**ATAR HUMAN BIOLOGY – UNIT 2**

**Task 11 – Inheritance (DNA) Practical - MARKING KEY**

**Breeding Reebops Assessment**

Mark Allocated **Part 1**.

1. Genotypes and phenotypes of parents recorded accurately. (1 mark)
2. Genotypes and phenotypes of baby recorded accurately. (2 marks)
3. Baby created according to phenotype. (1 marks)
4. Notes made on babies and their characteristics in the nursery. (3 marks)
5. Genotype and phenotype of “mate” recorded. (1 mark)
6. Punnet square of cross drawn accurately for chosen characteristic and outcomes. (3 marks)

**Question 1**

1. Discuss the similarities and differences between the inheritance of the nose characteristics and the inheritance of the leg characteristics. (5 marks)

The leg characteristic is a dominant/recessive inheritance where if the dominant allele is inherited the characteristic will show does not matter what the other allele is or two recessive alleles are required for the recessive characteristic to show.

The nose characteristic is an example of co-dominance/incomplete inheritance where the heterozygous genotype creates a different phenotype to the two homozygous genotypes.

Both types of inheritance rely on only one pair of alleles controlling the inheritance

Both are examples of monogenic inheritance

Neither are sex-linked characteristics.

*(2 points description of patterns, 3 points must be two similarities, one difference)*

1. The symbols shown on the Decoding Key for the nose genotype are incorrect. How could you change the symbols used to properly show this type of inheritance. (1 mark)

Have used capital and small case letters, for codominance must use two capital letters that are different

eg RR=red, RW=green, WW=white or NRNR= red, NRNW=green, NWNW= white.

**Question 2**

1. What do the two “piles” of chromosomes you created represent in real life? Gametes/sperm/egg (1 mark)
2. Explain **in detail** what else can occur and where it occurs during this process to create new variations which may contribute to the evolution of the species. (3 marks)

Gene or chromosome mutations (1) can occur during crossing over and recombination/prophase1. (1)

And any one of the following:

If the mutation is then passed on to the gametes that becomes fertilised it may provide a selection advantage for the organism.

During crossing over and recombination sections of DNA may be attached wrongly eg deletions, duplications, inversions or translocation which may cause faults/changes in the gene sequences.

Description of trisomy or monosomy

Description of point mutations

**Question 3**

Genotype correct and phenotype correct (1). If mistake no mark in that section

**Question 4**

1. What was the most common phenotype for trait amongst the babies?Eg.*2 eyes/1eye whichever* (1 mark)
2. Is this the expected trend that you would predict? Explain your answer. (2 marks)

Eg 2 eye dominant feature, expected ratio of dominant feature when two heterozygous)1) individuals breed is 3:1 (1)

If 1 eye the most common need to say not what expected (1) but small group measure ratio may not show(1).

**Question 5**

1. Pedigree chart has 3 generations for one feature. (1) Babies in 3rd generation possible from parents. Any faults remove a mark per fault.

*(max 2 marks)*

1. From your pedigree chart is it possible to state the genotype of the two offspring in the third filial generation? Explain your answer. (2 marks)

Depends on parents and feature shown by babies. If babies exhibit recessive characteristic (1) then their genotype is easily defined as must be homozygous recessive (1)

or

If the babies have the dominant characteristic – cannot tell until actually breed (1) unless both parents are homozygous.(1)

**Question 6**

Correct number of males and females from breeding program.

1. When a couple have a baby the expected ratio of males to females is 1:1. Explain the ratio of males to females obtained in your breeding program. (2 marks)

If it is 50:50 then they can say why using a punnet square or explaining the inheritance of gender using XX and XY.(1) Half sperm x and half sperm Y(1)

or

If not 50:50 then can explain the difference by saying only small number of offspring (1), so therefore the expected ratio may not become apparent as law of probability does not work unless large number of offspring.(1)

1. If you wanted to carry out a breeding program which ensured all the offspring had 2 antennae you would choose only pure breeding adults to breed?

Explain why only pure breeding adults would be used. (1 marks)

Pure breeding means that they are homozygous for their genotype, so can only donate one type of allele/allele donated can be predicted(1)

How could a breeder prove for certain that his 2 antennae adult was a pure bred? (2 marks)

He could cross his “pure” breed with a recessive 1 antennae (both alleles recessive or has to be homozygous) (1).

If all the offspring came out with 2 antennae then could predict a pure breed (would need a lot of offspring to actually prove as a small amount of offspring may not get expected ratio, if some came out showing 1 antennae then know it is not a pure bred (1).

Must have that with only a small number of offspring you cannot be 100% certain a pure bred, it just Implies.

**Question 7**

a) Sex-linked or X-linked (1 mark)

b) Virtually all people with the condition are male (*only one mark*), if say recessive as child has characteristic but parents don’t (*max 1 mark*)

*To get two marks must have higher order thinking*

The only female with condition (*V 4)* has a father with the condition and Mum must be a carrier (2)

Or people without the condition showing only have sons with the condition, to get a daughter need father to have it (2)

c) (i) Child IV 3 is a carrier XBXb(1 mark)

(ii)XB Xb(1 mark for the punnet square correct, 1 mark probability)

XB  XB XB XB Xb *Probability 50% chance*

Y XBY XbY

d) Males are more commonly affected by a recessive sex-linked trait because:

* They only have one X chromosome (1)
* So to inherit a X-linked disease they only have to inherit it from one parent (Mum), there is no matching allele on the other chromosome, so will occur more frequently (1)
* For a female to inherit the condition she has to inherit it from both parents as she has two X chromosomes and as disease recessive she must have two alleles for trait to show. (1)