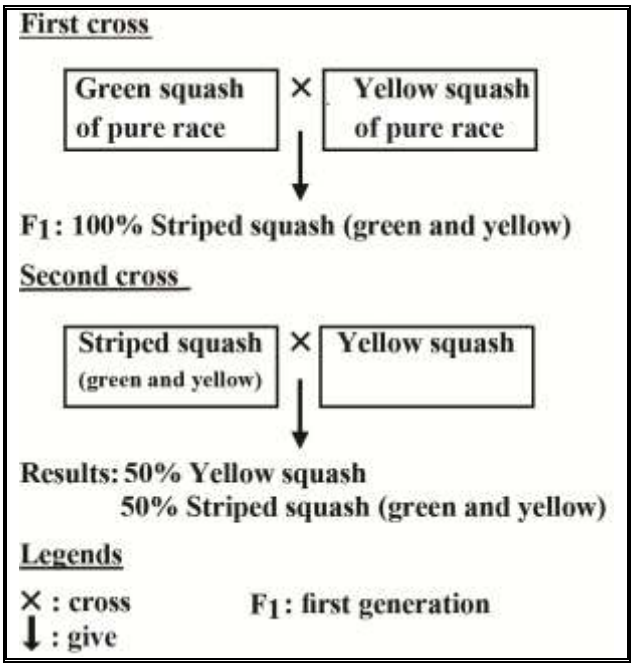
وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات الرسمية	امتحانات الشهادة المتوسطة	دورة العام ٢٠١٦ الاستثنائيّة السبت ٣٠ تموز ٢٠١٦
	مسابقة في علوم الحياة والأرض المدة: ساعة واحدة	الاسم: الرقم:

Answer the four following exercises:

Exercise 1 (5 points)

The gene responsible for the color of squash is located on an autosome. To study the transmission of this gene, two crosses are performed whose results are shown in the adjacent document.

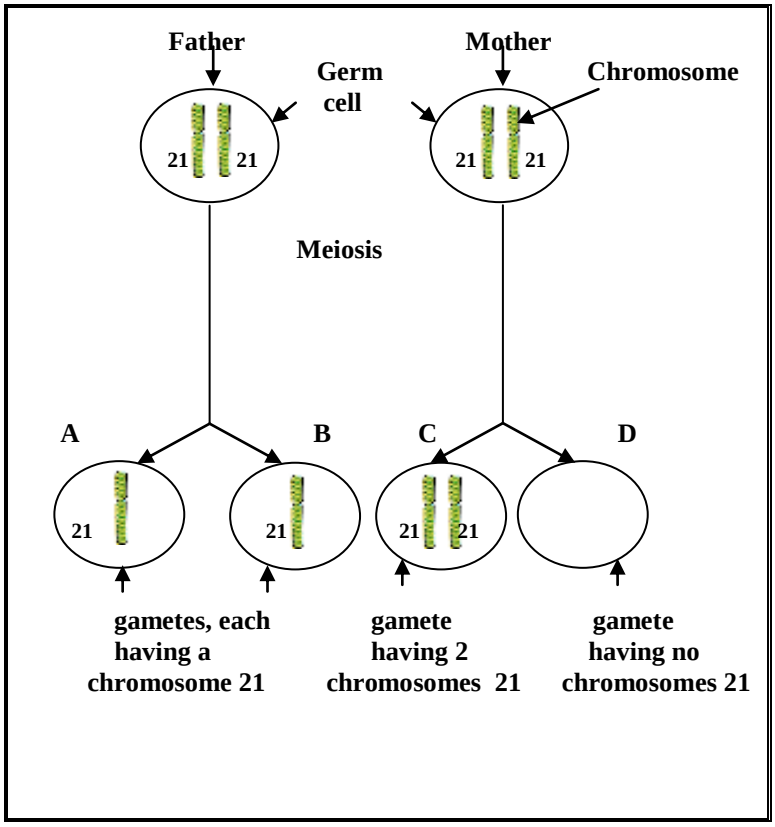
1- Describe the first cross using the given legends.
2- Is it a case of dominance or codominance? Justify the answer.
3- Designate by symbols the corresponding alleles.
4- Make the necessary factorial analysis to verify the results in the second cross.



