

Assessment Schedule – 2008**Biology: Describe the role of DNA in relation to gene expression (90715)****Evidence Statement**

Q	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	<p>DNA:</p> <ul style="list-style-type: none"> • Bases A, T, G, C • Long molecule • Deoxyribose sugar • Found in nucleus (and mitochondria). <p>RNA:</p> <ul style="list-style-type: none"> • Bases A, U, G, C • Short molecule • Ribose sugar • Cytoplasm (and nucleus) / ribosome. <p>All correct.</p>		
(b)	<ul style="list-style-type: none"> • The order of the bases in the DNA determines the order of amino acid / protein produced. • Triplet code: group of 3 bases (codon) codes for an amino acid. • Code degenerate – more potential codons than amino acids. <p>TWO from THREE required.</p>	<p>Achieved plus explains either:</p> <p>Redundancy eg.</p> <ul style="list-style-type: none"> • Four bases in groups of 3 → 64 possible codons. • 20 amino acids: some amino acids coded for by more than one codon. • Some codons may act as stop / start signals. <p>OR</p> <p>Relationship between DNA, mRNA and tRNA in terms of complementary bonding.</p> <p>OR</p> <p>Sequence of bases explained via effect of mutation on polypeptide chain.</p>	<p>Explains the relationship between DNA and RNA in terms of complementary bonding.</p> <p>PLUS</p> <p>Significance: mutations may have no effect on accuracy of information if one codon is replaced by another for the same amino acid.</p>
TWO (a)	<ul style="list-style-type: none"> • Intron: a sequence within the gene that does not code for amino acids in the finished protein / non-coding part of a gene • Exon: This is the coding sequence; a region of DNA within a gene that is transcribed into the final RNA molecule / coding part of a gene. <p>BOTH correct.</p>		
(b)	<p>Introns are non-coding / not expressed : and are spliced out / removed.</p>	<p>The initial transcript contains introns / non-coding sequences that must be edited / spliced out</p> <p>OR:</p> <p>Non-coding sequences are spliced out to produce a functional protein.</p>	

(c)	<ul style="list-style-type: none"> • mRNA forms complex with ribosome • ribosome ‘reads’ mRNA code • tRNA brings in amino acids • codon-anticodon ‘matches’ • peptide bonds form between amino acids. • start codon initiates translation • stop codon ends translation <p>FOUR points required.</p>	Achieved plus: Explains the complementary nature of the relationship between codons and anticodons OR Explains the relationship between codon and amino acid (specificity) OR Explains the relationship between tRNA and amino acids (specificity).	Recognition of relationship between mRNA, tRNA and structure / amino acid sequence of polypeptide chain.
(d)	Promoter is site where RNA polymerase binds OR Promoter is the site where RNA polymerase initiates transcription OR Promoter is the site where enzyme / polymerase binds to transcribe genes.		
(e)	Lactose (more specifically its metabolic by-product) acts as an inducer / turns the gene on OR Lactose removes the repressor / repression.	Explains that the inducer binds to and removes the repressor molecule so that transcription can proceed.	
THREE (a)	Yellow must be heterozygous (Yy) OR correct annotated Punnett square.	Answer must explain why yellow mouse is heterozygous and explain why it is not homozygous: Eg: If yellow mice were homozygous (YY) there would not be any grey mice in the F ₁ generation OR Only way to get a 1:1 ratio if one parent is pure-breeding is for the other to be heterozygous OR Because the mutant allele must be dominant to get a 1:1 ratio OR TWO clearly annotated Punnett squares.	

(b)	The yellow allele must be dominant (Y).	<p>Answer must explain why yellow is dominant</p> <p>Eg: Grey is pure-breeding so must be homozygous. If grey was dominant then F_1 would all be grey</p> <p>OR Yellow is dominant because the yellow phenotype is expressed even in the presence of the grey allele.</p>	
(c)	This is an example of a lethal allele / gene	<p>The 2:1 phenotypic ratio reflects 2 Yy: 1 yy; YY is lethal</p> <p>OR Correct annotated Punnett square.</p>	While a single copy of the allele affects coat colour, two copies produces a lethal effect – quite possibly through a pathway unrelated to coat colour. This is an example of pleiotropy , where the allele affects both appearance and viability.
(d)	Identifies: polygenic inheritance OR Correct description with incorrect / absent pattern of inheritance.	The trait is controlled by multiple genes. An individual's phenotype is dependent on the proportion of dominant and recessive alleles received from the parents.	

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Total of SIX opportunities answered at Achievement level or higher. $6 \times A$	Total of at least EIGHT opportunities answered with SIX at Merit level or higher. $6 \times M + 2 \times A$	Total of at least EIGHT opportunities answered with TWO at Excellence level and FOUR at Merit level or higher. $2 \times E + 4 \times M + 2 \times A$