الصفحة 1 / 3	الامتحان الوطني الموحد للبكالوريا المسالك الدولية الدورة الاستدراكية 2020 - عناصر الإجابة –	المملكة المغربية وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي المركز الوطني للتقويم والامتحانات
***|	SSSSSSSSSSSSSSSSSS RR 36E	

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-** □ **Diploid cell:** cell containing chromosomes in pairs, each chromosome of which has its homologous..... (**0.5pt**) □ **Crossing-over :** phenomenon of exchange of fragments of chromatids between two homologous chromosomes during prophase I of meiosis……..... (**0.5pt**) **2- Two characteristics of a diplophasic chromosomal cycle :** - Only the gametes are haploid (n)..... (**0.5pt**) - Fertilization immediately follows meiosis…..... (**0.5pt**) **NB:** accept other characteristics of a diplophasic cycle.	**2pt**
II	**(1; d) ; (2 ; a) ;(3 ; c) ; (4 ; b)**.....(**0.5pt x 4**)	**2pts**
III	**(1; b) ; (2 ; d) ;(3 ; c) ; (4 ; a)**.....(**0.25pt x 4**)	**1pt**
Section II : Scientific reasoning and communication in graphic and written modes (15pts)		
Questions	**Exercise 1 : (5 pts)**	**Scores**
1	- The chromosomal formula of the male: 2n= 3AA+ XY……..……...(**0,25pt**) -The chromosomal formula of the male gametes: n=3A+ X and n=3A+ Y ……..……**(2x0,25 pt)**	**0.75pt**
2	**a-** a- Interchromosomal mixing ……..……..……..…… (**0,25 pt**) Justification : the two genes are carried by different chromosomes.....(**0,25 pt**) **b-** Intrachromosomal mixing ……..……..…… (**0,25 pt**) Justification : both genes are carried by the same X chromosome …..... (**0,25 pt**)	**1pts**
	Interprétation chromosomique du croisement: Phenotype : ♀ [bw^+, j^+] × ♂ [bw, j] Genotype : bw^+//bw, $X^{j+}X^j$ × bw//bw, X^jY ↓ ↓ Gametes : (bw^+/ X^{j+}) ¼ ;(bw^+/ X^j) ¼ (bw/ X^j) 1/2 (bw^+/ X^{j+}) ¼ ; (bw^+/ X^j) ¼ (bw/ Y) 1/2 **Punnett Square** :	**0,5pt** **0,5pt**

♀γ / ♂γ	(bw^+/ X^{j+}) ¼	(bw^+/ X^j) ¼	(bw/ X^{j+}) ¼	(bw/ X^j) ¼
bw/ X^j 1/2	bw^+//bw$X^{j+}X^j$ ♀[bw^+,j^+]1/8	bw^+//bwX^jX^j ♀[bw^+,j] 1/8	bw//bw$X^{j+}X^j$ ♀[bw,j^+]1/8	bw//bwX^jX^j ♀[bw,j] 1/8
bw/ Y 1/2	bw^+//bwX^{j+}Y ♂[bw^+,j^+]1/8	bw^+//bwX^jY ♂[bw^+,j] 1/8	bw//bwX^{j+}Y ♂[bw,j^+]1/8	bw//bwX^jY ♂[bw,j] 1/8

0,5pt

The following theoretical results are obtained : **0,25pt**

♀+♂[bw^+, j^+] ¼ ; ♀+♂[bw^+, j] ¼ ; ♀+♂[bw, j^+] ¼ ; ♀+♂[bw, j] ¼

4-a — **1pt**

-The percentage of parental phenotypes (86.56%) is much higher than the percentage of recombinant phenotypes (13.44%), so the two genes responsible for body colour and wing shape are linked……..…..……..…….……...(**0,5pt**)
-The two genes are carried by the sex chromosome X since there is a phenotypic difference between males and females of the F_2 generation..……..…. (**0,5pt**)

4-b — **0,5pt**

- According to the percentage of recombinant phenotypes in males, the distance between the two genes is 13.44 cM, which corresponds to the distance indicated on the X chromosome (figure b of document 1)…….……...…….……(**0,5pt**)

Exercise 2 : (4 pts)