Exercise 2 (5 points)

The germ cells in the testes and ovaries undergo meiosis which leads to the formation of gametes. Each of these gametes possesses one chromosome of the two homologous chromosomes present in a germ cell. The adjacent document shows the behavior of the pair of chromosomes № 21 during meiosis in two parents.

1- **a-** Determine the parent who produces the abnormal gametes.
b- Formulate a hypothesis which explains the production of these abnormal gametes.
2- **a-** Draw the chromosome(s) **21** of each zygote resulting from the union of male and female gametes in each of the two cases:
Case 1: gamete A with gamete C
Case 2: gamete A with gamete D
b- Does the zygote in case 1 show any anomaly? If yes, name this anomaly.



Exercise 3 (5 points)

To study the gas exchange during cellular respiration, the following experiment is performed. Alive muscle tissues are placed in a well-sealed closed flask at a temperature of 37°C. The levels of O_2 gas and CO_2 are measured during 5 minutes. The results are shown in the table below.

Time(min) / Level of gas (%)	0	1	2	3	4	5
O_2 gas	21	19	18	17.5	17	16.5
CO_2	0.03	0.8	1.5	1.8	2.1	2.5

1- Pose the problem studied in this experiment.
2- Draw a curve showing the variation of O_2 gas as a function of time.
3- **a-** Analyze the results presented in the above table.
b- What do you conclude concerning the gas exchange during cellular respiration?

Exercise 4 (5 points)

Cellulose is a carbohydrate composed of glucose molecules. It is found in food of plant origin; however, it is not digested in the human digestive tract due to the absence of cellulase enzyme. Cellulose facilitates the movement of food through the large intestine.

Document 1

1- Pick out from document 1:
a. The name of the molecule that constitutes cellulose.
b. The reason why cellulose is not digested in humans.

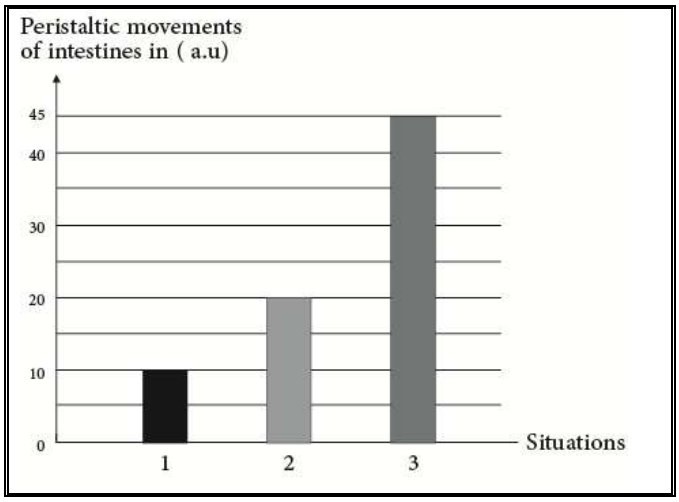
In order to verify the effect of cellulose on the activity of the large intestine, a study is performed on a group of healthy individuals of the same age, mass and sex. A suitable technique is used to measure the peristaltic movements of the intestine in each individual of this group in three situations:

Situation 1: They are fed food devoid of cellulose.
Situation 2: They are fed food poor in cellulose.
Situation 3: They are fed food rich in cellulose.

The obtained results are shown in document 2.

2- Deduce, based on the performed study whose results are shown in document 2, the effect of cellulose on the intestinal activity.

Sami suffers from constipation. The doctor advises him to eat more fruits and vegetables.



Document 2

3- Justify, based on all what precedes, the doctor's advice.

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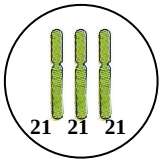
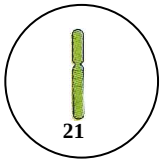
مشروع معيار التصحيح	مسابقة في مادة علوم الحياة والأرض المدة ساعة	الاسم: الرقم:

Answer the four following exercises:

