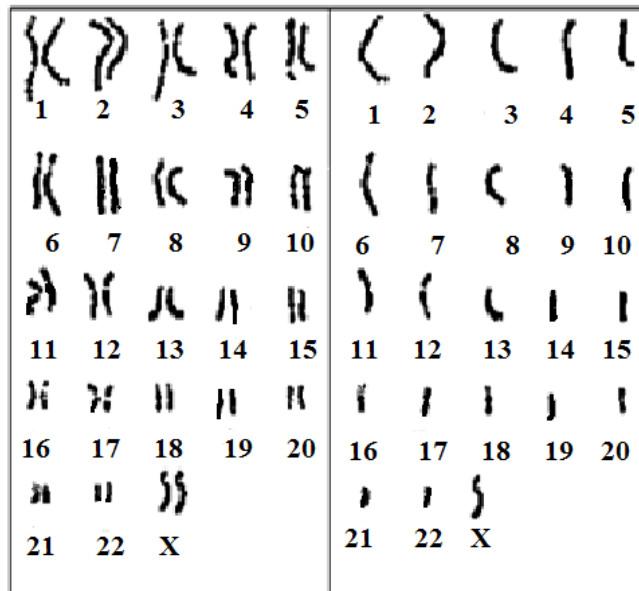
A karyotype represents the set of chromosomes in a cell, arranged according to well defined criteria. It permits us to determine the sex of the fetus and to detect the chromosomal abnormalities.

1- Pick out the aims of performing a karyotype.

2- Indicate one criterion to arrange the chromosomes in a karyotype.

The gametes originate from reproductive mother cells. Documents 1 and 2 show two karyotypes of two cells extracted from the same person:

- a gamete G
- a mother cell M of the gametes.



Document 1

Document 2

3- Identify which one of the two documents (1 or 2) is the karyotype that corresponds to:

3-1- the mother cell M

3-2- the gamete G.

4- Specify if the gamete G is male or female.

5-1- **Indicate** if the cell division at the origin of the formation of gamete G from the mother cell M, is mitosis or meiosis

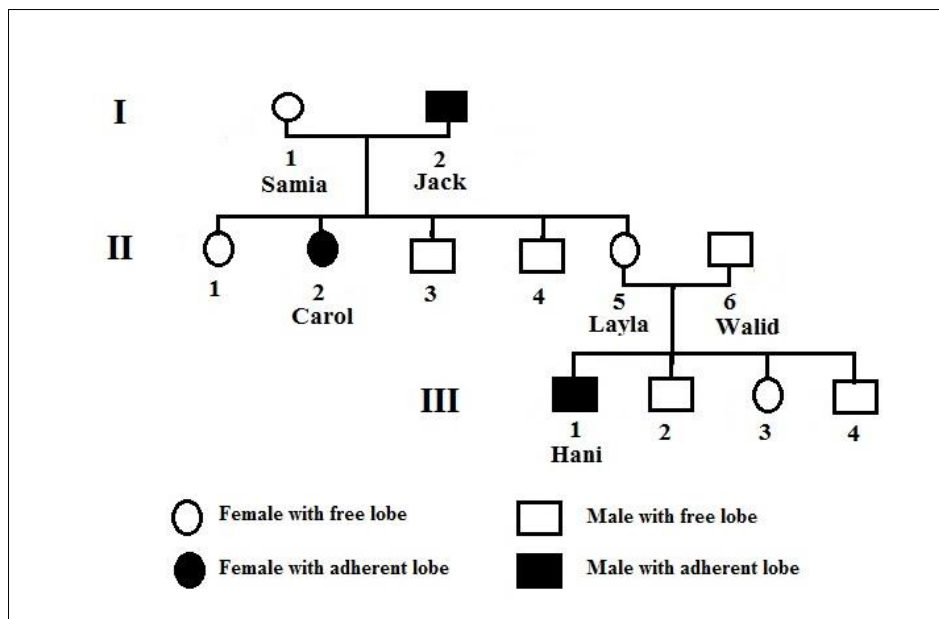
5-2- **Justify** the answer.

Exercise 2 (5 points)**Transmission of a Hereditary Trait**

The ear lobe can be either free or adherent. This hereditary trait is due to a gene located on an autosome. This gene exists in two alleles:

- an allele responsible for the phenotype “free lobe”
- an allele responsible for the phenotype “adherent lobe”.

The document below represents the genealogical tree of a family whose certain members have “adherent lobes”.



1-1. Show that the allele responsible for the phenotype “adherent lobe” is recessive.

1-2. Designate by symbols the corresponding alleles.

2. Indicate then justify each of the following:

2-1- the genotype of Samia.

2-2- the genotype of Hani.

3. Make the necessary factorial analysis to verify the phenotypic results of the descendants of Layla and Walid, referring to the following steps:

- **Write** the phenotypes of parents.
- **Write** the genotypes of parents.
- **Write** the gametes of each of the parents.
- **Make** the table of cross.
- **Give** the phenotypic results of the descendants.

Exercise 3 (4.5 points)**Characteristics of Blood Capillaries**

Blood circulates in the body through different types of blood vessels: arteries, veins and blood capillaries...However, the capillaries that are very numerous and have very thin walls, permit the exchange of substances between blood and cells.

1- Pick out two characteristics of the blood capillaries which favor this exchange.

2- Name two substances which pass from blood to cells.

The document below shows the average diameter of different types of blood vessels as well as the average speed of the blood circulation in each type.

Type of blood vessel	Average diameter (cm)	Speed of blood circulation (cm/sec)
Arteries	2.5	40
Capillaries	0.1	2
Veins	1.3	17

3- Show, by referring to the above document that the blood circulation slows down (which means that the speed of blood circulation decreases) in the blood vessels with smaller diameter.

