Surname	Centre Number	Candidate Number
Other Names		2

GCE A level

1074/01

BIOLOGY – BY4

P.M. FRIDAY, 10 January 2014

1 hour 45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**7**	
3.	**9**	
4.	**11**	
5.	**12**	
6.	**12**	
7.	**16**	
8.	**10**	
Total	**80**	

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INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.
The quality of written communication will affect the awarding of marks.

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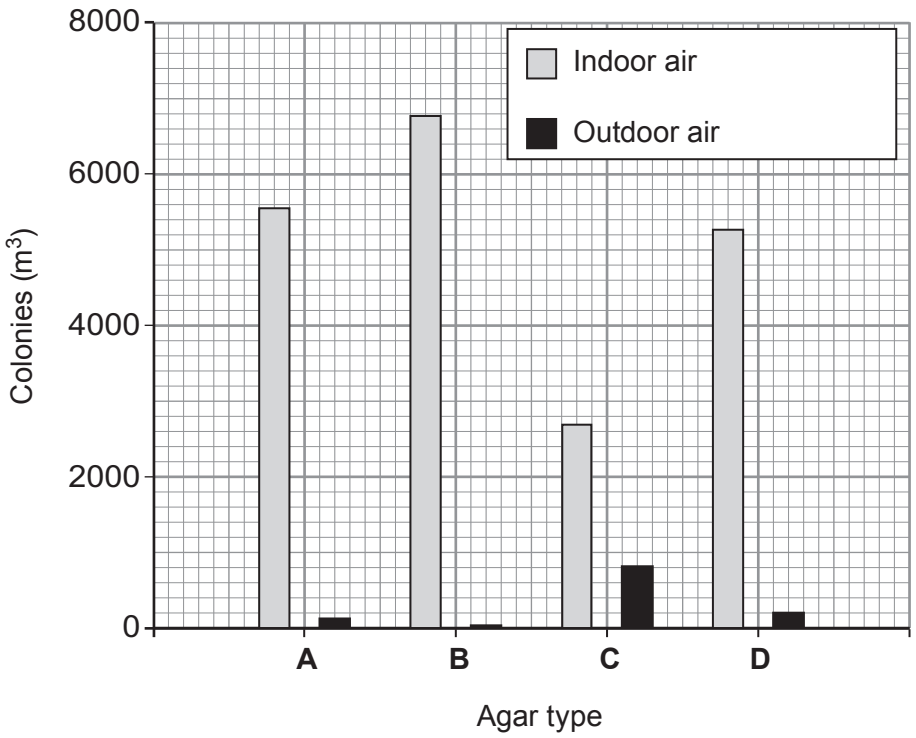
1. 1 m^3 of air was filtered from two different environments.
The microorganisms collected were grown, using aseptic technique, on four different types of agar plates (**A**, **B**, **C** and **D**) at the same temperature and for the same length of time.
The number of colonies grown from each sample is shown.



(a) What conclusion can you draw from the graph above about the numbers of microbes in the **two** air samples? [1]

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(b) The four agar types have resulted in different colony numbers because they contain different nutrients.
State **four** ways that the **agar types** could differ in composition. [2]

i. .....

ii. .....

iii. .....

iv. .....

3

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2. The photograph below shows root nodules on a plant.

(a) Name the group of plants which have large numbers of root nodules on their roots. [1]

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(b) Explain the advantage to these plants of having root nodules. [3]

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(c) *Nitrosomonas* and *Nitrobacter* are two groups of bacteria which carry out nitrification. Explain this process and why it is so important to soil fertility. [3]

