SUPERVISOR'S USE ONLY

90948



Level 1 Science, 2014

90948 Demonstrate understanding of biological ideas relating to genetic variation

9.30 am Monday 10 November 2014 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 space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

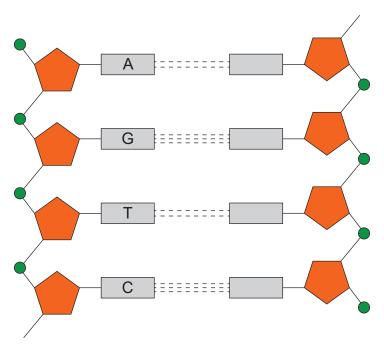
Check that this booklet has pages 2–13 in the correct order and that none of these pages is blank.

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

TOTAL

(b)

(a) Label the unlabelled bases A, G, C, or T in the diagram of DNA shown below.



Adapted from: http://cronodon.com/BioTech/Cell_Nucleus.html

| plain the relationship | between DNA, a | a gene, and an a | llele. | |
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| The pictures below show two plants of the same species. Plant A Plant B Discuss how BOTH inheritable and non-inheritable factors can result in the variation of these plants, AND explain the importance of this variation within a large population of the plants growing in a changing environment. | | Give two examples of environmental factors that can lead to non-inheritable variation in plants. |
|--|-----|---|
| The pictures below show two plants of the same species. Plant A Plant B Discuss how BOTH inheritable and non-inheritable factors can result in the variation of these plants, AND explain the importance of this variation within a large population of | | 1 |
| Plant A Plant B Discuss how BOTH inheritable and non-inheritable factors can result in the variation of these plants, AND explain the importance of this variation within a large population of | | 2 |
| Discuss how BOTH inheritable and non-inheritable factors can result in the variation of these plants, AND explain the importance of this variation within a large population of | ii) | The pictures below show two plants of the same species. |
| Discuss how BOTH inheritable and non-inheritable factors can result in the variation of these plants, AND explain the importance of this variation within a large population of | | |
| these plants, AND explain the importance of this variation within a large population of | | Plant A Plant B |
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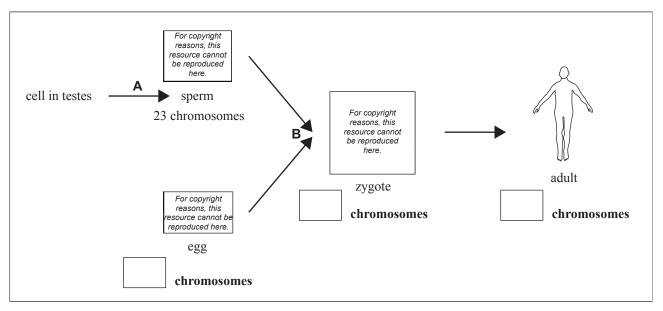
following page.

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QUESTION TWO: VARIATION IN HUMANS

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The diagram below shows the relationship between gametes (sex cells), zygotes, and chromosome number in humans.



sources: www.thedrinksbusiness.com/wordpress/wp-content/uploads/2014/03/more-sperm.jpg http://scm-l3.technorati.com/11/10/27/55025/zygote.jpg?t=20111027092220 http://static.guim.co.uk/sys-images/Guardian/About/General/2011/10/17/1318873301247/A-human-ovum-in-the-fallo-007.jpg

| | Process A: Process B: | |
|---|---|---|
|) | Complete the diagram above by writing the numbers | of chromosomes in the boxes. |
|) | Compare the chromosome number of the egg, sperm, differences and similarities in the numbers. | zygote and adult, AND explain any |
| | | |
| | | There is more space for your answer to this question on the following page. |

| enc | brothers, who have the same parents and are not identical twins, will have different otypes and phenotypes. |
|------|---|
|) | Define the term genotype. |
| ii) | Define the term phenotype. |
| iii) | Explain how the two brothers with the same parents can have different genotypes. |
| | In your answer you should explain: • the importance of meiosis |
| | • the role of fertilisation. |
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QUESTION THREE: ANIMAL BREEDING

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An animal breeder wanted to produce sheep with white wool, but some white sheep produce lambs that have black wool.

Animal breeders often use one male sheep to mate with all their female sheep.

