Beat the Examiners! – What are the questions asking for?

For each question write what information the examiners really want to know in one colour and then answer the question underneath in another colour.

1. Why is a viral infection more likely to destroy a complete batch of plants grown by plant tissue culture than a batch of plants grown from seeds?

2.Describe how a harmless virus, genetically engineered to contain a CFTR gene, can be used to insert the gene into a cystic fibrosis sufferer.

3.Haemophilia is a condition in which blood fails to clot. This is usually because of a mutant allele of the gene for Factor VIII. Explain how mutation could lead to faulty Factor VIII.

4.Normal tomato plants have an enzyme that softens tomatoes as they ripen. Genetically engineered tomatoes ripen and soften more slowly. A gene was inserted which reduces the amount of softening enzyme produced. The diagram shows matching parts of the base sequences for the mRNA produced by the gene for the softening enzyme and that produced by the inserted gene.

Softening gene mRNA ... AAUCGGAAU...

Inserted gene mRNA ... UUAGCCUUA...

Suggest how the inserted gene reduces the production of the softening enzyme.

5.Explain how the gene mutation results in failure to produce the enzyme phenylalanine hydroxylase.

6. Describe how mRNA is produced from a CFTR gene.

7. The protein haemoglobin is formed from two types of polypeptide chain. In people with sickle cell anaemia, one type of polypeptide chain has one amino acid which is different from normal. This is due to a mutation which produces the base sequence CAT instead of CTT. Explain why the mutation resulted in only one different amino acid in the affected polypeptide chains.

8.People with sickle cell anaemia have brittle red blood cells that are able to carry less oxygen. Explain how changing one amino acid affects the properties of haemoglobin.

9. The amount of DNA in cells from a tissue undergoing mitosis was analysed. Some cells were found to have 7.6 units of DNA, others had only 3.8 units. Explain why.

10. The cells in the heart and liver of a person are genetically identical but different in appearance. Use your knowledge of genes to suggest why these cells are different in appearance.

11. Date palms have separate male and female plants. Growers want many female plants but only a few male plants.

One method of obtaining a large number of female date palms is to take cells from a leaf of a mature female plant, and grow them in a culture medium. These cells divide to produce young plants.

Explain how this method will produce only female plants.

12.*Streptocarpus* is a common type of house plant with colourful flowers. Plant growers can produce new plants by taking leaf cuttings. Explain why all the cuttings taken from a single leaf grow into plants which are similar in appearance.

13.Some mutations occur when one nucleotide is substituted by a different nucleotide in a strand of DNA.

Explain how the substitution of a nucleotide may cause a gene to code for a different protein.