

الصفحة	الامتحان الوطني الموحد للبكالوريا المسالك الدولية الدورة العادية 2020 - الموضوع -		 المملكة المغربية وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي المركز الوطني للتقويم والامتحانات
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2	مدة الإنجاز	علوم الحياة والأرض	المادة
3	المعامل	شعبة العلوم الرياضية (أ) (خيار إنجليزية)	الشعبة أو المسلك

Candidates may use non-programmable calculators

Section I : Knowledge Retrieval (5 pts)

I. Answer the following questions on your writing sheet:

1. **Define** the following notions: -**The equational division**; -**The gene map**. (1pt)
2. **Name** two uses for the karyotype of the embryo during pregnancy. (1pt)

II. For each of the propositions numbered from 1 to 4, there is only one correct suggestion in each set. **Copy down** these pairs (1 ; ..), (2 ; ..), (3 ; ..), (4 ; ..), and **match** each number with its corresponding letter. (2pts)

<p>1. Mendel's second law is the law of:</p> <p>a. uniformity of hybrids to the first generation resulting from the crossing of two pure lines;</p> <p>b. gamete purity, following the disjunction of the two alleles of a gene in a hybrid;</p> <p>c. gamete purity, following the association of the two alleles of a gene in a hybrid;</p> <p>d. independent segregation of two pairs of alleles.</p>	<p>2. The interchromosomal mixing during meiosis results from the independent and random separation of :</p> <p>a. homologous chromosomes during anaphase I;</p> <p>b. homologous chromosomes during anaphase II;</p> <p>c. chromatids during anaphase I;</p> <p>d. chromatids during anaphase II.</p>
<p>3- In diploid organisms, for a particular gene, a heterozygous individual is characterized by:</p> <p>a. the production of gametes all having the same genotype ;</p> <p>b. a phenotype determined by the recessive allele;</p> <p>c. a genotype consisting of two alleles that occupy different loci (plural of locus);</p> <p>d. a genotype consisting of two different alleles occupying the same locus.</p>	<p>4. The metaphase I of meiosis is characterized by:</p> <p>a. the distribution of homologous chromosomes on either side of the equatorial plane;</p> <p>b. the formation of an equatorial plate by two chromatids son chromosomes;</p> <p>c. the separation of homologous chromosomes followed by polar migration;</p> <p>d. the separation of two chromatids of the same chromosome followed by polar migration.</p>

III. Copy down the letter corresponding to each proposition and **Write** whether the statement is “**true**” or “**false**”. (1pts)

- a- In the case of a dominant X-linked disease, there is a 50% chance that daughters will be sick if their father is sick.
- b- In the case of an X-linked recessive disease, all the boys of a sick mother will be sick.
- c- In the case of an autosomal recessive disease, the probability of a heterozygous father transmits the morbid (mutated) allele to his children is 50%.
- d- In the case of an autosomal dominant disease, a heterozygous father transmits the morbid allele to 100% of his children.

Section II: Scientific Reasoning and Communication in graphic and written modes (15 pts)

Exercise 1 : (5.75 pts)

To study the mode of transmission of two hereditary traits characteristics in cats: "the hair color" and "the presence or absence of the tail", the following data are proposed:

- Hair color is under the control of an "O" gene with two alleles (O^+ and O^-): the " O^+ " allele determines the red [O^+] phenotype and the " O^- " allele determines the black [O^-] phenotype. Heterozygous individuals have calico hairs (white hairs with large orange and black spots).
- The presence or absence of the tail in cats is determined by a pair of autosomal alleles. The "M" allele is responsible for the absence of tail and the "m" allele is responsible for the presence of tail.

The following table presents the results of the transmission of these two characteristics following two crosses in this animal.

	Cross I	Cross II
The parents	Between a red male cat and a calico female cat.	Between cats without tails
The descendants	25% calico females 25% red-haired females 25% red haired males 25% black haired males	2/3 cats without tails 1/3 cats with tails

1- Determine the mode of transmission of the two characters "hair color" and "presence or absence of tail". Justify your answer. (1pt)

Use :

- The symbols (**M, m**) for the alleles responsible for the "presence or absence of tail" characteristic.
- The symbols (**O^+ , O^-**) for the alleles responsible for the characteristic "hair color".

