

**Monday 14 January 2013 – Morning**

**GCSE TWENTY FIRST CENTURY SCIENCE  
BIOLOGY A**

**A162/01** Modules B4 B5 B6 (Foundation Tier)

Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**Duration:** 1 hour

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)



Candidate forename		Candidate surname	
-----------------------	--	----------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

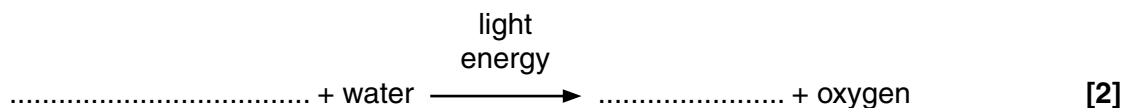
**INFORMATION FOR CANDIDATES**

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

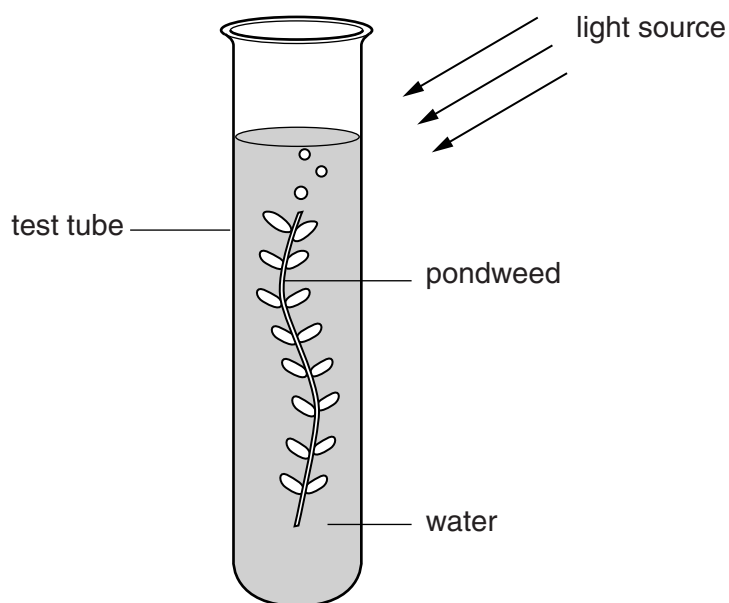
Answer **all** the questions.

1 Photosynthesis takes place in plants.

(a) Complete the word equation for photosynthesis.



(b) Jason is studying the rate of photosynthesis for pondweed under **low** and **high** light intensities.



- Jason cuts 20 pieces of pondweed and puts each piece in a separate test tube in water.
- He puts 10 test tubes under **low** light intensity and 10 under **high** light intensity.
- He records the number of oxygen bubbles produced by each of the pieces of pondweed during a 1 minute period.
- Jason records the data in **Table 1**.

**Table 1**

Light intensity	Number of bubbles produced per minute										Mean
	low	8	7	5	9	6	10	7	8	6	
high	10	11	9	13	15	8	11	10	9	12	

(i) Calculate the mean number of bubbles produced under **high** light intensity.

Write your answer in the empty box in **Table 1**.

[1]

- (ii) Another student repeats the experiment using five species of pondweed, **A**, **B**, **C**, **D** and **E**.

The mean number of bubbles produced per minute for each species of pondweed is shown in **Table 2**.

**Table 2**

		Mean number of bubbles produced per minute				
Light intensity	Pondweed species					
	A	B	C	D	E	
low	7	5	7	6	8	
high	15	10	11	17	13	

Use the results in **Table 1** and **Table 2** to identify which species, **A**, **B**, **C**, **D** or **E**, was the one also used by Jason.

species used by Jason = ..... [1]

- (iii) How confident can you be about your conclusion?

Explain why

.....

.....

.....

..... [2]

- (iv) Suggest **two** improvements for Jason's experiment.

.....

.....

..... [2]

- (c) Pondweed cells contain structures that have different roles in photosynthesis.

Draw a straight line to link each **cell structure** to its **role in photosynthesis**.

cell structure	role in photosynthesis
chloroplast	contains the genetic code for making the enzymes needed
cell membrane	allows oxygen to pass out of the cell
nucleus	contains a light-absorbing pigment and enzymes

[2]

- (d) Different molecules move in and out of pondweed cells by various processes, including osmosis.

What is **osmosis**?

Complete the sentence.