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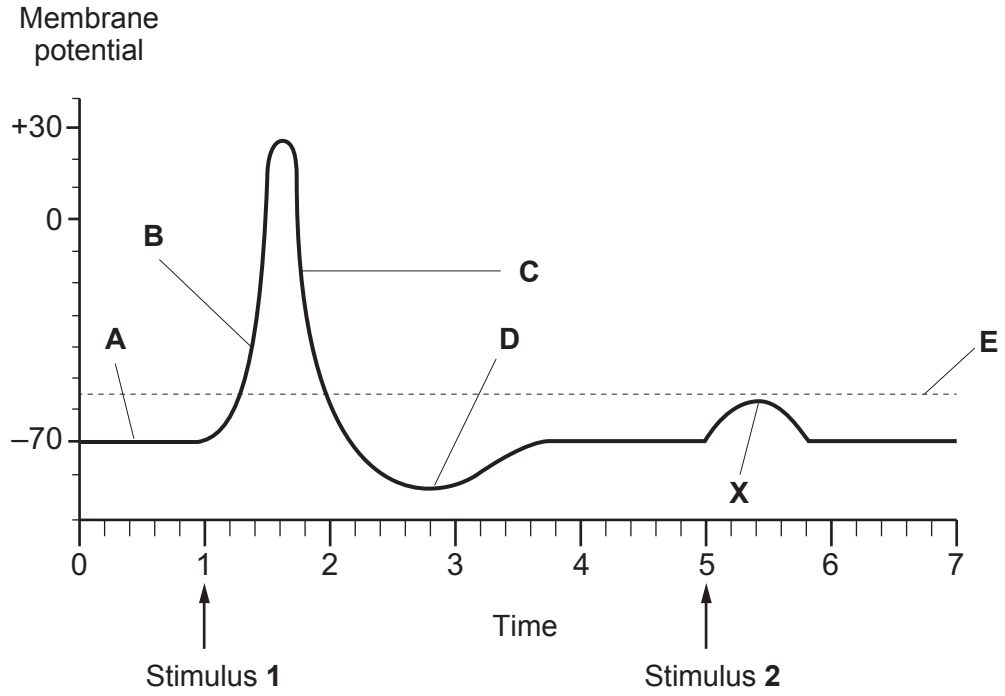
3. An action potential is illustrated in the following graph.



(a) What units should be used on the two axes of the graph shown above? [2]

Membrane potential .....

Time .....

(b) Identify the stages of the action potential indicated by **A**, **B**, **C** and **D**. [4]

A .....

B .....

C .....

D .....

(c) (i) What is represented by line **E** on the graph above? [1]

.....

(ii) Explain why stimulus **2** failed to initiate an action potential as seen at point **X**. [2]

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4. Roughly 60% of the mass of the body is water and despite wide variation in the quantity of water taken in each day, body water content remains incredibly stable.
One hormone responsible for this homeostatic control is antidiuretic hormone (ADH).

(a) Describe the mechanisms that are triggered in the mammalian body when water intake is reduced. [6]

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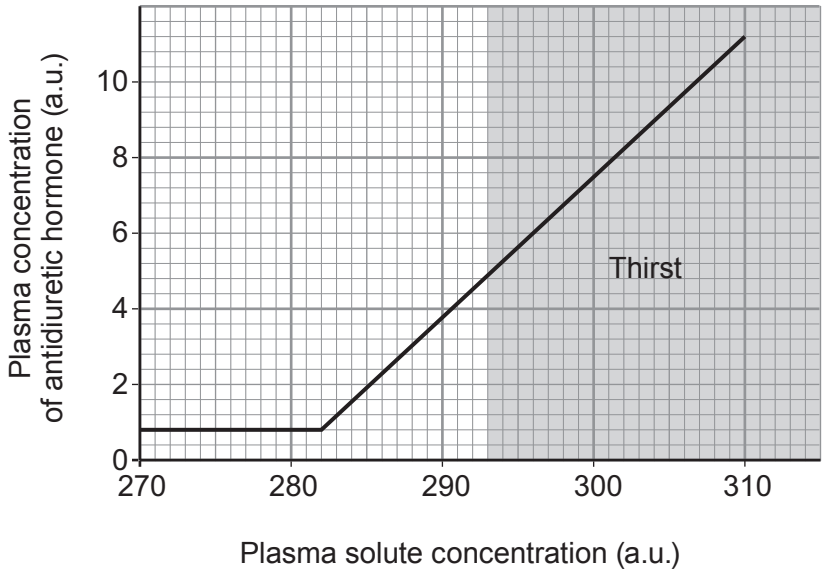
(b) The graph below shows how the plasma concentration of antidiuretic hormone changes as plasma solute concentration rises.



