# Level 2 Biology: practice paper 2026

AS 91159 Demonstrate understanding of gene expression · Vertex Academy practice paper, not an NZQA paper

Attempt ALL the questions. Show ALL working. Write your answers on lined paper, or in the space under each question.

## QUESTION ONE

**(a)** Part of the template strand of a gene reads: 3′ TAC GGA TTC ACC 5′
Use the codon table to write the mRNA sequence transcribed from it, and the sequence of amino acids it codes for.

| Codon | AUG | CCU | CCC | AAG | UAG | UGG | CUA | AGU |
|---|---|---|---|---|---|---|---|---|
| Amino acid | Met (start) | Pro | Pro | Lys | stop | Trp | Leu | Ser |

**(b)** Explain the roles of mRNA, tRNA and the ribosome in translation.

**(c)** Three possible mutations could change the template strand in (a), 3′ TAC GGA TTC ACC 5′:
Mutation 1: TTC changes to ATC.
Mutation 2: GGA changes to GGG.
Mutation 3: the first G of GGA is deleted.
Discuss the effect of each mutation on the mRNA and on the protein.

## QUESTION TWO

**(a)** Part of a metabolic pathway in human cells is:
phenylalanine → (enzyme 1, phenylalanine hydroxylase) → tyrosine → (enzyme 2, tyrosinase) → melanin (skin and hair pigment)
Describe what a metabolic pathway is, and explain what is meant by 'one gene, one enzyme', using this pathway.

**(b)** Phenylketonuria (PKU) is caused by having two faulty alleles of the gene for phenylalanine hydroxylase. Every newborn baby in New Zealand is screened for PKU with a heel-prick blood test. Babies with PKU are given a diet low in phenylalanine from birth.
Explain why phenylalanine builds up in a baby with PKU, and why the special diet prevents harm.

**(c)** Albinism is caused by two faulty alleles of the gene for tyrosinase (enzyme 2). People with PKU usually make some melanin, but people with this kind of albinism make none, even on a normal diet. Discuss why, using the pathway.

## QUESTION THREE

**(a)** Hydrangeas are common in New Zealand gardens. Cuttings from one plant (so with identical genotypes) grow blue flowers in acidic soil but pink flowers in alkaline soil.
Describe what is meant by genotype and phenotype, and explain what this example shows about phenotype.

**(b)** Siamese cats have pale bodies but dark ears, face, paws and tail. They carry an allele that codes for a form of the enzyme tyrosinase (which makes dark pigment) that works only at temperatures below normal body temperature.
Explain the Siamese cat's colour pattern.

**(c)** A vet shaves a patch of fur on a Siamese cat's back and keeps the patch cool with a cold pack while the fur regrows. The new fur on the patch grows dark. Siamese kittens are born almost completely pale and darken at the extremities over the first weeks.
Discuss what these observations show about the interaction between genotype, environment and gene expression.

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