Science 1.9 AS 90948 Demonstrate understanding of biological ideas relating to genetic variation

Writing Excellence answers to **Variation and Survival** questions

Variation and Survival QUESTION	
Question: Discuss why variation caused by sexual reproduction in a population of plants or animals is an **advantage** in a changing environment, such as a period of drought (a period of time of very dry weather, when there is no or very little rain) In your answer you should: • define sexual reproduction • explain how ONE important process in sexual reproduction helps to produce variation in offspring (Support your answers with examples)	
ANSWER	
1. define **genetic variation**	Genetic variation is variety within a population of their traits or phenotype. It means there are different alleles possible for each gene.
2. explain **sexual reproduction** as the process that gives individuals genetic variation	Sexual reproduction involves combining DNA from two parents using gametes. These gametes (sex cells) are formed during meiosis. Gametes have only one set of chromosomes, and so these can be combined with another parent to make a unique individual. This increases variation [OR crossing over OR independent assortment OR meiosis OR fertilisation].
3. **link advantage to survival** to changing environment	The advantage of variation to a population is that it may see some individuals survive if environment changes, in this case if drought occurs If there is variation in their alleles (DNA / genes) some individuals may have phenotypes that are more suited to the environment; therefore they will be more likely to survive.
4. **discuss your example** and link to how it is an advantage in a drought (or other changing environment)	For example: The length of a giraffe's neck, a phenotype, is controlled by genes. There is continuous variation of the neck length within a population. A longer neck will help giraffes reach leaves higher in the tree but makes it more difficult for the animal to drink and for blood to circulate to the head compared to a shorter neck giraffe. In a year where there is a drought, and a shortage of food, the giraffes with a longer neck phenotype are more able to reach higher into the trees for food than the shorter necked giraffes can. The extra food that the longer necked giraffes can eat may mean their survival and reproductive rate is higher than shorter necked giraffes and they pass their alleles onto the next generation and allow the species to survive.
5. link survival of some to **survival of the species**	Because of variation, not all individuals will be wiped out. Those with favourable alleles (traits / phenotypes) such as the long neck in giraffes, will survive and be able to pass on genetic material to offspring and therefore survival of the species occurs.

NOTE: The white column is how your answer would appear on your test paper so make sure you **write out complete sentences**. The grey area is just to help you structure your answer and would not appear in the question.

Information sheet

Example 1 - giraffe and neck length variation

The length of a giraffe's neck, a phenotype, is controlled by genes. There is **continuous variation** of the neck length within a population. A longer neck will help giraffes reach leaves higher in the tree but makes it more difficult for the animal to drink and for blood to circulate to the head compared to a shorter neck giraffe. During 'typical' years when there is sufficient food an average length neck will be favoured.

In a year where there is a drought, and a shortage of food, the giraffes with a longer neck phenotype are more able to reach higher into the trees for food than the shorter necked giraffes can.

The extra food that the longer necked giraffes can eat may mean their survival and reproductive rate is higher than shorter necked giraffes and they pass their alleles onto

the next generation and allow the species to survive.

If there was no variation in giraffe neck length, and no giraffe could reach higher than another, then in a drought year every giraffe would face equal opportunity of starving and the entire population of giraffes would be at risk of extinction.

Example 2 – Tasmanian Devil and aggression variation

Tasmanian Devils are a species of meat-eating marsupial mammal native to Australia. They are the size of a small dog, and the males especially, are very aggressive towards each other most of the time. Aggression is a behavioural phenotype that is controlled by genes.

Tasmanian Devils aggression helps males fight off competitors from breeding females therefore ensuring their genes get passed to the next generation. Aggressive behaviour also ensures survival of an individual when born. A female Tasmanian Devil gives birth to 20-30 small young but only has 4 milk teats in her pouch.

However, aggression costs the animal energy and risk of injury so it can also reduce the survival rate of an individual if the behaviour becomes excessive.

Variation of the aggressive behaviour trait in the population of Tasmanian Devils helps the species survive.

The more aggressive Tasmanian Devils survive when there is a lack of mates or food for the females to produce milk. The more peaceful Tasmanian Devils survive when there is plenty of food and mates and they suffer less injuries, while conserving energy.