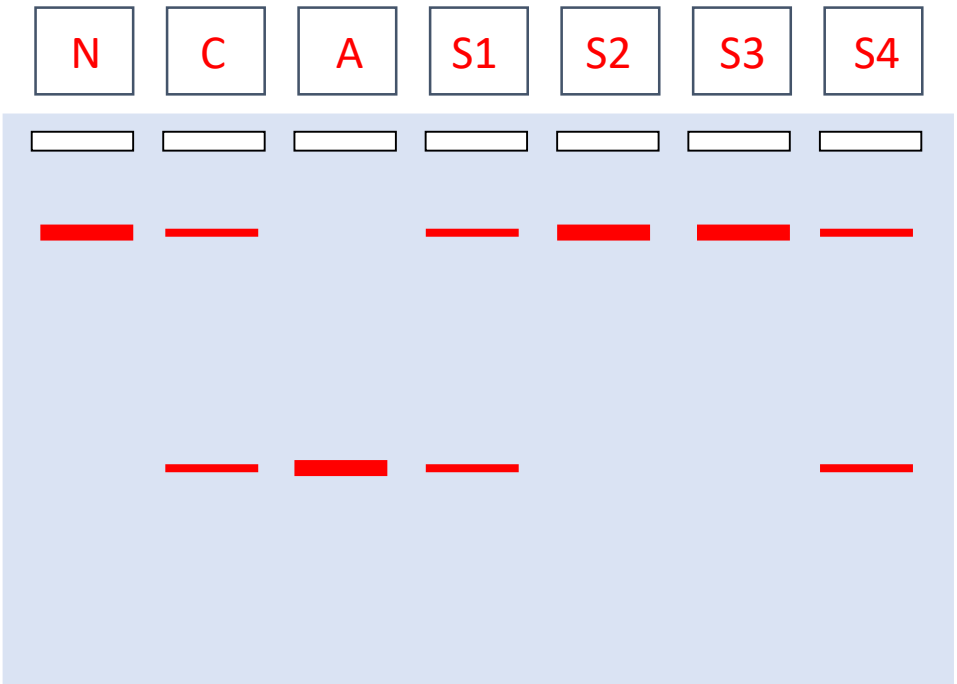
Gel Electrophoresis

Student Worksheet – TEACHER ANSWERS

DNA fragment analysis

Draw the results from your gel on the diagram below.



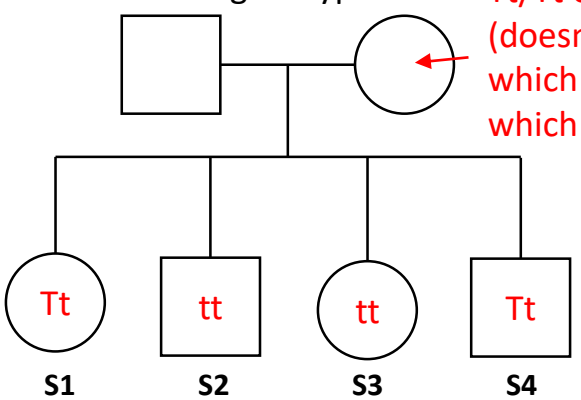
Identifying the genotype

Write in the genotype of the samples, then work out the genotype of the parents

T = Short Tail
t = Long Tail

= Male
= Female

N	tt
C	Tt
A	TT



Tt/Tt or Tt/tt (doesn't matter which parent has which genotype)

Analysis of your results

1) Which sheep have short tails? S1 + S4

2) Which sheep carry the tailless gene? S1 + S4

3) Which sheep have long tails? S2 + S3

4) Which sheep have no tails? None

Further Investigations

Why do you think we don't see any homozygous dominant sheep?

- We have only tested 4 samples so may not have all genotypes represented.
- The dominant allele may be lethal early in development when there are two copies. Therefore the homozygous dominant embryos die before being born.
- The parents may be of the genotype Tt/tt, which means they can't inherit two dominant alleles

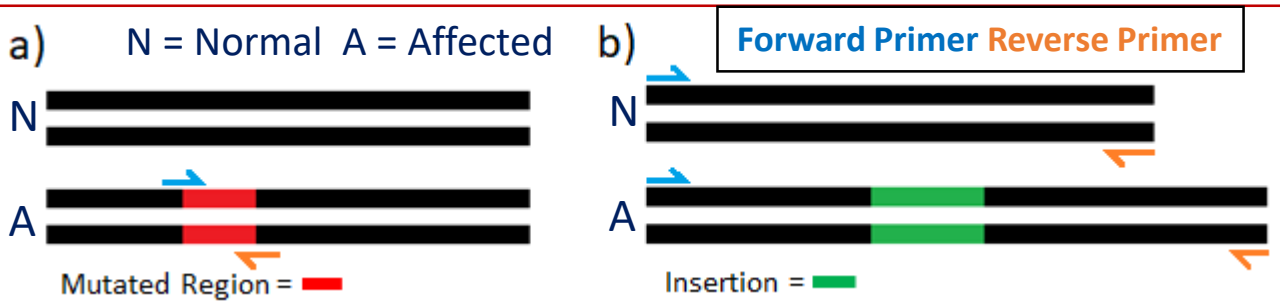
PCR is often used to amplify genomic DNA samples.
Some of the uses of PCR include:

- Amplifying regions of DNA
- Screening for the presence or absence of a specific sequence, often used for disease diagnosis.
- Generating genetic profiles for use in paternity disputes or to identify suspects from crime scenes.

1) What are the three steps in PCR?

1 – Heating to separate the strands (92 - 98°C)
2 – Cooling to allow primers to bind (50 - 65°C)
3 – Heating to allow DNA polymerase to replicate the DNA (70 - 80°C)

2) Draw on the diagram the primers needed to identify the differences between the sequences below.



a) Primers should cross part of the mutated (red) region, as the sequences are the same length and primers at either end would not differentiate them. As the primers bind to part of the mutated region they will not bind to the top (all black sequence), so only the bottom sequence would appear on a gel.

b) Primers can be placed as either end of the two sequences as they are different lengths due to the insertion (green), and would separate on a gel. Primers could also be used that bind to part of the insertion as in a).

3) Write out the primers for the whole sequence below (label the 5' and 3' ends)

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      ATGCTGACTGACTCGTCTAA →
1  5' ATGCTGACTGACTCGTCTAAGTTCGATTTGACTGTACACATAGCTGCCCT 3' 50
   3' TACGACTGACTGAGCAGATTCAAGCTAAACTGACATGTGTATCGACGGGA 5'

51 5' CGTAGCTAGCTTAGCCTAGCTAAGCTAGCTTGTGTACGATGCATTTTCAG 3' 100
   3' GCATCGATCGAATCGGATCGATTCGATCGAACACATGCTACGTAAAAGTC 5'
                                  ← ACACATGCTACGTAAAAGTC
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Forward Primer – 5' ATGCTGACTGACTCGTCTAA 3'

Reverse Primer – 5' CTGAAAATGCATCGTACACA 3'

Primers should be ~20bp in length, and start at the ends of the sequence