وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات	امتحانات الشهادة المتوسطة	دورة ٢٠٠٤ العادية
	مسابقة في علوم الحياة والارض المدة : ساعة واحدة	الاسم : الرقم :

Answer the following questions.

Question I (5pts)

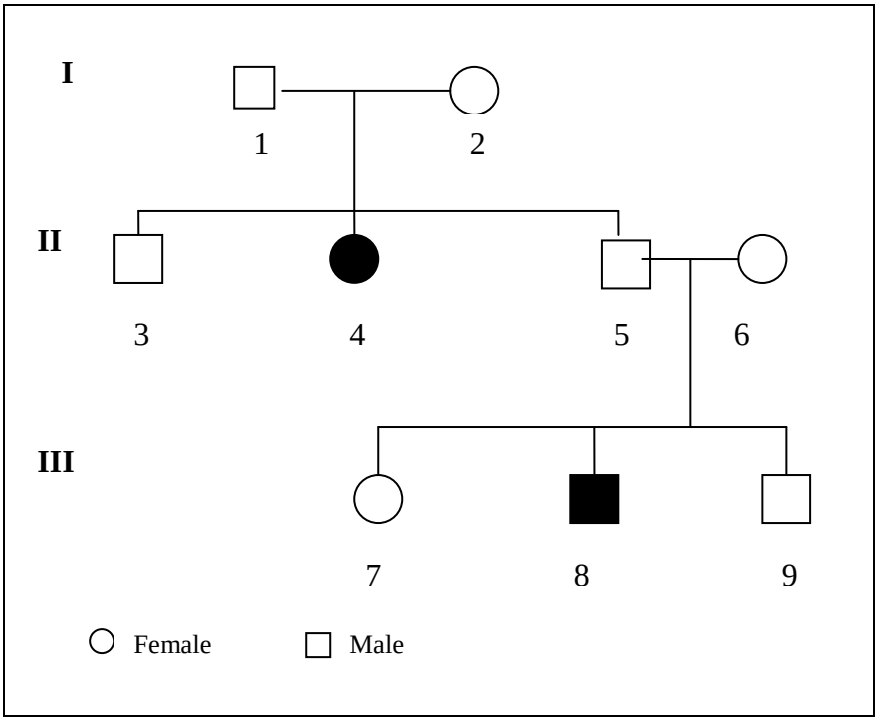
Diabetes is a disease determined by a gene located on an autosome.
The adjacent pedigree represents a family whose certain members, colored in black, are affected.

a- Is the allele responsible for the disease dominant or recessive? Justify the answer.

b- Designate by symbols the corresponding alleles.

c- Indicate the genotype of the individuals 4 and 5. Justify the answer for each genotype.

d- Make the necessary factorial analysis to verify the appearance of the phenotypic descendants of the couple 5-6.



Question II (5pts)

" The digestion of proteins, found in our food, starts in the stomach. Certain cells of the wall of this organ liberate in its cavity an enzyme called pepsin. Pepsin is produced in the form of an inactive substance. It only becomes active when it is released in the cavity of the stomach. It hydrolyzes proteins and only proteins. Thus, the products obtained from this digestion are peptides of different sizes. The action of pepsin stops when the contents of the stomach arrive into the duodenum, the first segment of the small intestine. In fact, the pH of the duodenal content is around 6.5 while that of the stomach is nearly 2…"

a- Pick up from the text:

1- The name of: the enzyme, the digested substance, and the products of this digestion.
2- The pH of the medium in each of the above mentioned organs.
3- The statement, which indicates the specificity of the enzyme.

b- In reference to the text, explain why this enzyme does not attack the cells of the stomach.

c- Name the final product of digestion of this substance at the level of the duodenum.

Question III (6pts)

We measure the concentration of glucose, amino acids and oxygen in the blood as it enters and leaves the small intestine. At the same time, we observe a change in the color of the blood. The results are represented in the document below.

	Blood entering the small intestine	**Blood leaving the small intestine**
Glucose	1 g /L	1.3 g/L
Amino acid	0.2 g/L	0.5 g/L
Oxygen	200 mL/L	160 mL/L
Blood color	Bright red	Dark red

a- Compare the concentration of glucose and amino acids in the blood as it enters and leaves the small intestine. What can you conclude?

b- Name the physiological process, which is responsible for the difference in the concentration of glucose and amino acids.

c- What is each blood color due to? Do the measured amounts of oxygen verify the two blood colors? Justify the answer.

d- Formulate a hypothesis that explains the loss of oxygen in the blood at the level of the small intestine.

Question IV (4pts)

The following document shows a cloning method, that had been performed a few years ago.

a- In a few lines, describe this cloning method.

b- In the two embryonic cells, is the genetic information the same or different? Justify the answer by referring to the results obtained.

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Question I (5pts)

a- Recessive.(½ pt). The parents are healthy and have sick children. Thus, the alleles responsible for the disease are masked.(½ pt)

b- Consider " N" for the normal dominant. (¼ pt)
Consider " d" for the sick recessive. (¼ pt)

c- Genotype of 4 : dd (½ pt) .The recessive character can be expressed only when it is pure. (½ pt)
Genotype of 5: Nd (½ pt). He has a diabetic child (8). **OR,** he has a diabetic child (8) dd, this child receives one recessive allele from each parent. (½ pt)

d- P : Nd x Nd (¼ pt)
γ P : ½ N ½ d ½ N ½ d (½ pt)

Table of cross: (½ pt)

♂ ♀	½ N	½ d
½ N	¼ NN	¼ Nd
½ d	¼ Nd	¼ dd

Phenotypes (¼ pt)
¾ [N] or ¾ non-diabetic children
¼ [d] or ¼ diabetic children

Question II (5 pts)

a- 1- Pepsin (½ pt). Proteins (½ pt). Peptides (½ pt)
2- Stomach: pH = 2. (½ pt); small intestine: pH = 6.5 (½ pt)
3- It hydrolyzes the proteins and only proteins. (1 pt)

b- Pepsin is produced in an inactive form. For this reason it does not attack the cells of the stomach. (1pt)

d- Amino acids. (½ pt)

Question III (6pts)

a- The amount of glucose 1g/L in the blood entering the intestine is less than that in the blood leaving the intestine, 1.3g/L.(1 pt)
The amount of amino acids 0.2g/L in the blood entering the intestine is less than that in the blood leaving the intestine, 0.5g/L.(1pt)

Since these amounts have increased, we can say that the blood is enriched in glucose and amino acids at the level of the small intestine. (½ pt)

b- Intestinal absorption. (½ pt)

c- The bright red color due to the richness of blood in O_2 (½ pt). The dark red color due to impoverishment of blood in O_2 (rich in CO_2). (½ pt) Yes (¼ pt).The measurement reveals that the quantity of O_2, which is 200 mL/L becomes 160 mL/L therefore, this quantity has decreased that's why the color of blood changes from bright red to dark red color.(¾ pt)

d- Hypothesis: The cells of the intestine use the oxygen to produce energy needs for their activities. (1pt)

Question IV (4pts)

a- We remove a zygote from a cow having white skin and we put it in a culture medium. After the first division, we separate the two embryonic cells and we transfer each of these cells into the uterus of a carrier mother having white skin spotted in black. These cells give birth to two identical calves and of the same sex. (3pts)

b- The genetic information is identical in the two embryonic cells since the obtained calves are identical and of the same sex.(1pt)