1-a — **1pt**

- The allele responsible for the disease is recessive
Justification: Birth of a sick children (II_3, II_8) from a healthy parents (I_1 and I_2)
……..……(**0,25pt**)
- The gene responsible for the disease is carried by an autosome……..…..(**0,25pt**)
Justification :
● The gene responsible for the disease is not carried by the Y chromosome.
Since sick females are present (II_8 and III_2)……..…….….. (**0,25pt**)
● The gene responsible for the disease is not carried by the X chromosome.
Since the sick females (II8 or III2) come from a healthy father.....…… (**0,25pt**)

1-b — **1pt**

b- Genotype of individuals: ……..……..……(**4x0,25pt**)

II_2	II_5	III_2	III_3
H//h	H//H or H//h	h//h	H//H or H//h

2 — **1,25pt**

● Female III_2 gives only one type of gamete h/. ……..... (**0,25pt**)
● There is a probability of ½ (50%) for father III_3 that he is homozygous H//H and a probability of ½ (50%) that he is heterozygous H//h.……..……(**0,25pt**)
● The couple gives birth to a sick child if the father III_3 is heterozygous H//h.
according to the following Punnett Square: ……..…….....……. (**0,5pt**)

γ ♂ / γ ♀	h/ 50%	H/ 50%
h/	h//h [h] 50%	H//h [H] 50%

Probability to give birth to a sick child from parents III_2 and III_3 is ½ x 50%= 25%
……..……..…. (**0,25pt**)

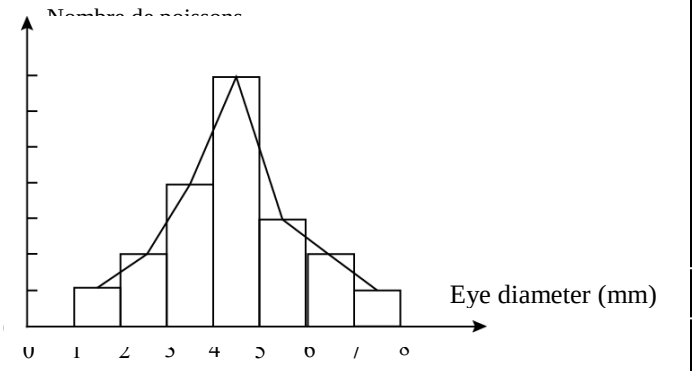
3 — **0,75pt**

- The genotype of the foetus is h/h.…...……..…..…(**0,25pt**)
- The fœtus will have a sick phenotype [h]……..……..…(**0,25pt**)
- The electrophoresis results show that the genotype of father III_3 is heterozygous, so this couple has a 50% risk of having a sick child.....(**0,25pt**)

Exercise 3 : (6 pts)

1 — **2pt**

Realization of a histogram and a correct frequency polygon according to the scale proposed in the exercise.



2 — **2pts**

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

Classes	**Centre des classes (x_i)**	**f_i**	**x_iX f_i**	**$x_i - \bar{X}$**	**$(x_i - \bar{X})^2$**	**f_iX $(x_i - \bar{X})^2$**
[1-2[	1,5	1	1,5	-2,95	8,7025	8,7025
[2-3[	2,5	2	5	-1,95	3,8025	7,605
[3-4[	3,5	4	14	-0,95	0,9025	3,61
[4-5[	4,5	7	31,5	0,05	0,0025	0,0175
[5-6[	5,5	3	16,5	1,05	1,1025	3,3075
[6-7[	6,5	2	13	2,05	4,2025	8,405
[7-8[	7,5	1	7,5	3,05	9,3025	9,3025
Total		20	89			40,95

Arithmetic mean : $\bar{X}$=4.45 mm……..……..**(0. 25 pt)**
Standard deviation : σ = 1,43cm ……..……..…… **(0.25 pt)**

3-a — **1pt**

+ The arithmetic mean of the descendant population E2 is higher than the arithmetic mean of the mother population E1. ……..…….. (**0,5pt**)
+ The standard deviation of the descending population E2 is less than that of the mother population E1.....……..……..…….. (**0,5pt**)
So the selection was effective.

3-b — **1pt**

+ The E2 descendant population is homogeneous……..…….. (**0,25 pt**)
+ The arithmetic mean and standard deviation of the E2 descendant population are identical to those of the P2 population ……..…….. (**0,5 pt**)
+ The P2 population with normal vision is purebred……..…… (**0,25 pt**)
So artificial selection at the E2 progeny level would be ineffective..... **(0.25 pt)**

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