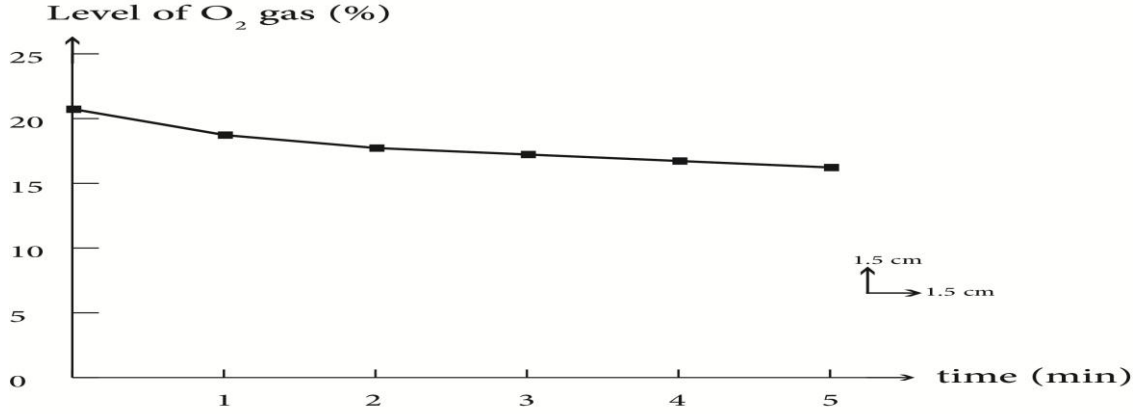
Exercise 1 (5 points)

Part of the Q	Answer	Mark
1	The cross of a green squash of pure race with a yellow squash of pure race, gives in the first generation 100% striped squash plants (green and yellow).	1
2	This is the case of codominance (0.5 pt), because we obtained in $\mathbf{F_1}$ a new phenotype (0.25) squash striped (green and yellow) where the alleles green and yellow are that are responsible for color are expressed.(0.25 pt)	1
3	Symbols of alleles: **G :** green (0.25 pt **Y :** yellow (0.25 pt)	0.5
4	Factorial analysis : P : ♂ **G Y** × ♀ **Y Y** (0.25 pt each) γP : (G) (Y) (Y) (0.25 pt each) **50% 50% 100%** (0.25 pt) Table of cross :(0.5 pt) ♀ \ ♂ : **G** 50% | **Y** 50% **Y** 100% : **GY** 50% | **YY** 50% After analyzing the table we obtain two phenotypes : 50% squash striped green and yellow 50% yellow squash Thus, the experimental results are confirmed. (0.5 pt)	2.5

Exercise 2 (5 points)

Part of the Q	Answer	Mark
1-a	Certain maternal gametes contain two chromosomes 21and other gametes don't contain any chromosomes 21 (0.5 pt).On the contrary the normal gamete should contain one chromosome 21(0.5 pt). Thus the abnormal gametes are produced by the mother. (0.5 pt)	1.5
1-b	Hypothesis: During anaphase I the two homologous chromosomes 21 migrated to the same pole instead of migrating to opposite poles. Hypothesis: During anaphase II, sister chromatids of chromosomes 21 migrated to the same pole instead of migrating to opposite poles.	1
2-a	**Case 1**  Zygote having 3 chromosomes **21** **Case 2**  Zygote having one chromosome **21**	1.5
2-b	Yes . (0.25 pt), Trisomy 21 (0.75 pt)	1

Exercise 3 (5 points)

Part of the Q	Answer	Mark
1	The posed problem: Is oxygen gas consumed and carbon dioxide released during cellular respiration? OR What gas exchange takes place during cellular respiration?	1
2	 The variation in the percentage of oxygen gas a s a function of time	2
3a	The level of O_2 gas in the closed jar where the alive muscle tissues are placed decreases from 21% to 16.5% during 5 minutes(0.75 pt). On the contrary, the level of CO_2 increases from 0.03% to 2.5% during the same duration(0.75 pt).	1.5
3b	During cellular respiration, oxygen gas is consumed while CO2 is released by the cells.	0.5

Exercise 4 (5 points)

Part of the Q	Answer	Mark
1-a	Glucose	0.75
1-b	Cellulose is not digested in the human digestive tract due to the absence of cellulase enzyme	0.75
2	The peristaltic movements of the intestines are the least(10 a.u) in the group of healthy individuals which are fed food devoid of cellulose; these peristaltic movements increase to a much higher value (20 a.u to 45 a.u) as the diet becomes richer in cellulose (1.5 pt). Therefore, cellulose enhances the peristaltic movements of the intestine. (0.5 pt)	2
3	Since fruits and vegetables are of plant origin, thus they contain cellulose which facilitates the movement of non-digested food through the large intestine and enhances its peristaltic movements which can solve Sami's problem.	1.5