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http://dansperry.com/wp/wp-content/uploads/2013/02/sheep.jpg

http://verrasnotebook.typepad. com/.a/6a00e54fd05e9e8834010534be51f4970b-p

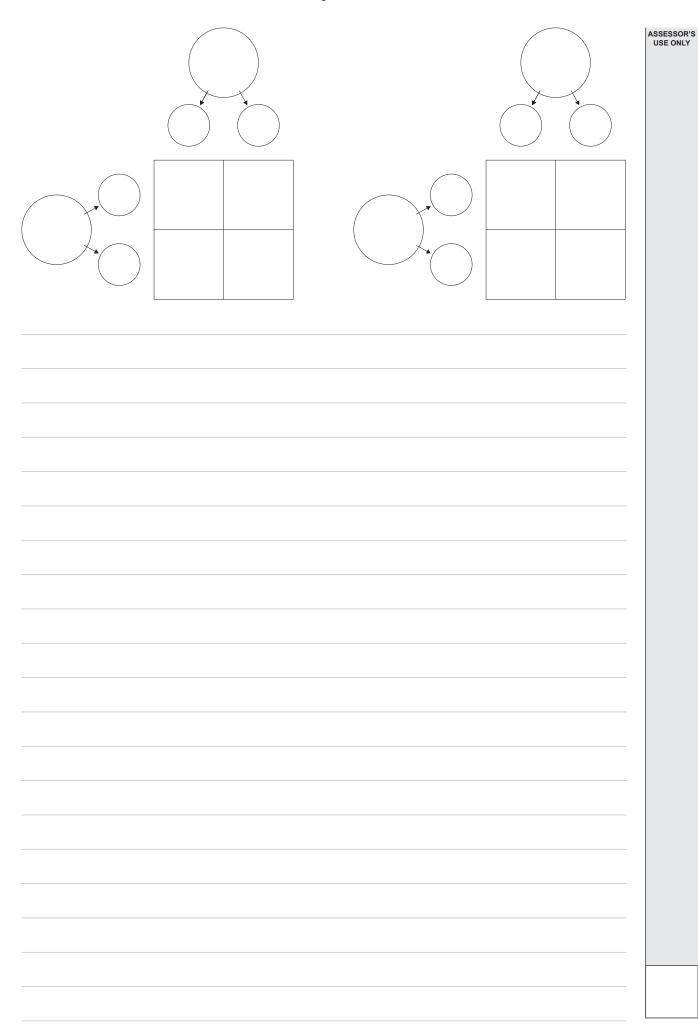
(a) Give all possible genotypes for each phenotype.

Use **A** to represent the dominant allele for common white wool, and **a** to represent the recessive allele for black wool.

White wool: _

Black wool:

- (b) Discuss how a farmer could develop a group of sheep that are pure breeding for white wool. In your answer you should:
 - state the genotypes of the male and female sheep the farmer should use to breed from
 - explain how the animal breeder can determine the genotypes of the male and female to produce sheep that all have white wool.
 - You should include at least two Punnett squares with your explanation
 - explain how the animal breeder could make sure that the offspring would always be pure breeding.



QUESTION FOUR: FAMILY TREE

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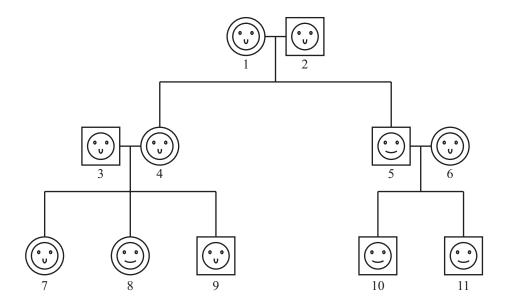
For copyright reasons, this resource cannot be reproduced here.

Non tongue roller.

Tongue roller.

http://staff.gpschools.org/speirss/meapcontent/responses/inherit.htm

In the family tree below, people who are tongue rollers are shown as (v), while those who cannot roll their tongue are shown as (v).



Use the letters T and t to represent the alleles for tongue rolling (T) and non rolling (t).

| (a) | (i) | Use the family tree above to work out the genotype of individual 5. |
|-----|-----|---|
|-----|-----|---|

| (ii) | Explain how you worked this out. |
|------|----------------------------------|
| | |

| Use the fa | amily tree to explain why individual 6 must be Tt . | |
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Question Four continues on the following page.

| • | draw Punnett squares in the box below | |
|---|--|-------------|
| • | explain why the genotypes of individuals 3 and 4 cannot be TT or tt. | |
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| | | Extra paper if required. | |
|-------------------|---|---|--|
| NIESTION | ı | Write the question number(s) if applicable. | |
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