الامتحان الوطني الموحد للبكالوريا
المسالك الدولية
الدورة العادية 2020
- عناصر الإجابة -

SSSSSSSSSSSSSSSSSSSS | NR 36E

المملكة المغربية
وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي
المركز الوطني للتقويم والامتحانات

المادة	علوم الحياة والأرض	مدة الإنجاز	2
الشعبة أو المسلك	شعبة العلوم الرياضية (أ) (خيارإنجليزية)	المعامل	3

Section I : Knowledge Retrieval (5 pts)			
		Questions	Scores
I	1	**The equational division:** **Accept all correct answers from the following suggestions:** - 2nd division of the meiosis which allows the separation of the two chromatids of each chromosome. - 2nd division of meiosis which halves the amount of DNA while preserving the number of chromosomes. - 2nd division of meiosis which results in 4 cells with n chromosomes from two cells with n chromosomes……………………..………………………..(0,5pt) **The gene map :** **Accept all correct answers from the following suggestions:** - The order in which genes succeed each other on the chromosomes and the relative distance between them. - Representation of the arrangement of genes on a chromosome.…………..(0,5pt)	1pt
	2	**The realization of the karyotype of the embryo makes it possible to (**accept two of the following correct proposals**) :** - Detect possible chromosomal anomalies. - Determine gender. - Determine the number of chromosomes. - Determine the structure of chromosomes.	1pt
II		(1 ; b), (2 ; a), (3 ; d), (4 ; a) ………...…(0.5×4)	2pts
III		a. **" false "** - b. **"true"** - c. **"true"** - d. **" false "**... (0.25×4)	1pt

Section II : Scientific reasoning and communication in graphic and written modes (15pts)		
Questions	Exercise 1 : (5.75pts)	Scores
1	**Cross I:** - Codominance between the allele responsible for the red color (O^+) and the allele responsible for the black color (O^-).……………………..………………(0,25) - Phenotypes are different between males and females. So the heredity studied is sex-linked (the allele carried by the sex chromosome X). ………..………..(0,25) **Cross II:** - The progeny is made up of 2/3 of individuals without tails and 1/3 of individuals with tails. So it is a lethal gene. ……………………………………….....(0,25) - Tailless individuals are hybrids with dominance of the allele responsible for the tailless characteristic (M) over the allele responsible for the normal characteristic (m)……………………………………………………………………..….(0,25)	1pt

2

Genotype of the progeny :

Cross I :

- Calico female: $\mathbf{X^{O+}X^{O-}}$ ……………………………………….(0.25 pt)
- Red-haired female: $\mathbf{X^{O+}X^{O+}}$ ……………………………………….(0.25 pt)
- Red-haired male: $\mathbf{X^{O+}Y}$ ……………………………………….(0.25 pt)
- Black haired male $\mathbf{X^{O-}Y}$ ……………………………………….(0.25 pt)

Cross II :

- Cats without tail: **M//m** ……………………………………….(0. 5 pt)
- Cats with tail **m//m** ……………………………………….(0. 5 pt)

2pts

3

Theoretical results of the F'$_2$ generation resulting from the cross between black hair male cats without tail with calico hairs female cats without tail:

Phenotype : ♂ [M, O^-] [M, O^-O^+] ♀

Genotype : M//m ,$X^{O-}Y$ × M//m ,$X^{O+}X^{O-}$

Gametes : (M / , X^{O-}) ¼ ; (M / ,Y) ¼ (M /, X^{O+}) ¼ ; (M /, X^{O-}) ¼

(m / , X^{O-}) ¼ ; (m /, Y) ¼ (m / , X^{O+}) ¼ ; (m /, X^{O-}) ¼

0,75pt

Punnett Square :

γ♂ / γ♀	(M / , X^{O-}) ¼	(M / ,Y) ¼	(m / , X^{O-}) ¼	(m /, Y) ¼
(M /, X^{O+}) ¼	~~**M//M , $X^{O+}X^{O-}$** 1/16♀~~	~~**M//M ,X^{O+} Y** ♂1/16~~	**M//m, $X^{O+}X^{O-}$** [M,O^-O^+]1/16♀	**M//m,X^{O+} Y** [M, O^+] 1/16♂
(M /, X^{O-}) ¼	~~**M//M, $X^{O-}X^{O-}$** 1/16♀~~	~~**M//M, X^{O-}Y** ♂1/16~~	**M//m , $X^{O-}X^{O-}$** [M, O^-] 1/16♀	**M//m, X^{O-}Y** [M, O^-] 1/16♂
(m / , X^{O+}) ¼	**M//m , $X^{O+}X^{O-}$** [M, O^-O^+] 1/16♀	**M//m, X^{O+} Y** [M, O^+] 1/16♂	**m//m , $X^{O+}X^{O-}$** [m,O^-O^+] 1/16♀	**m//m , X^{O+} Y** [m, O^+] 1/16♂
(m /, X^{O-}) ¼	**M//m $X^{O-}X^{O-}$** [M, O^-] 1/16♀	**M//m, X^{O-}Y** [M, O^-] 1/16♂	**m//m , $X^{O-}X^{O-}$** [m, O^-] 1/16♀	**m//m ,X^{O-}Y** [m, O^-] 1/16♂

1.5pt

2/12 ♂ [M, O^+] ; **2/12** ♂ [M, O^-] ; **1/12** ♂ [m, O^+] ; **1/12** ♂ [m, O^-]

