



VCE BIOLOGY 2016

YEAR 12 UNIT 3

Topic Test 1 – Molecules of Life

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Time allowed: 50 minutes

Total marks: 40

14 Multiple Choice Questions

5 Short Answer Questions

An Answer Sheet is provided for Section A.

Answer all questions in Section B in the space provided.

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STUDENT NUMBER

Figures

Words

Letter

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Student Name.....**VCE Biology 2016 Year 12 Topic Test 1 Unit 3****Molecules of Life****Student Answer Sheet**

There are **14 Multiple Choice** questions to be answered by circling the correct letter in the table below. Use only a 2B pencil. If you make a mistake, erase and enter the correct answer. Marks will not be deducted for incorrect answers.

Question 1 A B C D

Question 2 A B C D

Question 3 A B C D

Question 4 A B C D

Question 5 A B C D

Question 6 A B C D

Question 7 A B C D

Question 8 A B C D

Question 9 A B C D

Question 10 A B C D

Question 11 A B C D

Question 12 A B C D

Question 13 A B C D

Question 14 A B C D

VCE Biology 2016 Year 12 Topic Test 1 Unit 3

Molecules of Life

SECTION A – Multiple Choice Questions

Question 1

Amphipathic molecules are unusual in that part of these molecules attract water while other parts of these molecules repel water. Phospholipids are considered to be amphipathic because they have a

- A. lipophobic head and a lipophilic tail.
- B. hydrophobic head and a hydrophilic tail.
- C. hydrophilic head and a lipophobic tail.
- D. lipophilic head and a hydrophobic tail.

Question 2

A human chromosome was found to contain 21% adenine. The percentage of guanine in this chromosome would be

- A. 21%
- B. 42%
- C. 58%
- D. 29%

Question 3

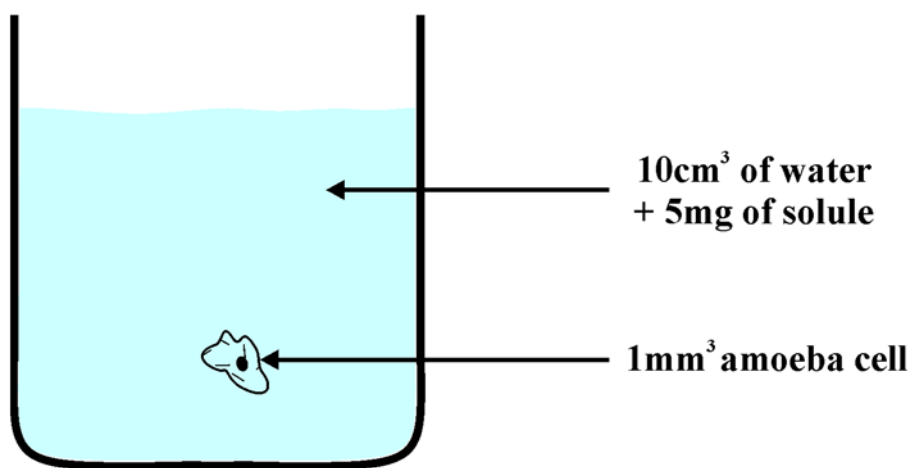


Figure 1

An amoeba cell with a volume of 1mm³ is placed in a 10cm³ container of water. The amoeba and the container both have 5mg of solutes dissolved in them. With respect to the surrounding solution, the intracellular fluid of the amoeba is said to be

- A. hypertonic.
- B. hypotonic.
- C. isotonic.
- D. catatonic.

Question 4

An organic molecule was found to have the formula $C_{57}H_{98}O_6$.

This is likely to be a sample of

- A. carbohydrate.
- B. protein.
- C. lipid.
- D. deoxyribonucleic acid.

Question 5

The movement of the cell membrane of an amoeba to engulf a solid particle would be an example of

- A. pinocytosis.
- B. phagocytosis.
- C. osmosis.
- D. exocytosis.

Question 6

Which cellular organelle does not possess a phospholipid membrane?

- A. Nucleus.
- B. Ribosome.
- C. Mitochondrion.
- D. Lysosome.

