



# VCE BIOLOGY 2017

Year 12 Unit 3 – Topic Test 1

**How do cellular processes work?**

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**Time allowed: 50 minutes**

**Total marks: 40**

14 Multiple Choice Questions

4 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**

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Student Name.....

**VCE Biology 2017 Year 12 Topic Test 1 Unit 3**

**How do cells maintain life?**

**Area of Study 1: How do cellular processes work?**

**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 2017 Year 12 Topic Test 1 Unit 3

## How do cells maintain life?

### Area of Study 1: How do cellular processes work?

#### SECTION A – Multiple Choice Questions

##### Question 1

Which of the following is not a polymer made up of repeating monomer units?

- A. Starch.
- B. Fat.
- C. Protein.
- D. Deoxyribonucleic acid.

##### Question 2

Which of the following elements would be in the lowest concentration of atoms in a peptide hormone?

- A. Carbon.
- B. Nitrogen.
- C. Sulphur.
- D. Oxygen.

##### Question 3

Ribosomes would **not** be found

- A. within a chloroplast.
- B. on the rough endoplasmic reticulum.
- C. in a lysosome.
- D. inside mitochondria.

##### Question 4

Channel mediated diffusion involves the movement of

- A. polar molecules down a concentration gradient.
- B. polar molecules against a concentration gradient.
- C. non-polar molecules down a concentration gradient.
- D. non-polar molecules against a concentration gradient.

**Question 5**

After a lysosome has broken down the contents of a vesicle, the waste products are removed from the cell in a process known as

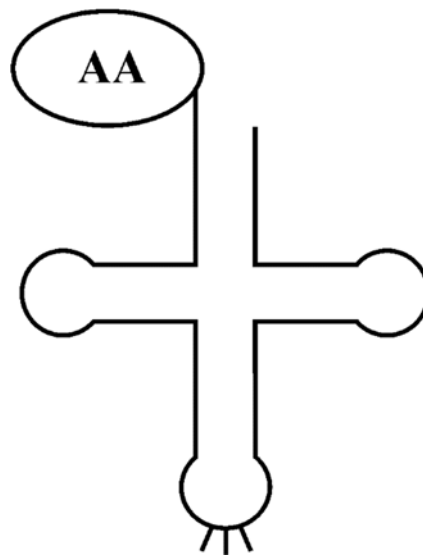
- A. endocytosis.
- B. exocytosis.
- C. pinocytosis.
- D. phagocytosis.

**Question 6**

The order of cellular features encountered by a substance as it moves into a plant cell would be

- A. cell wall, plasma membrane, vacuole, cytoplasm.
- B. plasma membrane, cell wall, vacuole, cytoplasm.
- C. plasma membrane, cell wall, cytoplasm, vacuole.
- D. cell wall, plasma membrane, cytoplasm, vacuole.

**Question 7**



**Figure 1**

**Figure 1** represents a molecule of

- A. transfer RNA.
- B. transport RNA.
- C. transfer DNA.
- D. transport DNA.

### Question 8

Which of the following statements is correct?

- A. One gene can only code for one specific protein.
- B. Genes can be regulated by alternate splicing of the introns in pre-mRNA.
- C. Genes can be regulated by alternate splicing of the exons in pre-mRNA.
- D. Genes can be regulated by removal of sections of the coding region of the DNA.

### Question 9

A repressor protein like the one involved with the Lac operon works by binding

- A. downstream of the promotor region.
- B. upstream of the promotor region.
- C. in the middle of the gene for lactase.
- D. downstream of the gene for lactase.

### Question 10

A macromolecule was found to contain the elements Carbon, Hydrogen, Oxygen, Phosphorus and Nitrogen. This molecule is most likely to be

- A. a protein.
- B. deoxyribonucleic acid.
- C. a phospholipid.
- D. glycogen.

