

**Answer ALL questions. Write your answers in the spaces provided.**

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

### CRISPR

- 1 CRISPR is a new way of genetic modification. It is a method that can edit genes by removing and replacing DNA bases. CRISPR uses a cutting enzyme called Cas9 to snip DNA like a pair of molecular scissors. The method also uses a small RNA molecule that guides the scissors to a specific base sequence of DNA to make the cut. The cell tries to mend the cut, but often makes mistakes. The gene that has been cut no longer functions. Genes can also be corrected by CRISPR, or new genes can be added.

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10 CRISPR is thought to be more efficient than selective breeding in producing plants with desired characteristics. This is because selective breeding of plants takes a long time. Scientists hope that CRISPR can be used to make crops such as corn and soybeans more resistant to pathogens and drought.

15 CRISPR could change the DNA in the nucleus of any cell. This includes the DNA in sperm, eggs or a zygote. These changes can be inherited by future generations. This raises the possibility of producing offspring that carry no risk of some genetic disorders. For example, it might be possible to correct a harmful mutation in the BRCA1 gene and stop someone inheriting the risk of breast cancer.

CRISPR could also help to treat genetic disorders of blood cells such as sickle cell anaemia, SCID and beta thalassaemia. Doctors could extract bone marrow, which contains large numbers of stem cells. CRISPR can then be used on these stem cells and the genetically modified cells can be put back into the bone marrow.

- 20 However, CRISPR, as a means of genetic modification, raises ethical issues with some people. They argue that we should not interfere with nature. Many people are concerned that genetic modification could be used to produce designer babies.

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