2/12 ♀ [M, O^-] ; **2/12** ♀ [M, O^-O^+] ; **1/12** ♀ [m, O^-] ; **1/12** ♀ [m, O^-O^+]

0, 5pt

Exercise 2 : (3.25 pts)

1

Anomaly of color blindness (accept all correct justifications for example)**:**

- The morbid allele is linked to X, the father II_3 is sick and his daughter III_4 is healthy, so the allele is recessive. Because if he is dominant the daughter III_4 will be sick because she receives the X chromosome from her father.
- The gene responsible for the disease is carried by the X chromosome, the mother II_2 is healthy and her son is sick. So the allele is recessive because if he is dominant, this woman will be sick. ……………………………………….(0.25 pt)

Anomaly of deaf-mutes:

- Parents I_3 and I_4 are healthy and had a sick daughter II_5. So the allele responsible for the disease is recessive.……………………………………….(0.25 pt)
- The gene responsible for the disease is not carried by the X chromosome: II_5 is a sick daughter while her father is healthy (or her son is healthy)…………(0.25 pt)

1pt

	- Since II_5 is female, therefore the gene is not carried by the Y chromosome ………………………………………………………………………… (0.25 pt)	
2-a	Genotype of individuals: III_4 : $X^D X^d$,**S//S** ……………………………………………………(0.25 pt) III_5 : X^D Y ,**S// s** ……………………………………………………(0. 25 pt)	**0,5pt**
2-b	The probability of the couple III_4 and III_5 giving birth to a healthy child who is both colorblind and deaf-mute [d, s] is : Phenotypes: **[D,S] III_5 ♂** x ♀ **III_4 [D,S]** Genotypes: X^D Y ,**S// s** x $X^D X^d$,**S//S** Gametes: X^D ,S/ ¼ ; X^D ,s/ ¼ ; Y ,S/ ¼ ; Y, s / ¼ — X^D ,S/ ½ ; X^d ,S/ ½	**0, 5pt**

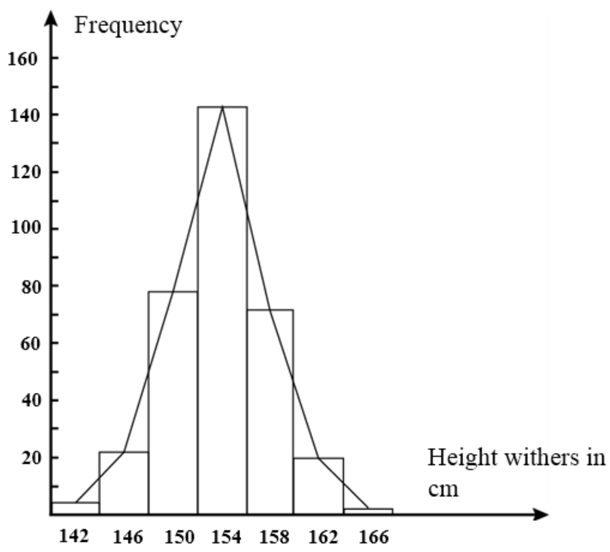
γ♂ / γ♀	(X^D, S/)1/4	(X^D, s/) 1/4	(Y ,S/) 1/4	(Y, s /) 1/4
(X^D,S/) 1/2	X^DX^D ,S//S 1/8 [D,S]♀	X^DX^D ,S//s 1/8 [D,S]♀	X^DY, S//S 1/8 [D,S]♂	X^DY ,S//s 1/8 [D,S]♂
(X^d, S/) 1/2	X^DX^d ,S//S 1/8 [D,S]♀	X^DX^d ,S//s 1/8 [D,S]♀	X^dY ,S//S 1/8 [d,S]♂	X^dY ,S//s 1/8 [d,S]♂

1pt

The probability is : 0 ……………………………………………………… **0,25pt**

Exercise 3 : (6 pts)

1 — The frequency histogram and the frequency polygon of the distribution height at withers”: — **1.5pt**



2	Correct application table for the calculation of statistical parameters. Score only the last four columns - (0,25 pt) for each column : …………….(1.5 pt)	3pts

Classes	central classes (xi)	f_i	$x_i \times f_i$	$x_i - \bar{X}$	$(x_i - \bar{X})^2$	$f_i \times (x_i - \bar{X})^2$
[140-144[	142	2	284	-12,19	148,54	297,08
[144-148[	146	20	2920	-8,19	67,04	1340,76
[148-152[	150	72	10800	-4,19	17,54	1262,64
[152-156[	154	143	22022	-0,19	0,04	5,04
[156-160[	158	78	12324	3,81	14,53	1133,63
[160-164[	162	22	3564	7,81	61,03	1342,71
[164-168[	166	4	664	11,81	139,53	558,12
Total		341	52578			5939,99

Arithmetic mean : $\bar{X}$=154,19 cm……………..…………………….………..(0. 5 pt)

Standard deviation : σ = 4,17cm ……………………….…………...………. (0.5 pt)

Confidence interval: [150,02 ; 158,36] ………………………………….. (0, 5pt)

3	The conclusion must include the following : - Unimodal frequency polygone (mode = 154cm, or class [152-156[ ). So the sample is homogeneous…………………………………….............(0.75 pt) - the confidence index indicates that 68 % of the sample belongs to the interval [150,02 ; 158,36] ……………………….………………………….…….(0.75 pt)	1.5pt