


المادة: علوم الحياة والارض - لغة إنكليزية الشهادة: المتوسطة نموذج رقم 2019/1 المدة : ساعة واحدة	الهيئة الأكاديمية المشتركة قسم : العلوم	
--	--	---

Exercise 1: (5.5 points)

Regulation of Body Fluids

Blood and Lymph are two types of body fluids. The lymph bathes the body cells and is present in lymphatic vessels, while blood is present in the blood vessels. The composition of these fluids is constantly submitted to variations due to food supply and cellular activities. However, this composition is maintained constant due to the intervention of regulatory systems.

- Pick out from the text:
 - Two body fluids and their locations.
 - The factors that modify the composition of these fluids.

In order to study the role of the kidneys in the regulation of the composition of the body fluids, the following study is performed.

A normal individual is fed a meal poor in salt for 3 consecutive days followed by a meal rich in salt (10g NaCl/day) for 3 other consecutive days.

The concentrations of NaCl in the blood leaving the kidneys and that eliminated in the urine are measured in each case. The results are presented in the adjacent document.

- Name the blood vessel that carries blood:
 - Towards the kidney
 - Away from the kidney.

- Draw the graph showing the variation of the quantity of salt eliminated in the urine as function of time following the ingestion of the two meals.

- Analyze the obtained results presented in the adjacent document.
- What can you conclude concerning the role of the kidney?

Time (days)	Meal poor in salt			Meal rich in salt		
	1	2	3	4	5	6
Concentration of NaCl in the blood leaving the kidney (g/l)	3.2	3.2	3.2	3.2	3.3	3.2
Quantity of salt eliminated in the urine (mmol/24 hr)	50	50	50	75	100	150

Exercise 2: (5 points)

Achondroplasia, a Genetic Disorder

Achondroplasia is a genetic disorder that results in dwarfism. The gene responsible for this disease is localized on chromosome 4.

Jad and his brother Fouad, like their parents, are affected with achondroplasia, but their sister Lara is not and she has a normal height. Jad marries a normal woman, they give birth to an unaffected boy.

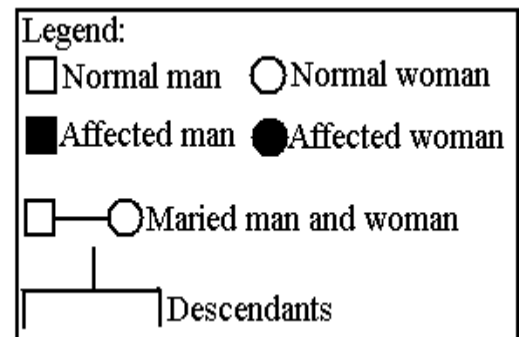
- Construct the pedigree of Jad's family using the legends shown in the adjacent document.
- Determine if the allele responsible for achondroplasia is dominant or recessive.
- Designate by symbols the corresponding alleles.

4.1 Indicate the genotypes of Jad and his son.

4.2 Schematize the pair of chromosomes 4 of Jad and that of his child with the corresponding alleles.

Jad's wife is pregnant and they are worried about having an affected child.

- Determine by factorial analysis, the proportion of obtaining a child with achondroplasia by this couple.



Exercise 3: (5 points)

Role of the Small Intestine

The ingested food passes through out different organs of the digestive tract. Digestive enzymes secreted by digested glands allow the food transformation into nutrients.

The concentration of glucose is measured in the blood entering and leaving four different organs of the digestive tract, following the ingestion of a meal rich in glucose. The obtained results are shown in document 1.

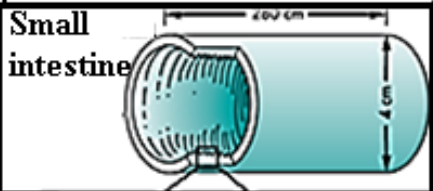

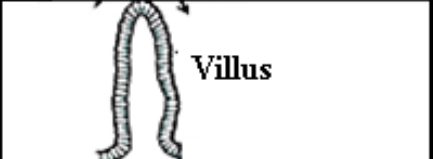
Organ	Concentration of glucose (g/l)	
	Blood entering the organ	Blood leaving the organ
Esophagus	1	0.9
Stomach	1	0.7
Small intestine	1	2.6
Large intestine	1	0.8

Document 1

1. Show that the small intestine is the organ where absorption of glucose takes place.

In order to find out one of the features that makes the small intestine a structure well adapted for absorption, the surface areas of the external and the inner walls of a section of the small intestine are measured. The results are presented in document 2.