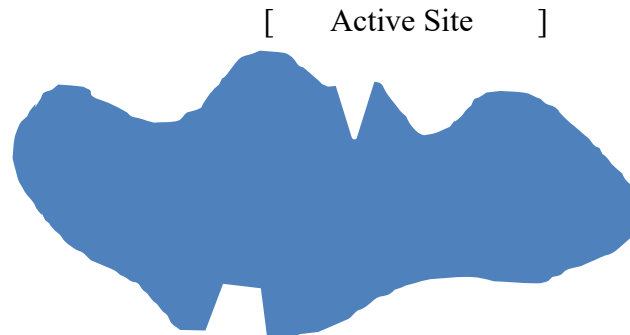
### Question 11

A prokaryote would **not** be expected to contain

- A. ribosomes.
- B. RNA.
- C. genes.
- D. mitochondria.

**Question 12**

Which of the following shapes would be most suitable to act as a competitive inhibitor for the enzyme in **Figure 2**?



**Figure 2**

- A.
- B.
- C.
- D.

**Question 13**

The stage of respiration that produces the greatest amount of loaded acceptor molecules for each unit of substrate is

- A. the Calvin cycle.
- B. glycolysis.
- C. the Krebs cycle.
- D. the electron transport chain.

**Question 14**

The second stage of photosynthesis in plants does not occur during the night. The reason for this is due to a lack of

- A. sunlight.
- B. water.
- C. NADH molecules.
- D. NADPH molecules.

**End of Section A**



# VCE Biology 2017 Year 12 Topic Test 1 Unit 3

## How do cells maintain life?

### Area of Study 1: How do cellular processes work?

#### SECTION B – Short Answer Questions

##### Question 1 (7 marks)

Glucose has the formula  $C_6H_{12}O_6$  yet the molecule lactose, which is made from two glucose molecules, has the formula  $C_{12}H_{22}O_{11}$ .

- a. Explain the likely cause for the difference in expected numbers of each element present in the two glucose molecules and a lactose molecule. **1 mark**

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- b. Lactose is reverted back to glucose by the action of an enzyme in the digestive system. Name the enzyme and describe how it is able to break down the lactose. **2 marks**

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- c. Enzymes are proteins formed from long chains of amino acids. Define the primary, secondary and tertiary structure of proteins and explain how these work to form a functioning enzyme. **4 marks**

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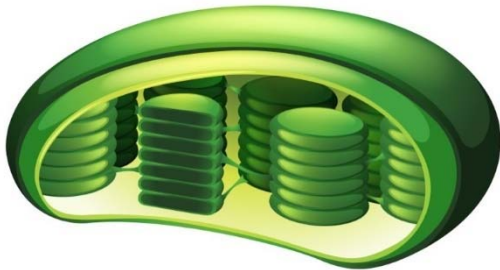
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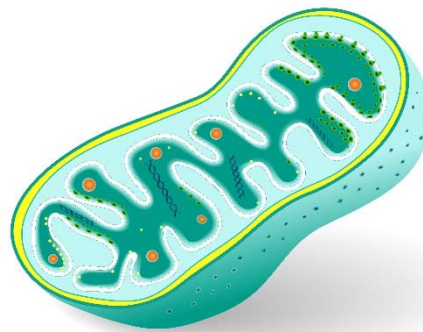
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**Question 2 (10 marks)**

ORGANELLE A



ORGANELLE B



**Figure 3**

- a. Compare the two organelles shown in **Figure 3** above. **6 marks**

	Organelle A	Organelle B
Name the two main intracellular structures that make up each of these organelles.		
Name the <b>loaded</b> acceptor molecules that are involved in the reactions that occur in each of these organelles.		
For each of these organelles, state the stage of reaction where the enzyme ATP synthase is involved.		

- b. Write the balanced chemical equation for the cellular process that occurs in organelle A. **2 marks**

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- c. Name a cell in which both organelles would be found. **1 mark**

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- d. Name a cell in which neither organelle would be found. **1 mark**

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**Question 3 (5 marks)**

**Figure 4** shows a section of template strand DNA in the nucleus of a cell.



**Figure 4**

- a. Write the order of ribonucleotides that would be transcribed from this section of DNA. **1 mark**

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- b. Name one modification that would need to occur to this strand of RNA before it leaves the nucleus. **1 mark**

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When the mRNA reaches a ribosome it is then read and translated into a polypeptide chain.

