

GCSE Biology B (Twenty First Century Science)
J257/04 Depth in biology (Higher Tier)

Question Set 17

1

Huntington's disease is caused by a faulty allele of a single gene.

(a) The allele that causes the disease is dominant. The other allele is recessive.

A couple are planning to have a baby.

- The female's genotype is heterozygous dominant.
- The male's genotype is homozygous recessive.

Complete the Punnett square to show the predicted proportion of their offspring that will have Huntington's disease.

H		

Proportion of offspring with Huntington's disease = [2]

(b) Give **two** reasons why a Punnett square **cannot** be used to predict most of a person's features. [2]

(c) When a person has Huntington's disease, neurons in their brain start to die. The person becomes confused. Eventually they cannot control their body movements and cannot speak. [2]

(i) Explain why it is difficult to investigate brain function in a person with Huntington's disease. [2]

(ii) The neurons that make up the brain cannot undergo mitosis. [2]

Explain what this means, and therefore why the brain damage caused by Huntington's disease does not heal. [2]

(iii) Doctors hope to use embryonic stem cells to treat the brain damage caused by Huntington's disease. [2]

Explain how stem cells can be used for this type of treatment.

(iv) Discuss risks and ethical issues associated with this type of treatment. [2]

[2]

(d) The allele that causes Huntington's disease contains instructions to make a protein that kills neurons in the brain.

Scientists have developed a drug that destroys the mRNA made from the instructions in the allele. This prevents the brain damage caused by Huntington's disease.

(i) Explain how the drug prevents the brain damage caused by Huntington's disease.

[3]

(ii) The drug is injected into the patient's blood.

Give **two** reasons why the drug must be able to move through cell membranes but does **not** need to enter the cell nucleus.

[2]

Total Marks for Question Set 17: 17



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