**Stage 2 Biology**

**Quiz ANSWERS – Learning Intentions 1.1 – 1.4**

**Multiple Choice**

C7 = L C8 = K C9 = M C10 = L

C1 = L C2 = L C3 = M

**Short Answer**

1 a)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Genetic Code for Polypeptide** | | | | | | |
| DNA | TAC | GCG | CCC | AGA | TTA | ATT |
| mRNA | AUG | CGC | GGG | UCU | AAU | UAA |
| tRNA | UAC | GCG | CCC | AGA | UUA | AUU |

1 b)

*Less than 6. Firstly, if this DNA is from a eukaryotic cell some of the introns must be spliced out before the mRNA is mature and translated. This will reduce the number of codons used to code amino acids. Secondly, the last codon must be a stop codon (termination) and does not code for an amino acid.*

2 a)

Prokaryotic:

* No nucleous
* No other organelles present
* DNA is circular
* No evidence of intron splicing from mRNA

2 b)

In prokaryotic cells

* mRNA does not need to leave the nucleus
* mRNA is not spliced as in eukaryotic cells
* all steps happen in the cytosol
* overall quicker process
* only one chromosome to access genes from (not many)

2 c)

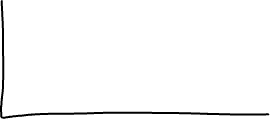
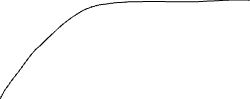
|  |  |
| --- | --- |
| **RNA Molecule** | **Function** |
| mRNA | Carry transcribed message in codons from DNA to ribosome |
| tRNA | To carry specific amino acids to the mRNA (by pairing with codons) in order to build the correct sequence in the polypeptide |
| rRNA | To provided the site where mRNA can be translated by using tRNA to bring amino acids for bonding in sequence |

3

Plateau – enzyme activity has reached a steady activity level; all active sites are full occupied at any given moment – cannot increase the activity

Y axis = enzyme activity

Activity rate increasing as more substrates added because there are available enzymes to catalyse them quickly



X axis = increasing substrate concentration

4.

Even though identical twins have the same DNA sequence they may have different patterns of epigenetics which control whether (or to what degree) their genes are expressed. The diagram illustrates one method of how genes, without altering the sequence, can actually be turned off (silenced) or activated. The heterochromatin is DNA that contains genes that cannot be accessed or expressed because it is too tightly condensed. Euchromatin is DNA that contains genes that can be expressed because they can be accessed by RNA polymerase. Identical twins could have different genes in heterochromatin form from each other – meaning they will not necessarily have the same phenotype even though they have the same genotype.

**Extended Responses** *(here I give brief summary points which should be included)*

1. **Mutations are often the cause of life-threatening diseases such as cancer.**
   * Discuss and compare the potential consequences of two different types of point mutation.

*Deletion – loss of a base; could have frameshift consequences; less impact at end of gene*

*Insertion – adding extra base; could have frameshift consequences; less impact at end of gene*

*Substitution – may not change any amino acid (samesense); may only change one amino acid (missesnse); could cause an early stop (nonsense)*

* + Explain the two phases of the cell cycle that are most likely to allow mutations to happen and why this is the case.

*S phase (synthesis) – this is where DNA is uncondensed, most exposed, and unzipped as free nucleotides are added; spontaneous mistakes can happen easily*

*Mitosis phase – when chromosomes are being manipulated and moved around; mistakes here can lead to cells that have too many/too few chromosomes OR damaged chromosomes*

* + Compare the different potential consequences of mutations in germ cells and somatic cells.

*Mutation in somatic cells (body cells) will be localised and not passed on; can be treated/removed with small consequences in some cases*

*Mutation in germ cells (reproductive tissue) will be passed on to future offspring via sperm/egg cells that are produced here; every cell of offspring will have this mutation inherited*

1. **The function of enzyme molecules is dependent on their specific 3D conformation. (6 marks)**
   * Explain what is meant by the ‘specificity’ of the active site in relation to enzyme function.

*Specificity refers to the unique 3D shape (conformation) of the active site region on the enzyme that does the work of catalysing the substrate. This shape is complimentary to the substrate molecule’s shape so that they can bind together. If the active site does not match the substrate shape it will not act on that substrate (will not function).*

* + Briefly explain how a protein owes its specific 3D shape to the base sequences in DNA.

*A protein owes its final 3D shape and specificity to the exact sequence of amino acids that make up the polypeptide chain. The order of these determines how the chain folds and bonds to itself into the final shape. What determines that actual sequence of the amino acids is the sequence of A,C,T,G bases in the DNA. Each group of three bases in the DNA codes for one particular amino acid. In this way the sequence of the DNA bases controls the sequence of the amino acids in the protein and so determines its final 3D shape.*

* + Chose and explain one factor that can affect enzyme function in the human body.

*pH – describe how it may affect the 3D shape; esp the active site*

*Temp – discussion of kinetic energy; discussion of denaturing and what that does*

*Concentration of enzyme or substrate – discuss the impact on the activity of the enzyme*

*Inhibitors – discuss any type and how it may impact the enzyme function*