4 Alleles are alternative forms of a gene. For example, there may be a dominant allele, **T**, and a recessive allele, **t**, at the same gene locus.

The relative frequency of each allele of a gene in a population can change over time due to factors such as selection, genetic drift and the bottleneck effect.

(a) Fig. 4.1 shows the relative frequency of the **T** allele in a population of 50 individuals over 20 generations.

At generation 0, the number of **T** alleles and the number of **t** alleles in the population was equal, so the relative frequency of each allele was 0.5. The relative frequencies of the two alleles of the gene add up to 1.

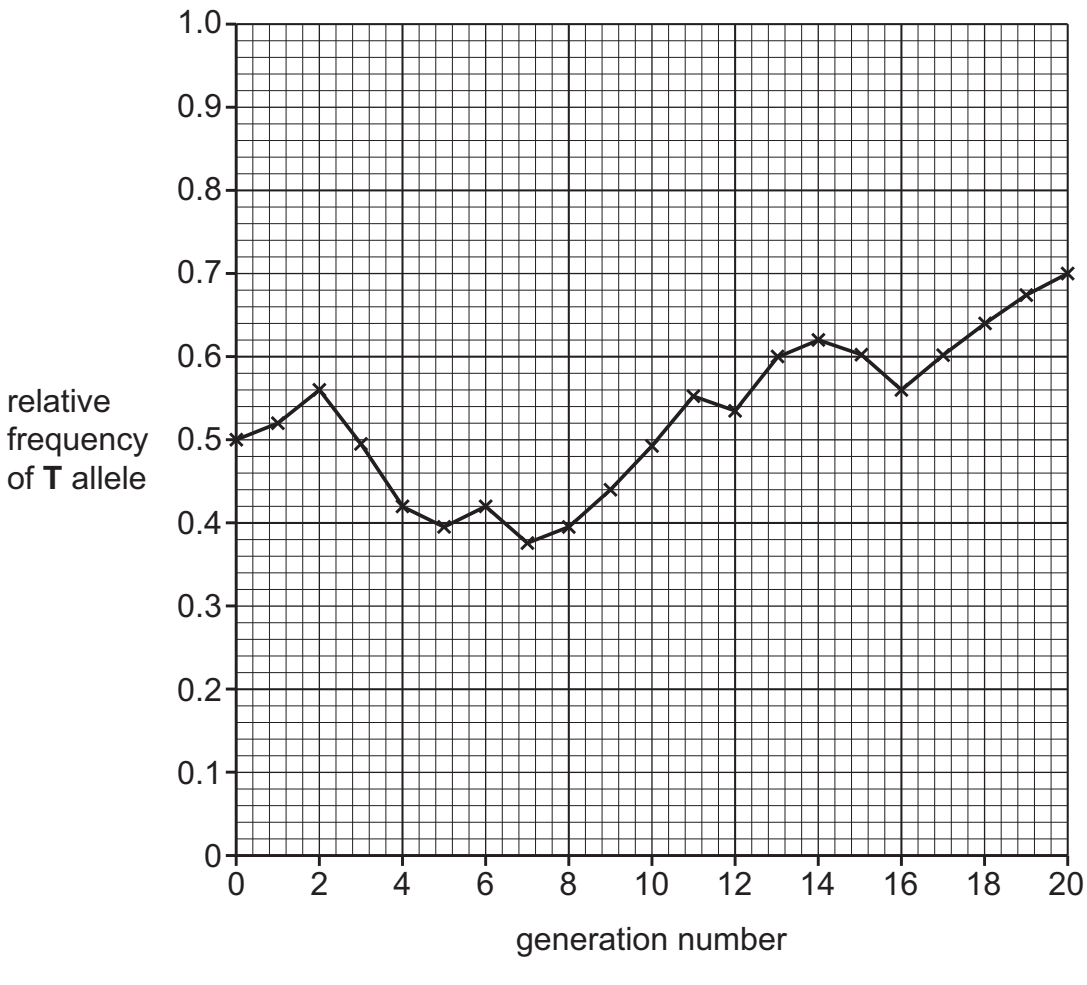

Fig. 4.1

(i) With reference to Fig. 4.1, state the relative frequency of the **t** allele after 20 generations.

