

Variation has a key importance to populations as it creates a large gene pool. This large gene pool allows organisms to become better adapted to their environment and therefore survive and reproduce, even when in hostile conditions. Different offspring from the same parents inherit the same genetic information however for a range of reasons the offspring are different in appearance. In the following essay I will be exploring the reasoning behind these differences.

always?

A key explanation as to why offspring from the same parents are different in appearance is due to mutations. A mutation is a change to one or more nucleotide bases or a change in the base sequences of DNA. Changing the DNA sequence may change the sequence of amino acids in a polypeptide. This is the primary structure of a protein and will also change the position of the bonds. Therefore, this may change the overall 3D shape (tertiary structure) of the protein, resulting in the protein being unable to carry out its function. There are six different types of mutation. A substitution is when a base is replaced by a different one. Deletion and addition involve losing and gaining a base from the DNA molecule. Duplication occurs when one or more base is repeated. Inversion is when a group of bases separate from the DNA molecule and re-join at the same position but in reverse order. And finally, translocation is a group of bases from the DNA sequence on one chromosome become inserted into the DNA sequence of a different chromosome or a different place in the same chromosome. Many mutations do not have any affect as they may occur in an intron (a non-coding section of DNA) or the same amino acid may be produced despite the mutation. However, if the mutation does have an affect it may cause a new allele to arise resulting in a different phenotype, therefore affecting the individuals appearance. This explains why offspring from the same parents are different in appearance.

Meiosis is a type of cell division which halves the chromosome number. Cells that divide by meiosis are diploid but cells produced by meiosis are haploid. Each haploid cell is genetically different. Meiosis introduces genetic variation into populations by two key processes. In the first stage of meiosis an event called crossing over occurs. The crossing over of chromatids in meiosis 1 means that each of the four daughter cells formed contains chromatids with different alleles. Homologous chromosomes line up in pairs and come together. The chromatids join at points called the chiasmata and sections of the chromatids swap. One chromosome from each homologous pair ends up in each cell. Because of this, each cell has a different chromatid and therefore a different set of alleles, which increases genetic variation. Crossing over during meiosis 1 is another reason why offspring from the same parents are different in appearance.

Independent segregation of chromosomes is another way in which genetic variation is increased through meiosis. Each homologous pair of chromosomes in our cells is made up from one maternal chromosome and one paternal chromosome. When these homologous pairs are separated during meiosis 1, it is completely random which chromosome from each pair ends up in which daughter cell. The four daughter cells produced by meiosis have completely different combinations of the maternal and paternal chromosomes. This shuffling of chromosomes leads to genetic variation in any potential offspring and is therefore another reason why offspring from the same parents can be different in appearance.

The random fusion of gametes is another event which provides explanation as to why offspring from the same parents are different in appearance. Each gamete produced is genetically unique and sexual reproduction is a random event as any sperm can fertilise the egg which has been released during that menstrual cycle. Therefore, no two offspring can physically carry the same alleles. Consequently, offspring from the same parents appear differently.

really well written eg: give a

✓3

^.

✓R.

Our phenotypes and thus our appearances do not solely rely on genetics. The environment has a huge influence on the way we look. For example, take two identical twins. One twin may choose to eat healthy and engage in a lot of sports activities. The other may prefer to eat unhealthy foods and not do much exercise. As a result, the healthy, sporty twin may have a slimmer physique compared to the other twin. The environment also influences other organisms including plants. For example, the light availability or nutrient sources surrounding a plant will affect its growth rate. If a plant has both high light availability and nutrient sources, it is likely that the plant will grow faster compared to a plant with less light availability and nutrient sources. Therefore, the environment is a key aspect as to why offspring from the same parents are different in appearance. ✓

To conclude, key events during meiosis including crossing over of chromatids and independent segregation as well as mutations in our DNA and random fusion of gametes are all genetic reasons which explain why offspring from the same parents are different in appearance. As well as this, the environment also plays a huge role in influencing our phenotypes.

1-✓✓ R
2-✓✓ R
3-✓ R
4-✓✓ R.

B-✓✓
R-✓✓✓
QWC-✓✓✓

(22) .

NO BS 14