

**A Level Biology B**

**H422/01** Fundamentals of biology

**Question Set 1**

1. (a) The gene, *HBB*, codes for the beta polypeptide in haemoglobin.

A person with sickle cell anaemia has a mutation in *HBB*. This causes a change to the sixth aminoacid in the beta polypeptide.

Describe the type of DNA mutation that causes the amino acid change in the beta polypeptide.

[1]

(b) (i) A couple with no symptoms of sickle cell anaemia want to have a child. Both individuals have close relatives with the disease.

Explain how a genetic counsellor can use knowledge of family history to provide genetic advice to the couple.

[2]

(b) (ii) Suggest **two** ethical concerns that may be associated with the genetic testing of embryos for sickle cell anaemia.

[2]

(c)\* Scientists carried out a study to investigate the effect of the sickle cell allele on the survival rate of children in Kenya.

Data were collected using questionnaires completed by health workers visiting families with young children. The questionnaires were collected from health centres in both urban and rural parts of Kenya.

The data were analysed and 867 children were grouped based on their *HBB* genotypes, which the health centres supplied, as shown in Table 31.

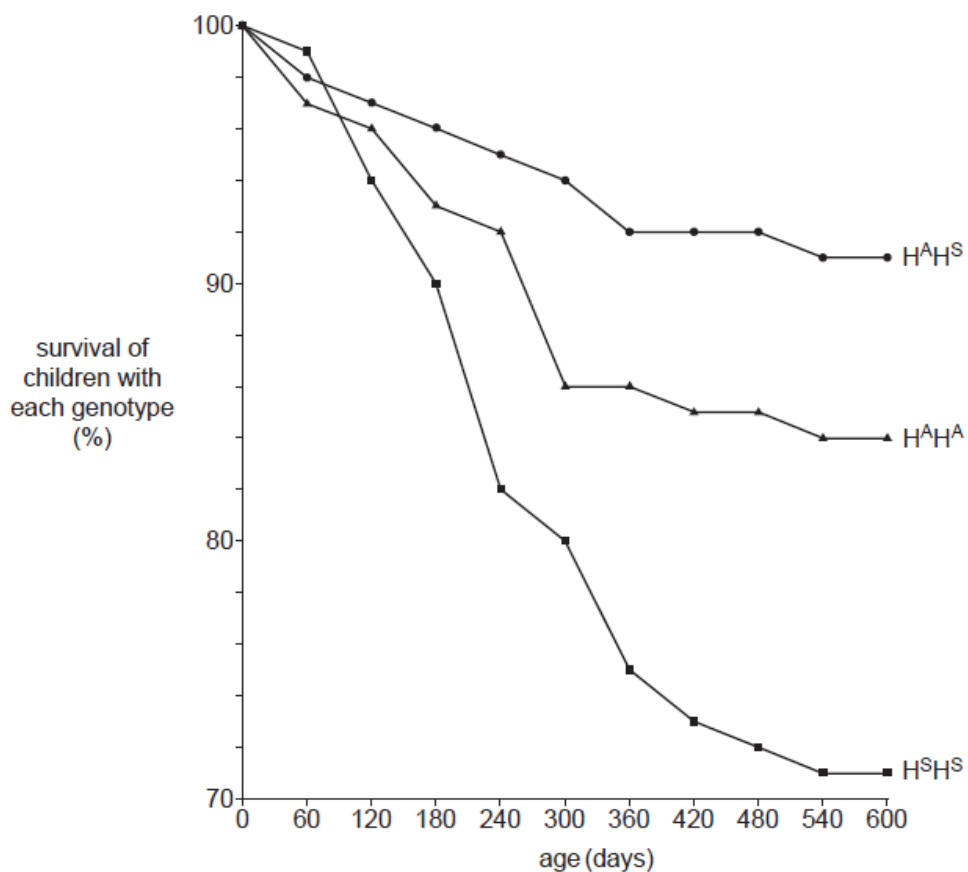
<i>HBB</i> genotype	Number of children
H <sup>A</sup> H <sup>A</sup>	392
H <sup>A</sup> H <sup>S</sup>	374
H <sup>S</sup> H <sup>S</sup>	101

**Table 31**

H<sup>A</sup> is the healthy allele and H<sup>S</sup> is the sickle cell allele.

The percentage of children surviving with each *HBB* genotype was recorded from birth at 60-day intervals until day 600.

Fig. 31 shows the data from this study.



**Fig. 31**

Malaria is a leading cause of mortality in Kenya.

Using this information and your own knowledge, describe and explain the data in Fig. 31 and comment on its quality.

[6]

**Total Marks for Question Set 1: 11**

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