DIHYBRID CROSSING

1. Two characteristics of rabbits (length of the ears and shape of the lip) were studied. Each of these characteristics has two variations: Ears may be long or short, and the lip may be wide or pointed.
A male rabbit homozygous for wide lips (LL) and heterozygous for short ears (Ee) is crossed with a female rabbit that is heterozygous for wide lips (Ll) and homozygous for long ears (ee).

1.1 What term describes a genetic cross involving two characteristics? (1)
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1.2 Give the
a) dominant phenotype for the length of ears …… (1)
b) recessive phenotype for the shape of the lip …… (1)
c) possible genotype for a rabbit with short ears and a pointed lip
…… (1)

1.3 A male rabbit with genotype EELl is crossed with a female rabbit with genotype Eell. List all the possible gametes that could be produced by the male rabbit. (2)
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1.4 Explain how Mendel's Law of Independent Assortment applies to parents with LlEe genotypes during gamete formation. (4)
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2. In holly trees, red fruit (R) is dominant over white fruit (r) and spiny leaves (L) are dominant over smooth leaves (l).
The Punnett square below shows the possible results of a cross between two individual plants. The genotype at X is not given.

Gametes	RL	Rl	rL	rl
RL	X	RRLl	RrLL	RrLl
Rl	RRLl	RRll	RrLl	Rrll
rL	RrLL	RrLl	rrLL	rrLl
rl	RrLl	Rrll	rrLl	rrll

2.1 Give the
2.1.1 genotype of X …… (1)
2.1.2 the phenotype of the parents (2)
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2.2 In a population of 128 plants, how many plants with red fruit and smooth leaves are expected from the Punnett square above? Show ALL working. (3)
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2.3 A farmer wanted to produce plants with only white fruit and spiny leaves. Give the genotype of the plants that he should use in the cross. (2)
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2.4 Determine the phenotypic ratio from the punnet square. (2)
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SEX DETERMINATION and SEX-LINKED DISEASES

3.1 Humans have 23 pairs of chromosomes.
3.1.1 The appearance, structure and functioning of the body is controlled by 22 pairs.
What are these chromosomes called? …… (1)
3.2 What are the sex chromosomes called? …… (1)
3.3 Sipho and Pamela have three sons and Pamela is pregnant again.
Show by means of a genetic cross what the percentage chance is of them having a baby girl.

3.2 Haemophilia is a sex-linked disease caused by the presence of a recessive allele (X^h).
3.2 1 A normal father and heterozygous mother have children. Construct a genetic cross to determine the possible genotype and phenotype of the children of the parents. Also indicate the proportion of F_1 phenotypes

3.2.2. Explain why the chances of men having a sex-linked disorder is much higher than it is for women. (4)
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BLOOD GROUPS

5. Human blood groups are controlled by **multiple** alleles.
5.1 List all the alleles that control human blood groups. (3)

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5.2 How many of the alleles named in question 5.1 can any individual inherit? ……

5.3 The table below summarises the different blood groups resulting from different allele combinations. Complete the table by filling in the missing blood groups.

Genotype	Blood group
I^AI^A	
I^Ai	
I^BI^B	
I^Bi	
$I^{Al}B$	
ii	

How many blood groups are found in humans? …… (1)

6. A man with blood group AB and a woman who is heterozygous for blood group B plan to have children.
6.1 How many alleles control the inheritance of blood groups? ……. (1)
6.2 Describe the type of dominance that occurs in the inheritance of Blood group B in the woman. (3)
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6.3 Use a genetic cross to show all the possible genotypes and phenotypes of their children.