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90948



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
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SUPERVISOR'S USE ONLY

Level 1 Science, 2017

90948 Demonstrate understanding of biological ideas relating to genetic variation

9.30 a.m. Wednesday 15 November 2017

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of biological ideas relating to genetic variation.	Demonstrate in-depth understanding of biological ideas relating to genetic variation.	Demonstrate comprehensive understanding of biological ideas relating to genetic variation.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

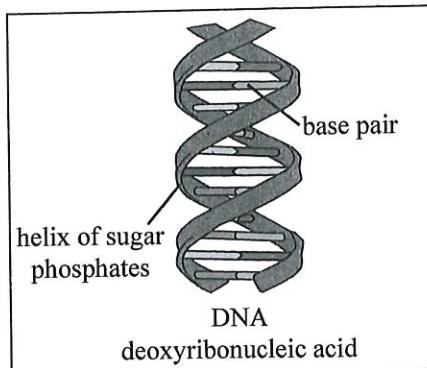
Merit

TOTAL

14

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QUESTION ONE



<https://pixabay.com/en/panter-leopard-black-spotted-359245/>

Adapted from: <https://commons.wikimedia.org/wiki/File:Dna-base-flipping.svg>

Some leopards or jaguars have a **mutation** causing them to have a black coat. These are known as "black panthers".

- (a) How can this **mutation** cause the coat colour to be different?

In your answer you should use the terms DNA, gene, allele, phenotype, and mutation to explain how this colour change occurs. The DNA diagram above may help you.

A mutation is a change in the base sequence of the DNA. This means that an allele has changed irreversibly and has changed the base sequence of alleles which changes the genetic code for the trait which ~~is~~ in this case is coat colour. As the genes have now changed, new DNA is created and the phenotype changes which means the leopard/jaguar physical trait could change. In this instance a mutation in the genes ~~has affected~~ has changed the alleles and phenotype which has caused the DNA to change and the coat colour to change to black.

- (b) Leopards in the wild commonly have scars, especially around their faces.

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Explain why the leopard cubs can be born with black coats but not with scars.

~~Leopard cubs can be born with black coats but not with scars AS black coats are GENETIC traits and are caused by the DNA you are born with/develop but scars are caused by ENVIRONMENTAL factors and some leopards may get scars as they live and get hurt/cuts/anything that can give you scars.~~

Not all cubs have scars as scars are environmental traits caused by the environment and NOT genetic!!

www.wilderness-safaris.com/media/blog/camp-news/chitabe-leopard-identikits/copy-of-01-mosadi-mogolo-web.jpg

MS

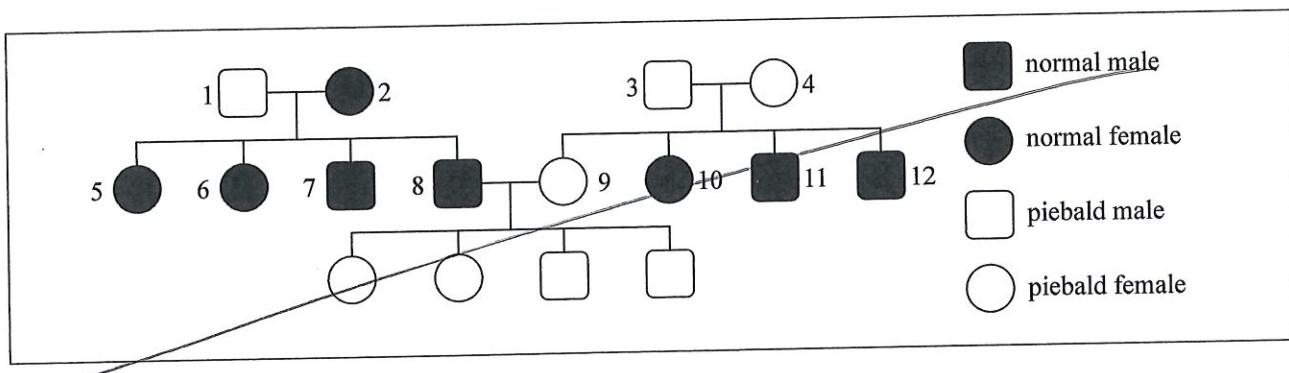
QUESTION TWO



[https://nz.pinterest.com/
pin/255297872600783620/](https://nz.pinterest.com/pin/255297872600783620/)

[www.mybligr.com/wp-content/uploads/
2017/02/beautiful-Black-horse-images-pictures-
photos-13.jpg](http://www.mybligr.com/wp-content/uploads/2017/02/beautiful-Black-horse-images-pictures-photos-13.jpg)

Piebaldism is a genetic condition causing a white patch on the head and body of horses. In horses piebaldism is a **dominant trait** (H), and “normal” colour is recessive (h).



- (a) From the pedigree chart above, list **all** the possible phenotypes and genotypes of horses 3, 8, and 9.

