



Oxford Cambridge and RSA

GCSE Biology B (Twenty First Century Science)

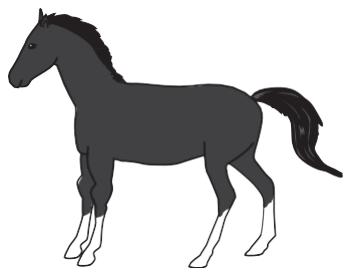
J257/03 Breadth in Biology (Higher)

Question Set 19

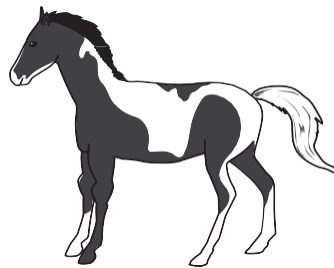
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Coat colour is inherited in a breed of horse called the American Paint horse.

Horses can either be a solid colour or frame patterned.



solid colour



frame patterned

Coat colour is determined by two alleles of a single gene.

The table describes the allele combinations that result in each coat colour.

Allele combination	Coat colour
Homozygous dominant	Solid colour
Heterozygous	Frame patterned

- (a) (i) Use the letter F to write down the genotypes for a horse with the following coat colours.

Solid coloured **FF**

Frame patterned **Ff**

[2]

(ii) Lethal white syndrome (**LWS**) is a genetic disorder found in these horses.

Foals born to these horses have all white or nearly white coats and blue eyes and appear normal.

Horses with this syndrome are homozygous recessive.

Complete the Punnett square to show how two horses **without** lethal white syndrome can have a foal with the syndrome.

Write down the probability of this happening.

	F	f
F	FF	Ff
f	Ff	ff

Probability of foal having LWS = **25%**

[4]

(b) Foals with LWS do not survive. Producing a LWS foal is now avoidable.

What technology is now available to assist breeders to prevent foals being born with LWS?

Genetic testing

[1]

(c) Explain how genetic variants arise and how they can influence the phenotype of an individual.

Genetic variants arise as a result of random mutations to DNA which alter the sequence of bases within the molecule. Mutations in coding DNA may lead to a change in the amino acid sequence coded for by the gene. This may alter the structure and function of the final protein produced, potentially altering the phenotype. Mutations in non-coding DNA may alter gene expression, preventing the production of a protein and altering the phenotype. [3]

Total Marks for Question Set 19: 10

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