Question 7

Cysteine is an amino acid that contains a sulphur atom in its R group. This amino acid is very important in the production of functioning proteins since sulphur atoms are attracted to other sulphur atoms in the polypeptide chain. In a single polypeptide chain, the presence of cysteine would have the greatest effect in the polypeptide's

- A. primary structure.
- B. secondary structure.
- C. tertiary structure.
- D. quaternary structure.

Question 8

Which of the following is directly required for the light independent stage of photosynthesis?

- A. Nicotinamide adenine dinucleotide (NADH).
- B. Oxygen.
- C. ADP.
- D. ATP.

Question 9

Which of the following cellular organelles would a bacterial cell possess?

- A. Nucleus.
- B. Ribosome.
- C. Mitochondria.
- D. Vacuole.

The following diagram in **Figure 2** refers to Question 10.

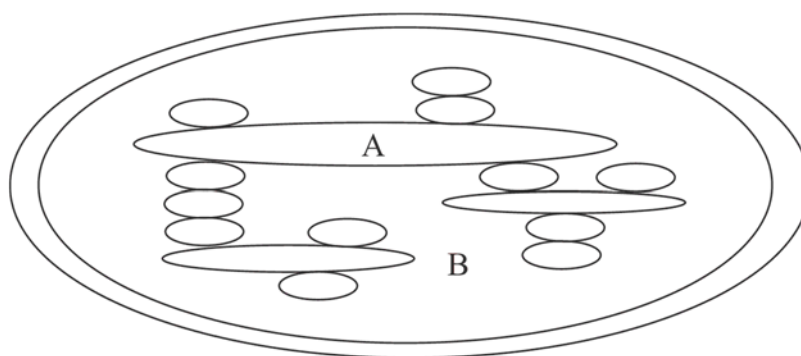


Figure 2

Question 10

Figure 2 shows a chloroplast. Structures A and B are respectively the

- A. Matrix and Cristae.
- B. Granum and Matrix.
- C. Granum and Stroma.
- D. Granum and Cristae

Question 11

How many molecules of water would be released when a ten amino acid long polypeptide chain is formed?

- A. 10
- B. 30
- C. 0
- D. 9

Question 12

The **three** stages of aerobic respiration in the correct order are

- A. Glycolysis, Krebs cycle, Electron Transport chain.
- B. Krebs cycle, Glycolysis, Electron Transport chain.
- C. Electron Transport chain, Glycolysis, Krebs cycle.
- D. Krebs cycle, Electron Transport chain, Glycolysis.

Question 13

The fluid that supports the nucleus and the other organelles in a cell is the

- A. vacuole.
- B. cytoplasm.
- C. water.
- D. cytosol.

Question 14

Consider the net amount of ATP produced during anaerobic respiration compared to the net amount of ATP produced during aerobic respiration for one molecule of glucose. Aerobic respiration is how many times more efficient at producing ATP than anaerobic respiration?

- A. 2×
- B. 8×
- C. 18×
- D. 36×

End of Section A

VCE Biology 2016 Year 12 Topic Test 1 Unit 3

Molecules of Life

SECTION B – Short Answer Questions

Question 1 (4 marks)

- a. Write the names of the **four** nitrogen bases of DNA in the boxes below.

2 marks

A_____	C_____
T_____	G_____

Figure 3

- b. In **Figure 3** shown above, draw lines between the boxes to represent the hydrogen bonding that forms between the complementary nitrogen bases. Draw one line for each hydrogen bond that occurs.

2 marks

Question 2 (5 marks)

Plants produce glucose via photosynthesis in their leaves. Excess glucose is converted into starch, a large insoluble polysaccharide, and stored in specialised cell organelles called leucoplasts as shown in **Figure 4**.

- a. Name the type of reaction that occurs when starch is created from glucose.

1 mark

- b. Is water produced in this reaction or is it utilised?

