Assessment Schedule – 2008

Science: Describe genetic processes (90729)

Evidence Statement

Q	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	• The original strand provides a template, which is used to pair complementary nucleotides to it. • Complementary base pairing (A with T and C with G). • Original base pairings break as the parent strand splits. One correct.	• Parent strand unzips breaking the original base pairings. • The original strand provides a template, which is used to pair complementary nucleotides to it, A with T and C with G. Both needed. • Labelled diagrams can be used to fully explain the bullet points.	
(b)	• PCR duplicates a sample of DNA exactly and in large amounts. • PCR gives the scientist many copies of the DNA sample. • Contamination will render the duplicated DNA useless. One correct.	• Contaminated DNA will be duplicated by PCR to produce large amounts of foreign DNA that would produce results that are useless. • Contaminated DNA will result in inaccurate identification tests for forensics or archaeological issues. • Contaminated DNA will result in the wrong gene being duplicated for the purposes of gene therapy. One explanation given.	**Discussion must relate to one example of the use of PCR**. PCR duplicates any DNA with accuracy and in large amounts. If contaminated with foreign DNA this would mean that any subsequent testing would produce results that are of little use. In forensics or archaeological identification tests, it would be impossible to trace the original DNA back to its source. In gene therapy, the correct gene could not be duplicated.
TWO (a)	• Transfer of part of the code held by the DNA onto messenger RNA (mRNA). • Messenger RNA (mRNA) is the link (template) between the DNA and the cytoplasm (ribosome). One correct.		
(b)	• Transfer RNA (tRNA) is a short molecule, as it only needs to deliver an amino acid (small) molecule. • Messenger RNA (mRNA) is a long molecule, which contains the code for producing a polypeptide chain (protein). • Transfer RNA (tRNA) has an anticodon site, while mRNA has a codon. One correct.	Transfer RNA (tRNA) is not required to have to total coding length of the gene, but only for one anti-codon to acquire one amino acid molecule (at a time), while mRNA is a longer molecule, which contains the whole code to produce a polypeptide chain (protein). Two linked statements.	Transfer RNA (tRNA) has an anti-codon coding for a specific amino acid. Each tRNA will match up with three bases (**codon**) on the one messenger RNA (mRNA) molecule, which carries the **code to produce the protein**. Messenger RNA (mRNA) contains multiple codons as defined by the length of the gene it transcribes. All required.

(c)	3 bases give enough combinations to code for all 20 different amino acids (needed to make proteins). Or 2 bases does not give enough different combinations to code for all 20 amino acids.	Must mention the numeric outcome of both either two or three bases. Three bases give 64 combinations, which are enough to code for the 20 amino acids, or two bases only gives 16 combinations.	Achieved plus must mention the outcome of two and three bases, giving examples from the genetic code.
THREE (a)	Process of taking genetic material from one species and placing it into the **genome** of another species.		
(b)	Restriction enzymes recognise and cut the DNA sequence. It is insufficient to only specify "DNA location".	Restriction enzymes recognise the specific DNA sequence either side of the hormone gene.	
(c)	Ligase joins the **sticky ends** of the hormone gene to the plasmid OR rejoins the sugar phosphate backbone OR "covalent" bond.		
(d)	• Easily contained in the laboratory. • Reproduce rapidly under ideal conditions. • Bacteria have plasmids, which are separate to the main chromosome. • Not an ethical issue. • Do not take up much space. ONE correct.	• Bacteria are easily contained in the laboratory; bacteria reproduce rapidly under ideal conditions. • Bacteria have plasmids, which are separate to the main chromosome, thus there are no significant ethical issues involved. ONE correct.	Bacteria are ideal as they can produce large amounts of hormone, bacteria reproduce rapidly under favourable conditions. Because bacteria have plasmids extra to the main chromosome the production of the hormone will not alter the genetic make-up of the bacteria, thus there are no significant ethical issues involved.

FOUR	Introduction of a gene into the lung tissue of a sufferer. • Inserted gene may only reach some (if any) of the targeted cells. • Inserted gene may not produce enough of the protein of use. • Sufferers of c.f. can live longer due to treatment, producing more offspring with c.f. • The introduced gene may alter the functioning of an existing gene. • The existing genome of the virus may not have been disabled and may therefore cause a viral infection. • The virus, although targeted to lung tissue, may infect other tissues leading to problems with those cells. • In CF gene therapy somatic cells are targeted, which may treat the disease in the patient but will not stop the faulty gene being passed on to their child nor will the introduced gene be passed on. • If CF gene therapy is targeted at the gametes, this would effect the next generation. • The introduced gene may not integrate into the patients genome, so may not work permanently.	TWO issues from Achievement.	THREE issues from Achievement.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Total of SIX opportunities answered at Achievement level (or higher). $6 \times A$	Total of SEVEN opportunities answered with FOUR at Merit level (or higher) plus THREE at Achievement level. $4 \times M + 3 \times A$	Total of EIGHT opportunities answered with TWO at Excellence level plus THREE at Merit level (or higher) plus THREE at Achievement level (or higher). $2 \times E + 3 \times M + 3 \times A$