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(i) Describe the relationship shown in the graph opposite. [2]

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(ii) Suggest why a person only begins to feel thirsty at a plasma solute concentration of 293 AU. [2]

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Secretion of antidiuretic hormone is stimulated by decreases in blood pressure and volume. These are conditions sensed by stretch receptors in the heart and large arteries. Severe diarrhoea is one condition which stimulates ADH secretion.

(c) Suggest another condition which might stimulate ADH secretion. [1]

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Turn over.

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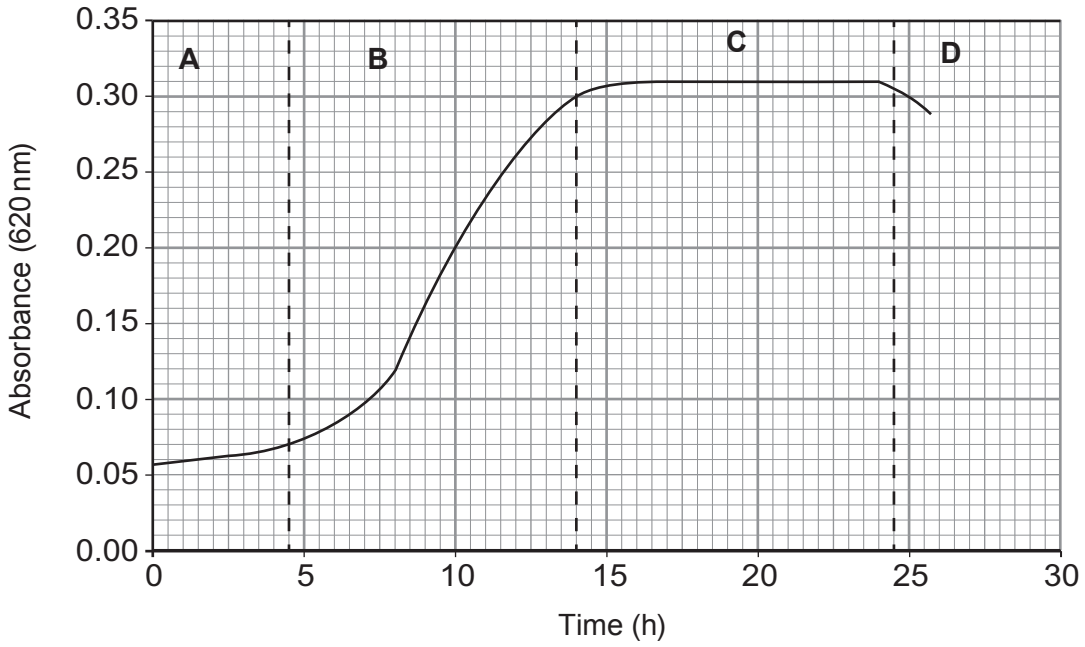
5. Dried yeast cells were added to sterile culture medium and grown under **anaerobic** conditions. Glucose was present in excess of requirements for 30 hours of culture. The following growth curve was obtained.



(a) Name the stages of the growth curve of yeast shown on the graph above and explain **precisely** what is occurring in the culture at **each** of these stages. [8]

	Name of stage	*Explanation*
A		
B		
C		
D		

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(b) Describe the metabolism of pyruvate in the anaerobic respiration of glucose in yeast. [4]