1 mark

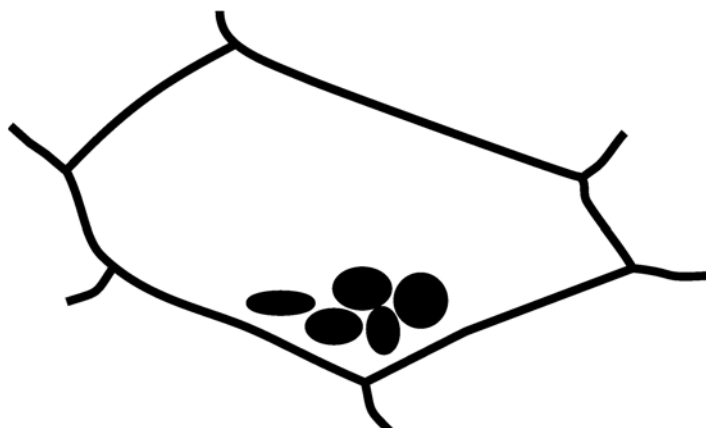


Figure 4: Plant cell showing leucoplasts in their cytoplasm after staining with iodine.

In times of energy shortage, the plant will convert starch back into glucose before use.

- c. State the problem that would occur within the cell if large amounts of glucose were allowed to build up in the cell and explain the process involved.

2 marks

- d. Explain how the conversion of glucose to starch helps the plant solve this issue.

1 mark

Question 3 (7 marks)

Class 2 MHC markers that exist on the surface of cells are made from two polypeptide chains and have a basic structure as shown in **Figure 5** below.

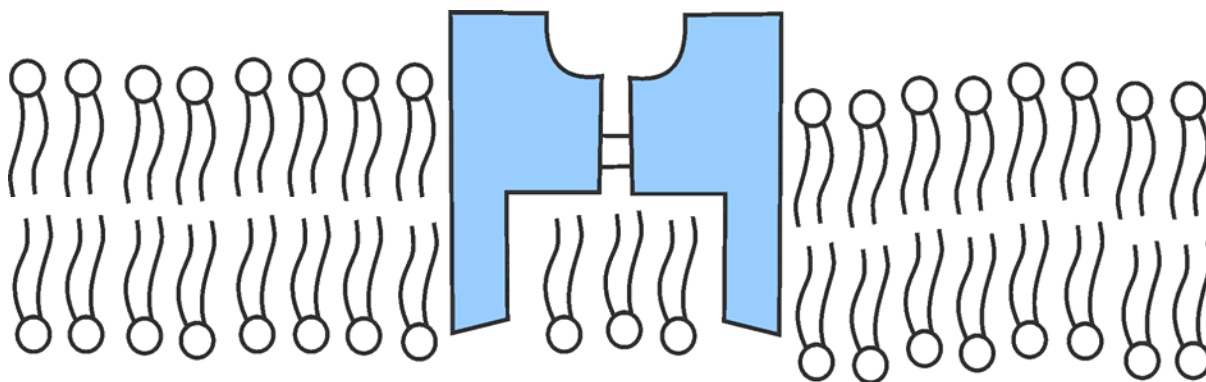


Figure 5

- a. Name the structural unit that the class 2 MHC marker molecule is made from.

1 mark

- b. What is the highest level of structural organisation shown by this class 2 MHC marker molecule?

1 mark

- c. Where in a cell are the class 2 MHC marker molecules modified into their correct shape?

1 mark

- d.** When looked at later, the class 2 MHC marker molecule may be at a different location on the cell membrane surface. What property does the cell membrane possess that allows the class 2 MHC markers molecule to move?

2 marks

- e.** Despite its ability to move around the surface of the membrane, the class 2 MHC markers molecule is always at the same depth in the membrane. Explain why the class 2 MHC markers remains embedded amongst the phospholipid tails at a particular depth in the membrane.

2 marks

Question 4 (3 marks)

Anne and Harry were gardening one Saturday and placed a large amount of leaves and grass clippings in their green waste bin. The next morning when Harry went to add more weeds to the bin he noticed that the inside of the lid of the bin was wet even though it had not rained the previous day.

- a.** Name the chemical process that occurred to produce this moisture and write a chemically balanced equation for it.

2 marks

- b.** Name the particular stage of the above chemical process that is responsible for producing the water.