- c. Name the molecule responsible for bringing the correct amino acid to the ribosome. **1 mark**

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- d. Use **Table 1** shown below to write the order of amino acids that would result from the translation of this section of mRNA. **2 marks**

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		Second Base								
		U		C		A		G		
First Base	U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
		UUC		UCC		UAC		UGC		C
		UUA	Leu	UCA		UAA	Stop	UGA	Stop	A
		UUG		UCG		UAG	Stop	UGG	Trp	G
	C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
		CUC		CCC		CAC		CGC		C
		CUA		CCA		CAA	Gln	CGA		A
		CUG		CCG		CAG		CGG		G
	A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
		AUC		ACC		AAC		AGC		C
		AUA		ACA		AAA	Lys	AGA	A	
		AUG	Met or Start	ACG		AAG		AGG	Arg	G
	G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U
		GUC		GCC		GAC		GGC		C
		GUA		GCA		GAA	Glu	GGA		A
		GUG		GCG		GAG		GGG		G

**Table 1**

*This information relates to Question 4.*

The endosymbiotic theory proposes that all mitochondria found in all eukaryotic cells were once free floating bacteria that became engulfed by another microbial cell.

**Question 4 (4 marks)**

State four pieces of evidence that scientists have used in support of this theory.

**4 marks**

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**End of Section B**

**End of Topic Test 1**

## Suggested Answers

### VCE Biology 2017 Year 12 Topic Test 1 Unit 3

#### How do cells maintain life?

##### Area of Study 1: How do cellular processes work?

##### SECTION A – Multiple Choice Answers

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

##### SECTION B – Short Answer (Answers)

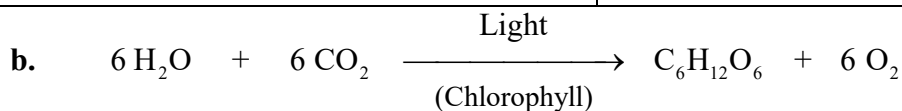
###### Question 1 (7 marks)

- The two monomers of glucose join in a condensation reaction that releases a water ( $H_2O$ ) molecule (**1 mark**).
- The lactose molecule binds to the active site of the enzyme lactase (**1 mark**). It is then broken down in a hydrolysis reaction to produce two glucose molecules (**1 mark**).
- Primary structure is the linear order of amino acids in the polypeptide chain (**1 mark**). Secondary structure is where hydrogen bonding between neighbouring amino acids forms shapes like alpha helices and beta pleated sheets (**1 mark**). Tertiary structure is the formation of a complex overall shape due to ionic and hydrogen bonding (**1 mark**). This specific complex shape creates an active site where the enzyme can bind to the substrate molecule (**1 mark**).

### Question 2 (10 marks)

a.

	Organelle A	Organelle B
Name the two main intracellular structures *that make up each of these organelles.	Grana (or thylakoid) and Stroma (1 mark).	Cristea and Matrix (1 mark).
Name the <b>loaded</b> acceptor molecules that are involved in the reactions that occur in each of these organelles.	ATP NADPH (1 mark).	ATP NADH FADH <sub>2</sub> (1 mark).
For each of these organelles, state the stage of reaction where the enzyme ATP synthase is involved.	Calvin cycle or Light Dependent stage (1 mark).	Electron transport chain (1 mark).



(1 mark) for correct equation.

(1 mark) for including light and chlorophyll.

c. Leaf cell of a plant (or any other reasonable answer) (1 mark).

d. Prokaryote / bacterial cell (1 mark).

### Question 3 (5 marks)

a. GUAUGCCUUAUGGUUGAC (1 mark).

b. Introns removed *or*  
Methyl cap added *or*  
Poly A tail added (1 mark).

c. tRNA or transfer RNA (1 mark).

d. Met (start) – Pro – Tyr – Gly – Stop (2 marks) (1 mark if they started with the first base and produced the sequence Val – Cys – Leu – Met – Val – Asp).

### Question 4 (4 marks)

Any **four** of the following (for 1 mark each)

- Mitochondria are enclosed in a double membrane similar to some bacteria.
- Mitochondria possess a loop of DNA like bacteria.
- Mitochondria divide by binary fission in the same way as bacteria do.
- Mitochondria are similar in size to bacteria.
- Mitochondria have their own ribosomes which are similar in size to bacterial ones.
- The mitochondrial outer membrane contains porins which are structurally similar to bacterial porins.

## End of Suggested Answers