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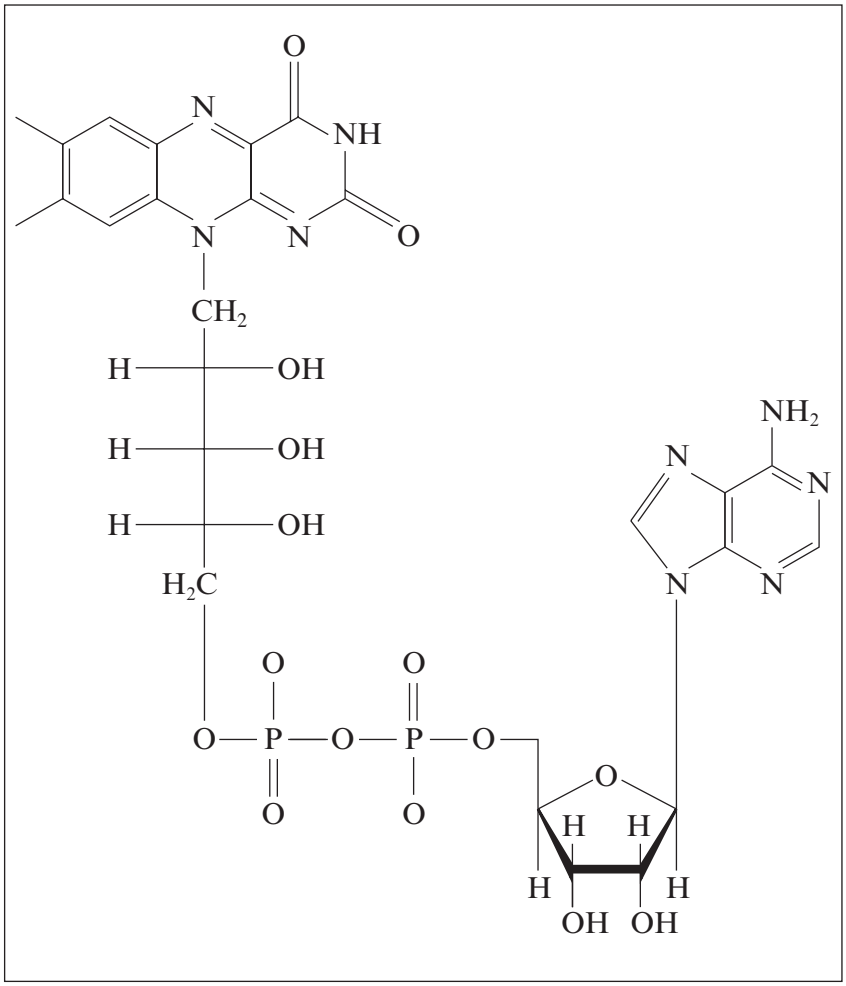
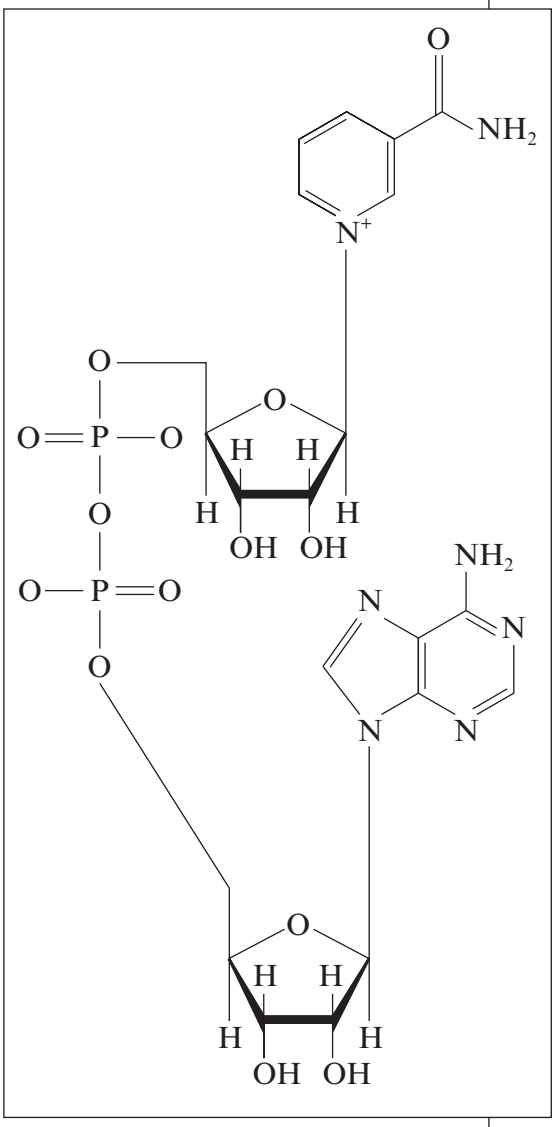
6. The two diagrams below show nicotinamide adenine dinucleotide (NAD) and flavin adenine dinucleotide (FAD), two nucleotides used in respiration.