1 mark

Question 5 (7 marks)

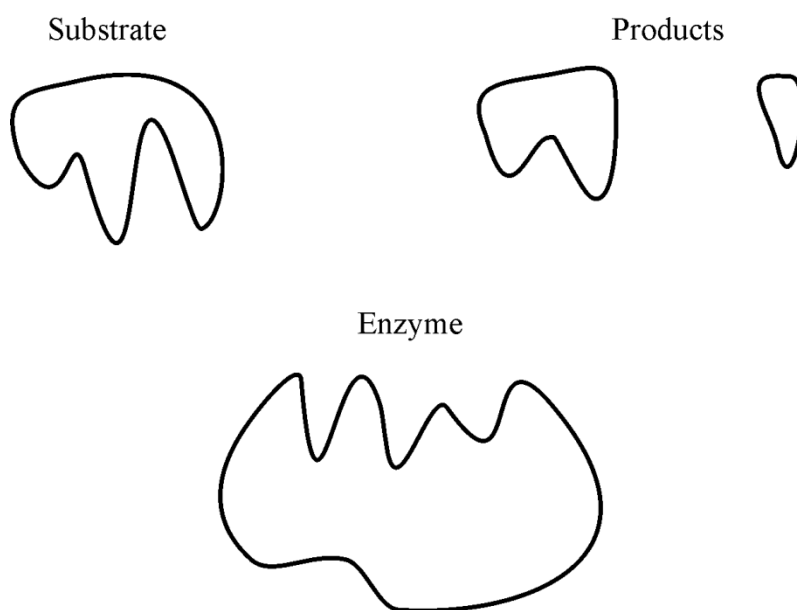
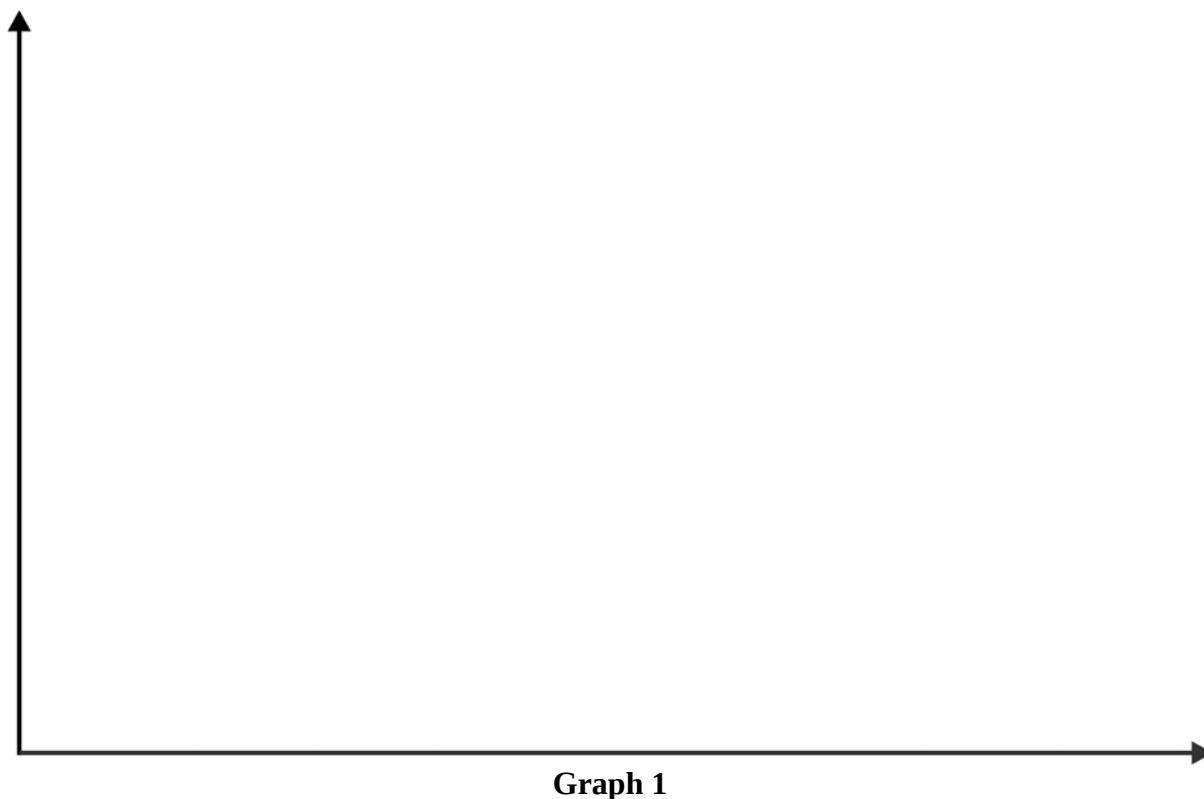