..... [1]

(ii) Suggest possible explanations for the change in the relative frequency of the **T** allele between generation 0 and generation 13.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) The relative frequency of the **T** allele in a population of only 10 individuals was determined over 20 generations. The environmental conditions remained the same throughout the experiment.

Fig. 4.2 shows the results.

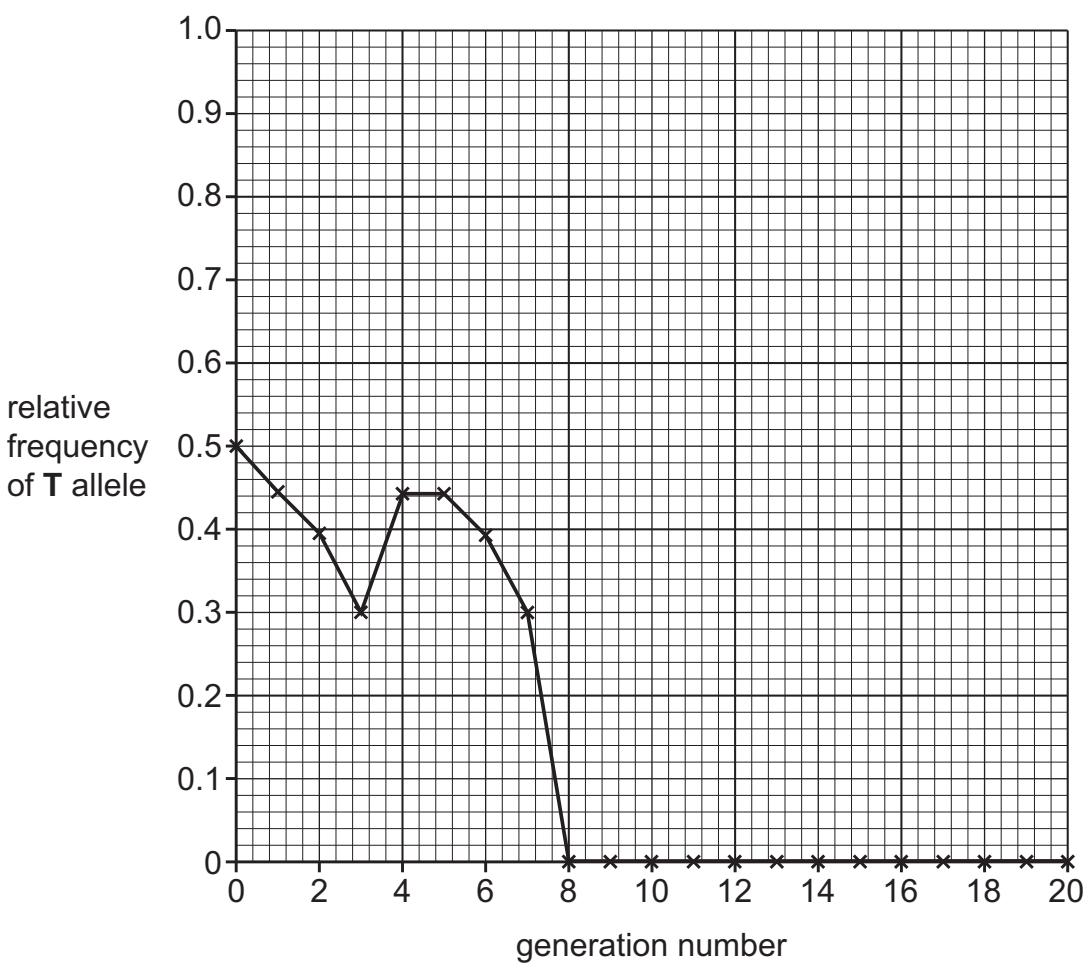

Fig. 4.2

Explain why Fig. 4.2 shows a different result from Fig. 4.1.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(c) State the name of the principle that can be used to calculate relative frequencies of two alleles by counting the numbers of organisms in the population showing dominant and recessive phenotypes.

..... [1]

[Total: 9]