FAD



NAD

(a) State **two** chemical features which these two molecules have in common and **one** difference between the two molecules. [3]

Features in common.

(i) .....

(ii) .....

Difference

.....

.....

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(b) Substrate level phosphorylation (SLP) is the simplest, oldest and least-evolved way to make ATP. In substrate level phosphorylation, ATP is made during the conversion of an organic molecule from one form to another. Energy released during the conversion is used to synthesise the high energy bond of ATP.

(i) Describe the position of the 'high energy bond of ATP' referred to in the paragraph above. [1]

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(ii) Suggest why SLP is referred to as the 'simplest and oldest way to make ATP'. [2]

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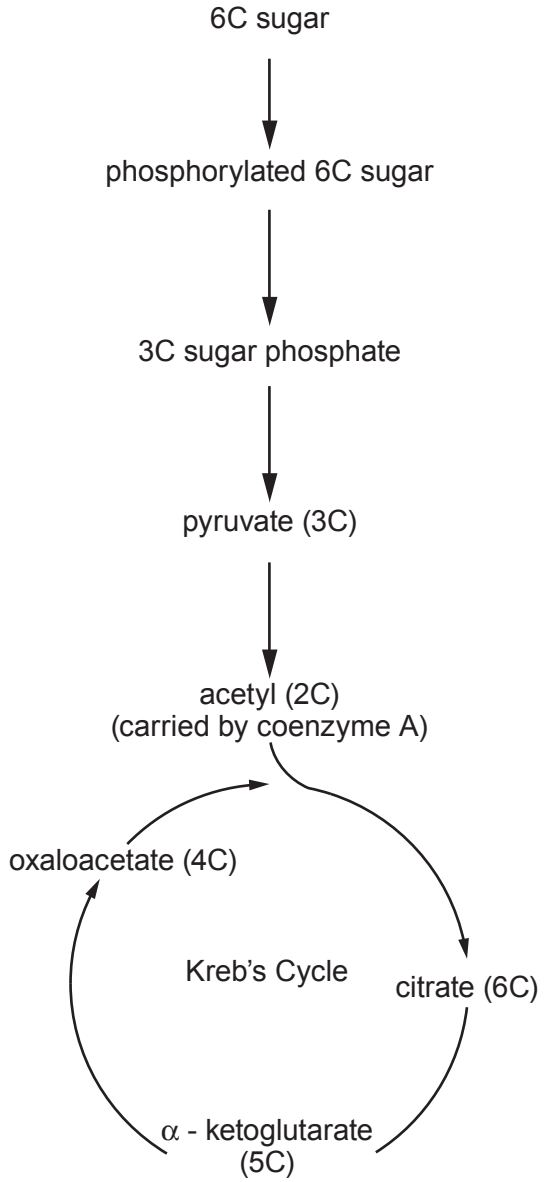
The diagram below shows glycolysis, the link reaction and Kreb's cycle.



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(iii) Draw **two** arrows labelled **A** and **B** on the diagram opposite to show the **two** steps where there is conversion of an organic molecule from one form to another and SLP occurs. [2]

(iv) Give the number of ATP molecules made by SLP at **each** of the conversions shown in part (iii) **per glucose molecule** in aerobic respiration. [2]

Arrow	Number of ATP molecules made per glucose molecule in aerobic respiration.
A	
B	

(c) (i) Where does the link reaction occur in cells? [1]

.....

(ii) Name the **two** types of enzyme involved in the link reaction. [1]

.....

.....

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7. Diuron is a weed-killer which is a very specific and sensitive inhibitor of photosynthesis. It blocks the electron carrier binding site on photosystem II. This stops the electron flow from where it is generated, in photosystem II, to the electron carrier. This reduces the ability of the plant to convert light energy into chemical energy.

Diuron only blocks electron flow from photosystem II. It has no effect on photosystem I or other reactions in photosynthesis, such as light absorption or carbon fixation in the Calvin cycle.

(a) Explain the effects of Diuron on non-cyclic photophosphorylation and why cyclic photophosphorylation is not affected. [4]

(b) Suggest why a plant would die when the weedkiller Diuron is sprayed onto it. [3]

(c) The Calvin cycle is shown below with some of the intermediate compounds drawn.