Figure 6

- a. On **Figure 6** draw the shape of the molecule that would work as a competitive inhibitor to the action of the enzyme molecule shown. **1 mark**
- b. Explain how a competitive inhibitor affects the action of an enzyme molecule? **2 marks**

- c. Draw a graph showing changes in energy levels of the substrate and product molecules for the reaction shown in **Figure 6**. Be sure to label the axes shown in **Graph 1**.

2 marks



It was previously believed that the shape of the active site of an enzyme was a perfect match to its substrate. This was known as the Lock and Key model. However, it did not explain why the substrate actually changed nor how the enzyme brought this change about.

If you look carefully at **Figure 6** you will notice that the shape of the active site of the enzyme is **not** an exact match. This model is known as an induced fit model.

- d. Explain how, in the induced fit model, the enzyme would work to cleave the substrate?

2 marks

End of Section B

End of Topic Test 1

Suggested Answers

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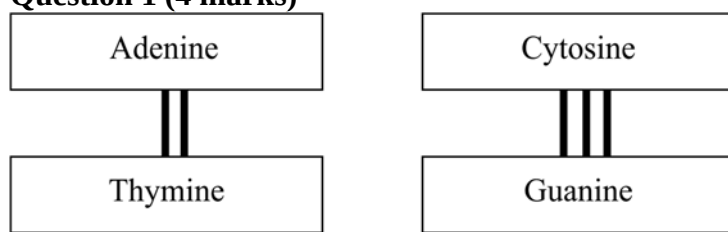
Molecules of Life

SECTION A – Multiple Choice Answers

- | | | | | | | |
|------|------|-------|-------|-------|-------|-------|
| 1. A | 2. D | 3. A | 4. C | 5. B | 6. B | 7. C |
| 8. D | 9. B | 10. C | 11. D | 12. A | 13. D | 14. C |

SECTION B – Short Answer (Answers)

Question 1 (4 marks)



- a. $\frac{1}{2}$ a mark for each correct name **2 marks.**
b. $\frac{1}{2}$ a mark each for linking: Adenine to Thymine and Cytosine to Guanine.
 $\frac{1}{2}$ a mark for showing the double bond between Adenine and Thymine and $\frac{1}{2}$ a mark for showing the triple bond between Cytosine and Guanine **2 marks.**

Question 2 (5 marks)

- a. Anabolic reaction (Endergonic, Polymerisation, Condensation polymerisation or Condensation reactions are also acceptable) **1 mark.**
b. Water is produced when glucose monomers join in starch formation **1 mark.**
c. If large amounts of glucose build up in the cell it would become hypertonic **1 mark.**
This would mean that large amounts of water would enter the cell via osmosis, increasing turgidity. This in turn would limit the cell's ability to move materials and function correctly **1 mark.**
d. Starch is largely insoluble so plant cell can maintain correct osmotic pressure **1 mark.**

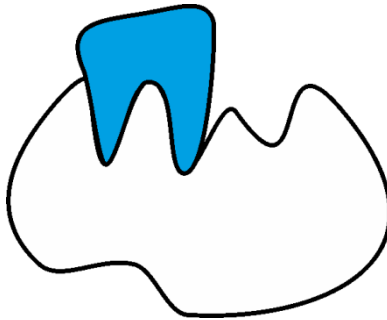
Question 3 (7 marks)

- a. It is a polypeptide chain and therefore is made up of amino acids **1 mark**.
- b. Quaternary structure **1 mark**.
- c. Golgi complex **1 mark**.
- d. The phospholipid molecules are attracted to each other but not locked in a rigid formation **1 mark**.
This allows flexibility and the ability for molecules to move across the surface **1 mark** (or any other suitable answer. E.g. The phospholipid tails are hydrophobic therefore remain close to each other but are still not attached in any fixed position.)
- e. Sections of the class 2 MHC marker molecule would be hydrophobic due to its primary structure containing amino acids that are hydrophobic **1 mark**.
Therefore, it is attracted to the phospholipid tails which are also hydrophobic and remain at a particular depth **1 mark**.

