

## Stage 2 Biology

### Quiz – Learning Intentions 1.1 – 1.4

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#### Multiple Choice

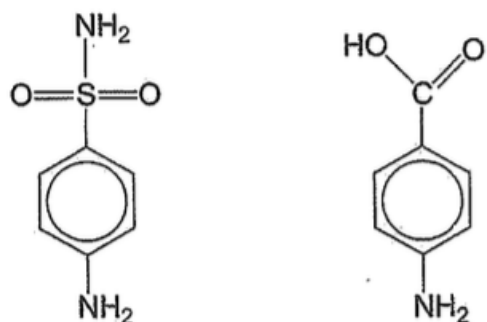
- C7 The enzyme cellulase is sometimes added to washing powders. Cellulase helps remove grass stains by breaking down cellulose into glucose. It has an optimum pH of 5.0 and an optimum temperature of 55°C.

Which one of the following conditions would result in faster removal of grass stains from clothes being washed with a powder that contains cellulase?

- J. Increasing the wash temperature from 55°C to 60°C.
- K. Adding less than the optimum amount of washing powder to the wash.
- L. Decreasing the pH from 7.0 to 6.0.
- M. Adding more than the recommended amount of water to the wash.

[2007 Q2]

- C8 A series of enzymes is necessary for the production of folic acid from 4-aminobenzoic acid. The chemical sulfanilamide has a structure similar to that of 4-aminobenzoic acid, as shown in the diagram below:



sulfanilamide

4-aminobenzoic acid

When a small amount of sulfanilamide is added to cells, it is most likely to

- J. replace 4-aminobenzoic acid as the substrate of the first enzyme in the series.
- K. reduce the rate of production of folic acid.
- L. bind to the 4-aminobenzoic acid, distorting the shape of the active site.
- M. denature the folic acid that is produced.

[2014 Q6]

- C9 The activation energy for a chemical reaction

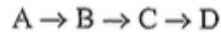
- J. is increased by the presence of an enzyme.
- K. is the energy released by the chemical reaction.
- L. helps to form new chemical bonds in the products.
- M. helps to break chemical bonds in the reactants.

[2006 Q6]

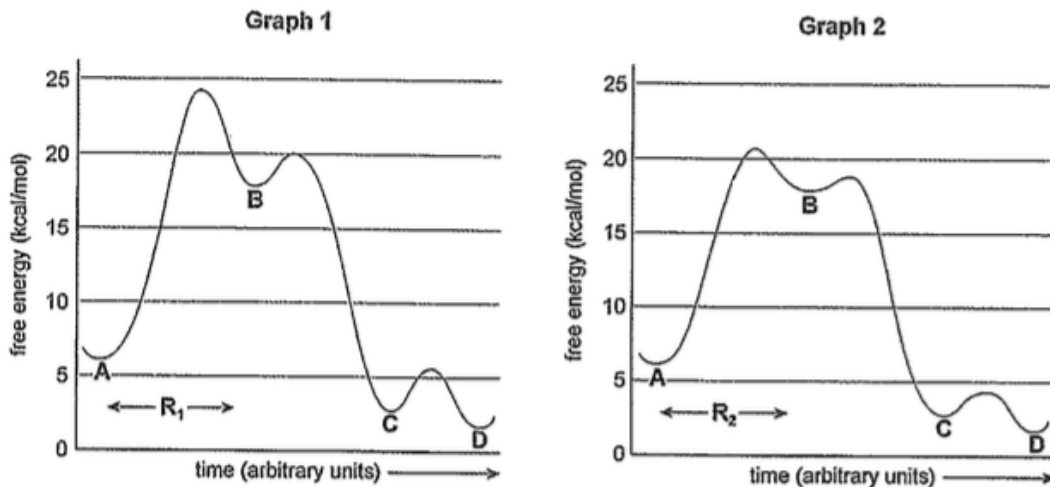
- C10 Dymorphin is a hormone that affects some brain cells. Morphine is an opiate drug that produces the same response as dymorphin in those brain cells. It is most likely that

- J. brain cells must have different cell membrane receptors for dymorphin and for morphine.
- K. the cell membrane receptor for dymorphin must change shape to recognize dymorphin.
- L. morphine binds to the same cell membrane receptors as dymorphin.
- M. the shape of morphine is similar to that of the cell membrane receptor for dymorphin.