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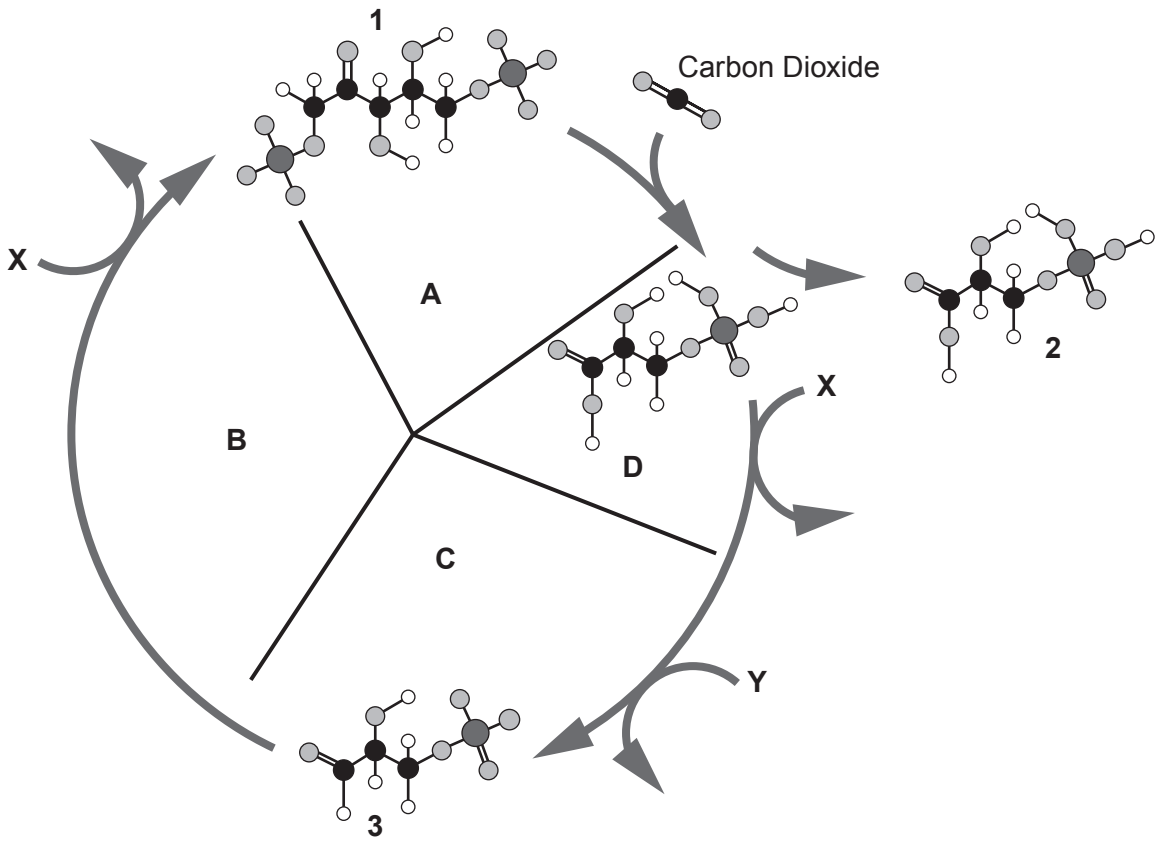

(i) Name compounds **1**, **2** and **3** shown on the diagram above. [3]

1 .....

2 .....

3 .....

(ii) What is the role of ribulose bisphosphate carboxylase (RuBisCo) in the Calvin cycle? [1]

.....

(iii) Name molecules **X** and **Y** shown on the diagram above. [2]

X .....

Y .....

(iv) Describe simply what is happening at **each** stage of the cycle indicated by **A**, **B** and **C** on the diagram above. [3]

A .....

B .....

C .....

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8. Answer **one** of the following questions.
All diagrams included in your answer must be fully annotated.

Either, *(a)* Explain what is meant by the viable count technique and describe how it is used to monitor population growth of microorganisms. [10]

Or *(b)* Describe the sequence of events involved in synaptic transmission at a synapse. [10]

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END OF PAPER

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