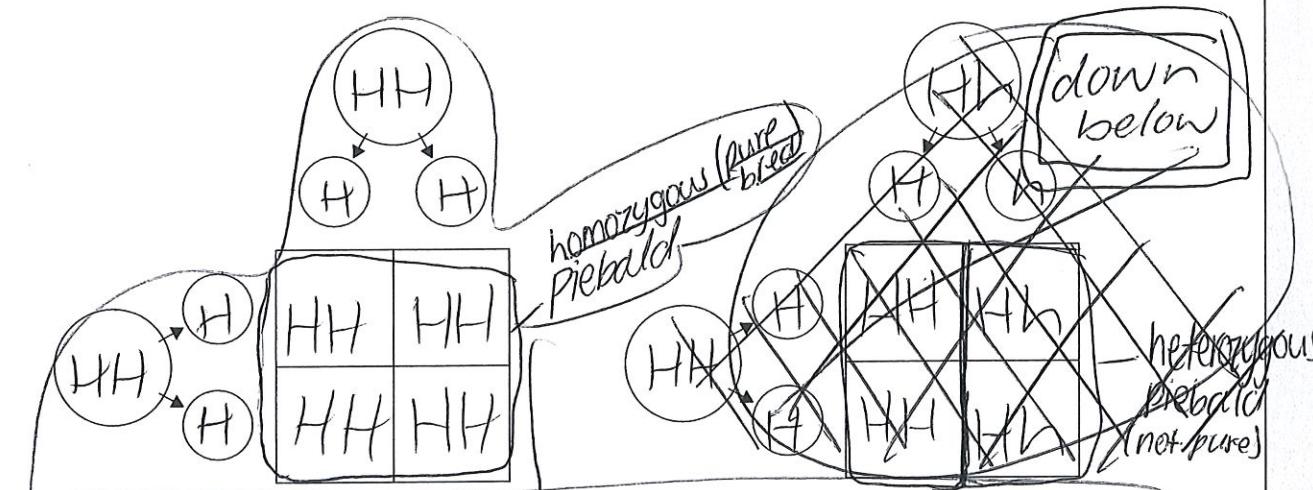
Use the letter H for the dominant trait and h for the recessive.

Individual	Phenotype (normal or piebald)	Genotype (HH, Hh, or hh)
3	Piebald	MM Mh
8	normal	hh
9	Piebald	HH or Hh most likely HH due to offspring!

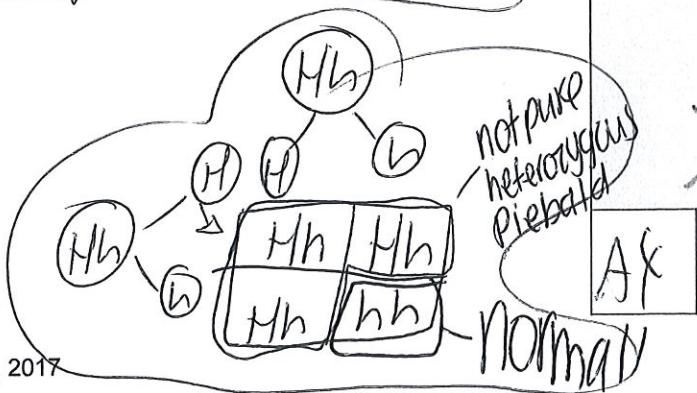
- (b) A breeder wants to produce only **dominant** (piebald) offspring from a breeding pair of horses. The breeder has piebald and normal horses to breed from.

How could the breeder use crosses to make sure that the pair of horses were **pure breeding**?

Show crosses using Punnett squares to support your answer.



He can use a test cross to ensure that his horses are pure bred by making sure ^{and parents} NO offspring are normal and are all piebald as if the horses are both pure bred dominant piebald all offspring would be pure bred piebald as well as, as seen above ^{below} in the punnet squares ~~as there are no recessive alleles present~~ and the 2 purebred homozygous dominant parents produce all purebred piebald offspring as it is impossible to produce normal as all alleles are present BUT the two non-purebred/heterozygous horses produce both normal horses and ONLY non purebred piebald horses.



QUESTION THREE

Wild bananas, showing seeds.

<https://commons.wikimedia.org/w/index.php?curid=1867879>

A "banana pup" growing.

www.promusa.org/Banana+sucker

Wild bananas have large seeds, and reproduce sexually.

Farmed bananas are produced asexually, from suckers called "banana pups".

- (a) How does the production of **gametes** result in variation for the wild banana plants?

Each gamete contains half the number of chromosomes (23)
~~(A normal)~~ body cell has (46) and in the ova they come from the mother & in sperm they come from the dad therefore when combined to produce offspring the combinations ~~are~~ of alleles are always random and different meaning no 2 sets of DNA are the same hence causing variation of traits in wild banana plants //

- (b) Suggest a possible problem that may arise with farmed bananas (produced from suckers), and explain why this problem would not occur in wild bananas (produced sexually)?

A ^{possible} problem with farmed bananas is that they are reproduced asexually mean all offspring are identical to each other & parent. Therefore if a BAD mutation occurs in one, ALL offspring from then on will carry the bad mutation through & it will be in the genes for basically ever and is very hard to get rid of - have to destroy all affected bananas. This does not happen with wild bananas as they are produced sexually so all of spring have ^{all} different combinations of alleles/genes ($\frac{1}{2}$ from mum $\frac{1}{2}$ from dad) so therefore not all off spring will be affected by the mutation as all offspring are varied!!! //

Merit Exemplar for 90948. 2017			Total score	14
Q	Grade score			
1	M5	This is an M5 because in (a) there was a description of a mutation. It was not an E7 because there was not extensive description of genetics terminology in context. In (b) there was achieved evidence correctly describing scars as non-genetic but failed to mention they were not able to be passed on.		
2	A4	This is an A4 because in (a) they gave the correct phenotypes. In (b) they gave a correct Punnett square, showed that HH was pure breeding and showed that to produce pure bred piebald you cross two homozygous dominants. It was not an M5 because there was no explanation of a test cross, even though they mentioned the term.		
3	M5	This is an M5 because in (a) they have explained fertilisation and the variation resulting. In (b) their response to farmed bananas did not say how the “bad” mutation could influence the survival of the bananas. Also for wild bananas saying they are varied is not enough to imply resistance. For an M6 they needed to explain the impact of chromosome shuffling more explicitly.		