C1 The following metabolic pathway occurs in some cells:



Refer to the following graphs, which show the changes in free energy along this pathway. One graph shows the changes in free energy in the presence of enzymes and the other shows the changes in free energy in the absence of enzymes.



Which one of the following statements is *not* consistent with the data presented for the reactions in the graphs above?

- J. Reaction R<sub>2</sub> is an enzyme-catalysed reaction in which product B was synthesised from substrate A.
- K. Product C contains less free energy than either substrate A or substrate B.
- L. In the absence of enzymes the formation of product B requires less activation energy than is required to break down product C.
- M. The formation of product C requires the prior synthesis of substrate B.

[2015 Q4]

C2 Angiotensin II is a protein produced by healthy human beings. It binds to the receptor in the blood vessels and causes the blood vessels to constrict, resulting in a rise in blood pressure. Irbesartan is a drug that is used to reduce high blood pressure by blocking the angiotensin II receptors in the walls of the blood vessels.

The information above suggests that irbesartan molecules

- J. have a very similar shape to the angiotensin II receptors.
- K. cause the angiotensin II receptor to denature.
- L. have a shape very similar to that of the angiotensin II molecules.
- M. have a complementary shape to the angiotensin II molecules.

[2013 Q3]

C3 The shape of the active site of an enzyme molecule can be altered by

- J. lowering the activation energy.
- K. the presence of molecules with a shape similar to that of the active site.
- L. the presence of molecules with a shape complementary to that of its substrate.
- M. increasing the temperature.

[2009 Q3]

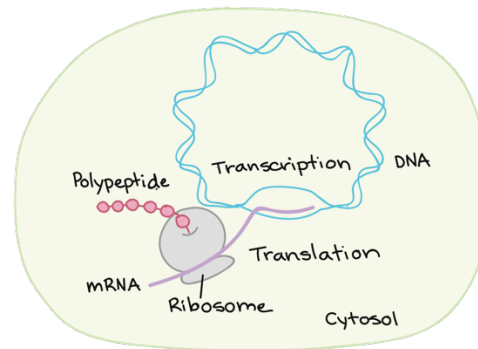
## Short Answer

1. Refer to the table below:

Genetic Code for Polypeptide						
DNA			CCC		TTA	
mRNA	AUG					UAA
tRNA		GCG		AGA		

- a) Complete the table. (4 marks)
- b) Will this DNA sequence (gene) from a eukaryotic cell code for a polypeptide that has more than 6, less than 6, or exactly 6 amino acids? Explain and justify your thinking. (3 marks)

2. Refer to the diagram of a single cell:



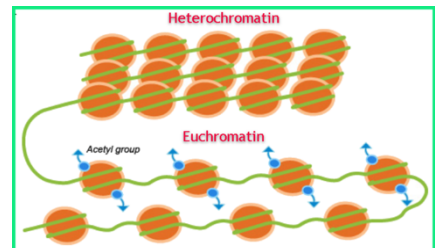
- a) Give three pieces of evidence that supports your view of whether this cell is eukaryotic or prokaryotic. (3 marks)
- b) Explain how the process of protein synthesis is different in prokaryotic cells and eukaryotic cells. (3 marks)

- c) List and describe the function of three types of RNA molecule that is involved in the process above. (6)

RNA Molecule	Function

3. Draw and briefly annotate a basic graph (with axis labels) that illustrates how **concentration of substrates** affects **enzyme activity**. (3 marks)

4. Refer to the diagram below. Explain how the diagram illustrates a possible way in which identical twins, with identical DNA sequences, could age to have different phenotypic expression. (3 marks)



**Extended Response (choose one) – answer on paper below**

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.
  - Explain the two phases of the cell cycle that are most likely to allow mutations to happen and why this is the case.
  - Compare the different potential consequences of mutations in germ cells and somatic cells.
  
2. 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.
  - Briefly explain how a protein owes its specific 3D shape to the base sequences in DNA.
  - Chose and explain one factor that can affect enzyme function in the human body.