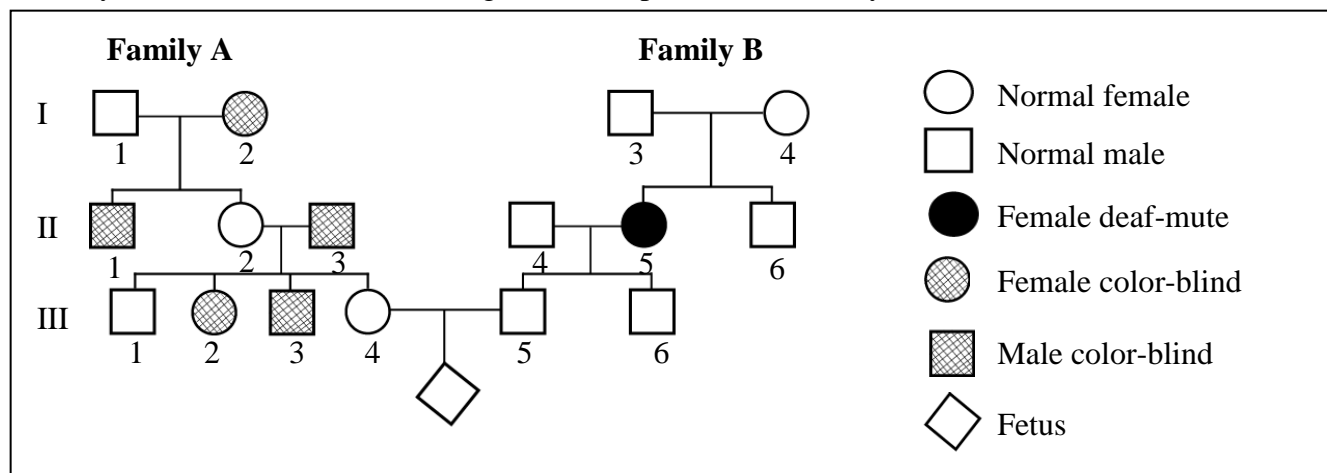
2- Give the genotype of the progeny, for each crossbreeding. (2pts)

In order to obtain an F_2 generation, we cross black hair male cats without tail with calico hairs females without tail.

3- Determine the theoretical results (phenotypes and proportions) of the F_2 generation, justify your answer by using the Punnett Square. (2.75pts)

Exercise 2 : (3.25 points)

Woman III_4 is pregnant and is worried that her future child will be affected by two hereditary anomalies abnormalities because she was born into a family of color-blind people and her husband III_5 comes from a family of deaf-mutes. The following document presents the family tree of the two families.

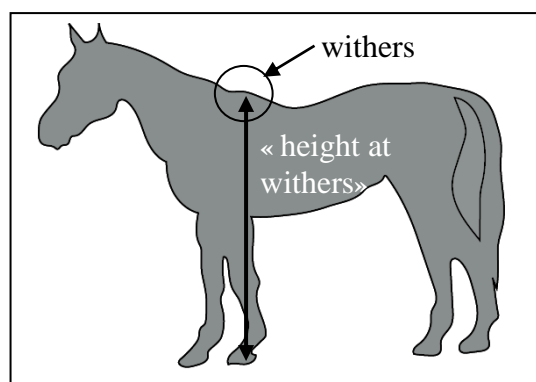


Document

- 1- Knowing that color-blindness is linked to sex and based on the family tree, **determine** the mode of transmission of each of these two anomalies. **(1pt)**
- 2- Knowing that the hereditary patrimony of each of the two spouses III₄ and III₅ does not carry the morbid allele (responsible for the anomaly) of the other family.
 - a- **Give** the genotypes of III₄ and III₅, taking both genes into consideration. **(0.5pt)**
 Use :
 - For color blindness the symbols (**D and d**) to represent the alleles.
 - For the deaf-mute the symbols (**S and s**) to represent the alleles.
 - b- **Demonstrate**, using the Punnett Square , that the future child of this woman cannot be at the same time color-blind and deaf-mute. **(1.75pt)**

Exercise 3 : (6 pts)

In order to study the variation of the "height at withers" (height between the withers and the ground surface) (see document 1), in horses of the Arab-Beard race, we propose the following data:
 In Morocco, the horse is still present in various religious and national events and its breeding is of great economic and socio-cultural importance.
 The measurement of "height at withers", carried out on 341 horses, aged 4 years and over, gave the results represented in document 2:



Document 1

height at withers in cm	[140-144[[144-148[[148-152[[152-156[[156-160[[160-164[[164-168[
Number of horses	2	20	72	143	78	22	4

Document 2

- 1- On your writing sheet, **make** the frequency histogram and the frequency polygon of the distribution "height at withers" in cm. **(1.5pt)**
 (Use 1cm for each class and 1cm for 10 horses).
- 2- **Calculate** the arithmetic mean, the standard deviation and the confidence interval $[\bar{X} - \sigma, \bar{X} + \sigma]$ of this distribution, based on an application table for the calculation of the statistical parameters. **(3pts)**

Use the following formula:

$$\bar{X} = \frac{\sum_1^i (f_i x_i)}{n} \text{ and } \sigma = \sqrt{\frac{\sum_1^i f_i (x_i - \bar{X})^2}{n}}$$

- 3- **Deduce**, using the previous data, the characteristics of this distribution. Justifying your answer. **(1.5pt)**