4- Choose from the following statements, four characteristics which permit the blood capillaries of being an efficient surface for the exchange between blood and cells.

- The blood capillaries have thick walls.
- The blood capillaries have thin walls.
- The blood capillaries have large diameter.
- The blood capillaries have small diameter.
- The blood circulation in the blood capillaries is slow.
- The blood circulation in the blood capillaries is rapid.
- The blood capillaries are very numerous.
- The blood capillaries are very few.

Exercise 4 (5.5 points)

Effect of Mechanical Digestion

In order to study the **effect of mechanical digestion on the chemical digestion**, the following experiment is performed:

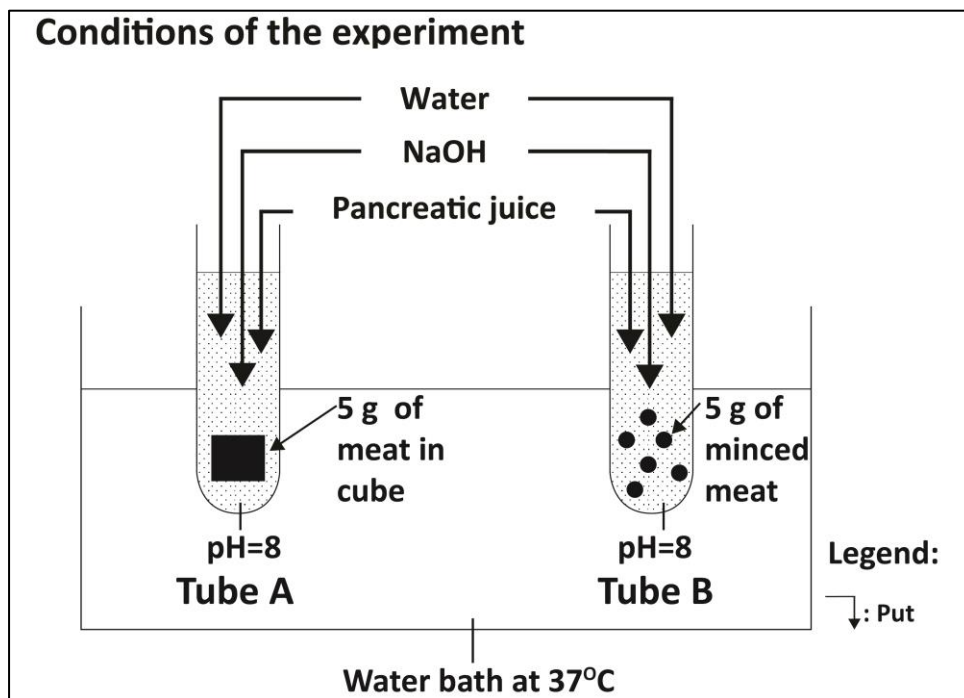
We put:

- In **tube A**, **5 g** of meat in cube,
- In **tube B**, **5 g** of minced meat.

Then we put, in both tubes A and B respectively, **the same amount** of:

- pancreatic juice,
- water,
- NaOH solution.

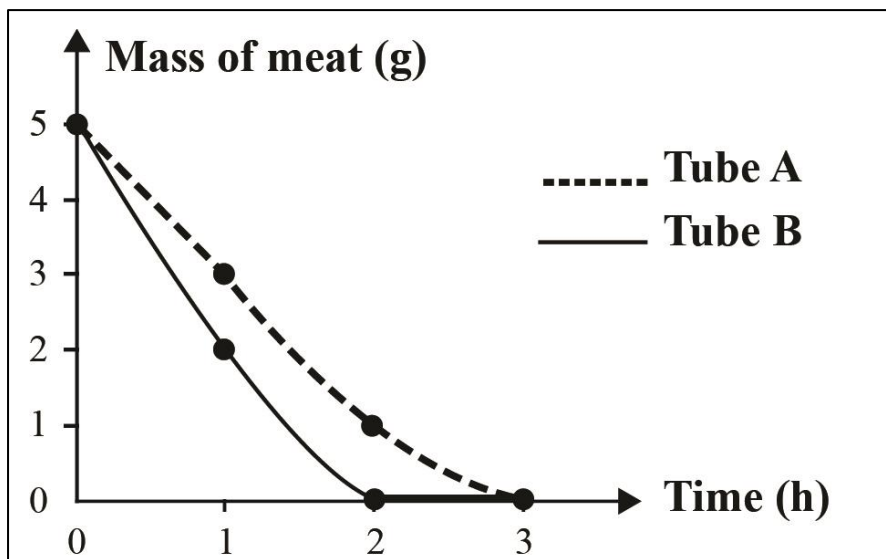
These experimental conditions are shown in document 1.



Document 1

The mass of meat is then measured in both tubes at different intervals of time.

The results are represented in document 2.



Document 2

1- Draw out the experimental condition that varied in this experiment.

2- Choose the hypothesis tested during this experiment:

- a. The mechanical digestion speeds up (facilitates) the chemical digestion
- b. The enzymatic activity depends on the pH of the medium.

3- Copy and complete the table below by referring to document 2.

Time (h)		0	1	2	3
Mass of meat (g)	Tube A				
	Tube B				

4-1- Analyze the obtained results, document 2.

4-2- Choose the correct conclusion :

- a. The mechanical digestion speeds up the chemical digestion
- b. The enzymatic activity is maximal at an optimum pH.

5- Suggest, based on this experiment, a good food habit that you can follow while eating your meals.