

**School
Logo**

LIFE SCIENCES GRADE 12

GENETICS TEST: 2

Memorandum

DATE:

TIME: 60MIN

MARKS: 60

1. A homozygous snapdragon plant with red flowers (**R**) was cross-pollinated with a homozygous snapdragon plant with white (**W**) flowers. All the plants that grew from the cross had pink flowers. Represent a genetic cross to determine the genotype of the F₁ generation of plants.

P₁ phenotype Red x White ✓
 genotype RR x WW ✓

Meiosis
G R x W ✓
 Fertilization

gamete	R
W	RW

OR 1 mark for correct gametes
1 mark for correct genotypes

genotype RW ✓ phenotype Pink ✓

Max (7)

2. A mother with blood group A and a father with blood group B are both heterozygous in terms of this characteristic. Represent a genetic cross to determine the different possible blood group genotypes and phenotypes of their children.

P₁ phenotype Blood group A x Blood group B ✓
 genotype I^Ai x I^Bi ✓

Meiosis
G I^A and i x I^B and i ✓
 Fertilization

gamete	I ^A	i
I ^B	I ^A I ^B	I ^B i
i	I ^A i	ii

OR 1 mark for correct gametes
1 mark for correct genotypes

genotype I^AI^B, I^Bi, I^Ai, ii ✓
 phenotype Blood group AB, Blood group B, Blood group A, Blood group O ✓

(7)

3.1.1 8 ✓

(1)

- 3.1.2 25% ✓ (2)
- 3.1.3 Ff ✓ ✓ (2)
- 3.1.4 Individual B would have one dominant gene since he/she has free earlobes ✓ and the other gene must be recessive since they were able to produce offspring with attached earlobes ✓ / the recessive characteristic (2)
- 3.1.5 No ✓ (1)
- 3.1.6 Since C and D have attached earlobes they have only recessive genes ✓ and can therefore have no dominant gene ✓ for free earlobes to pass to their offspring. (2)
- 4.1.1 Albert $X^h Y$ ✓ ✓
 Beatrice $X^H X^h$ ✓ ✓
 Carol $X^h X^h$ ✓ ✓
 Eckhardt $X^h Y$ ✓ ✓
 Fiona $X^H X^h$ ✓ ✓ (10)
- 4.1.2 25% ✓ (1)
- 4.1.3 Chance of 1 out of 4 of 25% ✓ (2)
- [13]

POLYGENIC INHERITANCE AND MULTIPLE ALLELES

5.1

Polygenic inheritance e.g. Skin colour	Multiple alleles e.g. Blood groups
1. At least three genes ✓ with two alleles each	One gene ✓ with three alleles
2. Incomplete dominance ✓ / intermediate phenotypes	Alleles I^A and I^B is co-dominant ✓ and i is recessive
3. a range of phenotypes ✓ / continuous variation	Distinct phenotypes ✓ / discontinuous variation
4. Genes at different loci ✓	Gene at one locus ✓

(Any 6) plus one for table [7]

6.1 Advantages of genetic engineering

- Production of medication/resources cheaply ✓

- Control pests with specific genes inserted into the crop✓
- Selecting the best genes to produce better resistant crops✓
- Using specific genes to increase crop yields✓ / food security
- Selecting genes to increase shelf life of plant products✓
- Selecting genes that delay ripening of fruits✓ to meet the demand
- Using specific genes to improve nutritional value✓ of food for better health
- Using specific genes to introduce new traits in crops✓ to suit specific needs of a population (e.g. to increase vitamin A in food)
- DNA and proteins of transgenic organisms unlikely to cause problems ✓ since it is digested in human gut.
- Transgenic organisms do not survive easily in wild ✓

Any 3

6.2 Disadvantages of genetic engineering

- Expensive✓ /research money could be used for other needs
- May be hard for poor people to access/compete✓
- Interfere with nature✓ /immoral/ we cannot play God
- Domination of the world food products by only a few companies ✓
- Loss of flora and fauna biodiversity✓ by inbreeding /entire species to be wiped out if exposed to disease against it has no resistance /such as allergens
- Potential health impacts✓
- Violation of natural organism's intrinsic value✓ /right to independent existence by changing the genetic makeup of an organism
- Unsure of long term effects✓
- Genes from transgenic organisms could escape✓ and be transferred to wild organisms

(Mark first THREE only)

Any 3

7.1 What are the phenotypes (descriptions) of rabbits that have the following genotypes?

Ggbb **Greyfur, red eyes**✓✓

ggBB **White fur, black eyes**✓✓

ggbb **White fur, red eyes**✓✓

(3x2=6)

How many out of 16 are:

7.2.1 Gray, red-eyed 8✓

7.2.2 Gray, black-eyed 8✓

7.2.3 White, red-eyed 0✓

7.2.4 White, black-eyed 0✓

(4)

TOTAL 60

For more tests follow the link: https://thundereduc.com/past-exam-papers/?doing_wp_cron=1593844505.1738760471343994140625