Question 4 (3 marks)

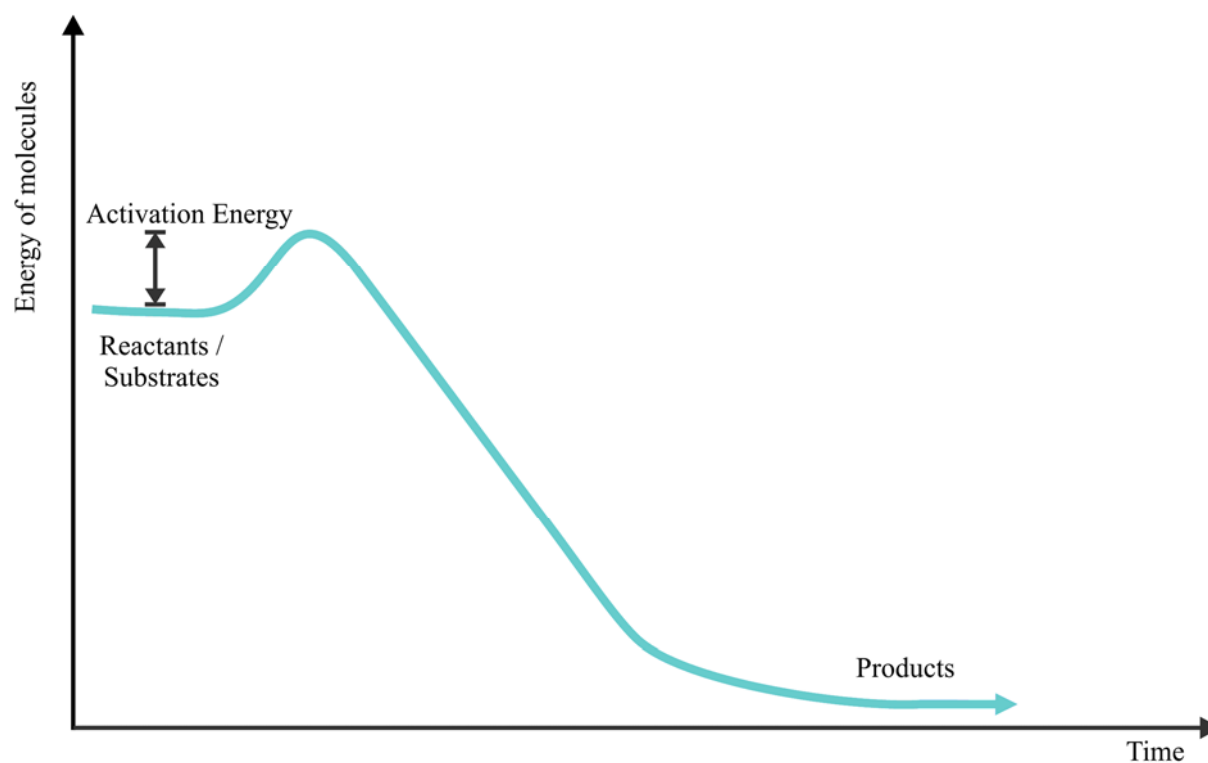
- a. Aerobic cellular respiration **1 mark**.
$$36-38 P_1 + 36-38 ADP + C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 36-38 ATP$$
 1 mark.
- b. Electron Transport Chain **1 mark**.

Question 5 (7 marks)



- a. Any shape is fine as long as it complements some part or all of the active site of the enzyme molecule shown **1 mark**.
- b. A competitive inhibitor is a molecule which blocks either partially or totally the active site of an enzyme molecule **1 mark**.
This means it is no longer able to bind with the substrate and the enzyme activity is reduced / stopped **1 mark**.

c.



1 mark for shape of graph (½ mark if they forgot to include the activation energy).

1 mark for correct axes labels.

- d. The substrate and the enzyme molecules are not perfectly complementary, so that when an enzyme substrate complex forms, the shape of the substrate puts pressure on the enzyme molecules and it is pushed slightly out of shape **1 mark**.
When the enzyme molecule springs back to its original shape, the pressure is enough to break the substrate **1 mark**.

End of Suggested Answers