- 2.1 Compare, by referring to the small intestine structure in document 2, the aspect of the external wall and that of the inner wall of the small intestine.
- 2.2 Compare the surface area of the different structures presented in document 2.
- 2.3 What can you draw out?

Structure	Surface area cm ²
	3300
	10 000
	100 000

Document 2

3. Indicate two other characteristics of the inner wall of the small intestine.

Exercise 4: (4.5 points)

Anemia a Blood Disorder


Blood circulates in blood vessels throughout the body, it delivers oxygen gas and nutrients to the cells and carries away carbon dioxide and wastes products such as urea. Some persons suffers from anemia which is a blood disorder, the most common symptoms of this disorder are: shortness of breath, fatigue, pale skin, etc...

- 1. Pick out from the text:
 - 1.1 The substances consumed by the cells.
 - 1.2 Two symptoms of anemia.

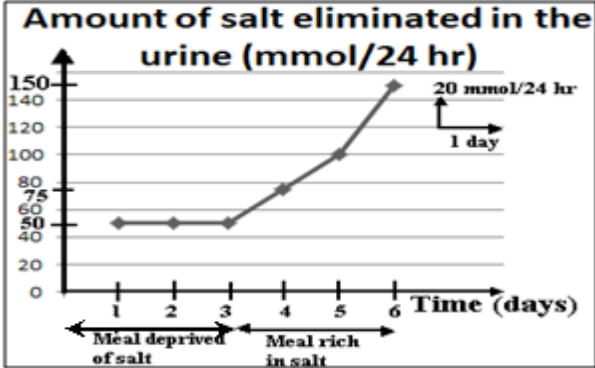
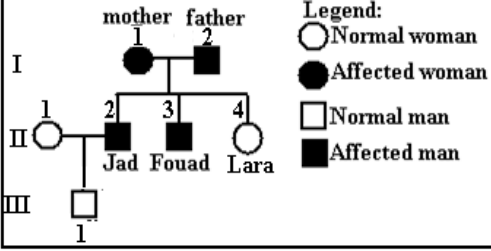
The number of red blood cells and the level hemoglobin in the blood are measured in a normal individual and in an anemic individual. The results are shown in the adjacent document.

- 2. State the role of hemoglobin.
 - 3.1 Compare the obtained results presented in the adjacent document.
 - 3.2 Conclude two features of anemia.
- 4. Explain why anemic persons suffer from fatigue.

	Normal individual	Anemic individual
Number of red blood cells x 10 ⁶ /mm ³ of blood	4.5	3.5
Level of hemoglobin in the blood (g/dl)	13	7

المادة: علوم الحياة والارض - لغة إنكليزية الشهادة: المتوسطة نموذج رقم 2019/1 المدة : ساعة واحدة	الهيئة الأكاديمية المشتركة قسم : العلوم	
--	--	---

أسس التصحيح:

Ex	Part	Exercise 1 (5.5 points) Regulation of the Body Fluids	Mark	
1	1.1	Blood and lymph are two types of body fluids. The blood is present in the blood vessels. The lymph bathes the body cells and is present in lymphatic vessel.	1	
	1.2	The composition of these fluids is constantly submitted to variations due to food supply and cellular activities.	0.5	
	2.1	The renal artery.	0.25	
	2.2	The renal vein.	0.25	
	3	Title: graph showing the variation of the quantity of salt eliminated in the urine as function of time following the ingestion of the two meals.		2
	4.1	The concentration of NaCl in the blood leaving the kidney (3.2 g/l) and the quantity of salt eliminated in the urine (50 mmol/24 hr) are maintained constant during the three days when the normal individual is supplied with a meal poor in salt. However, when this individual is supplied with a meal rich in salt for the other three consecutive days, the concentration of NaCl in the blood leaving the kidneys remains nearly constant (around 3.2 g/l), while the quantity of salt eliminated in the urine increases from 50 mmol/24 hr to 150 mmol/24 hr.	1	
	4.2	The kidneys play a regulatory role, they maintain the composition of blood constant by eliminating the excess salt in the urine.	0.5	
Ex	Part	Exercise 2(5 points) Achondroplasia, a Genetic Disorder	Mark	
	1	Pedigree of Jad's family		0.75
2	2	The parents of Jad are both affected with achondroplasia but they give birth to an unaffected girl (Lara); this means that the normal allele is present in both parents but masked by the allele responsible for achondroplasia and not expressed phenotypically. Hence, the allele responsible for achondroplasia is dominant with respect to the normal allele.	0.75	