Osmosis is the overall movement of ..... molecules from a dilute to a more concentrated solution across a membrane that is ..... [1]

[Total: 11]

**BLANK PAGE**

**Question 2 begins on page 6**

**PLEASE DO NOT WRITE ON THIS PAGE**

2 Yeast is a single-celled microorganism.

Yeast can be grown in a fermenter.

The yeast cells are grown in a liquid containing nutrients.

The nutrients are needed for them to grow and reproduce.

Yeast can carry out both aerobic and anaerobic respiration.

(a) What does yeast produce during **anaerobic** respiration?

Put a **ring** around the **two** correct answers.

- carbon dioxide**      **ethanol**      **glucose**      **light**      **oxygen**      **starch**

[2]

(b) Some yeast cells are put into a solution in two fermenters, **A** and **B**.

The lid is closed tight so that no air can get in or out of fermenter **A**.

Air containing oxygen is bubbled through fermenter **B**.

A scientist counts the number of yeast cells in samples taken from both fermenters.

She records her results in a table.

Time when samples were taken (hours)	Number of yeast cells in 1 mm <sup>3</sup>	
	Fermenter A	Fermenter B
0	100	100
1	200	200
2	300	400
3	350	800
4	390	1600

(i) Describe the results.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Cell production needs energy.

The scientist concludes that

“In fermenter **A**, the yeast cells started to carry out more anaerobic than aerobic respiration.”

Use the data in the table and your understanding of the release of energy in respiration to support this conclusion.

.....  
.....  
.....  
..... [3]

(c) Bacteria are also microorganisms.

Biogas production using bacteria is an application of respiration.

Complete the sentences about biogas production.

Use words from the list.

- carbon dioxide
- food
- fossil
- fuel
- methane
- nitrogen
- organic
- oxygen
- radioactive
- synthetic
- water

Biogas is the type of gas produced by the biological breakdown of ..... matter.

The process is carried out in the absence of .....

The gases produced include carbon dioxide and .....

Biogas is used as a ..... [4]

[Total: 12]

Turn over

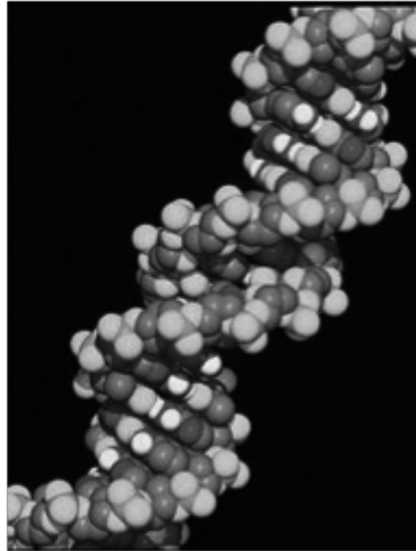
3 This question is about DNA and genes.

DNA is a double helix.

The double helix is divided into genes along its length.

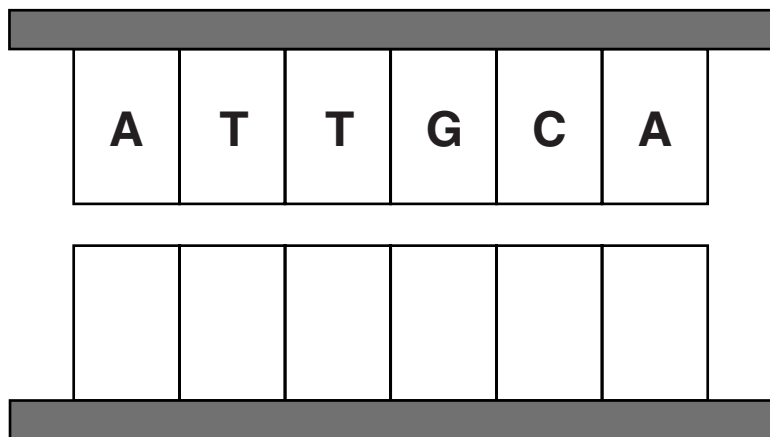
The two strands are held together by bonds between pairs of bases.

The bases always pair up in the same way.



(a) Complete the model of DNA to show the missing bases.

Write **A**, **T**, **C** or **G** in each box.



[2]



(b) 36% of the bases found in a particular gene are type **G**.

(i) What is the percentage of type **C** bases in this gene?

Explain your answer.

.....  
.....  
.....  
..... [2]

(ii) A second gene has a different percentage of type **G** bases.

Suggest **why** the percentage of type **G** bases is different in this gene.

.....  
.....  
.....  
..... [2]

(c) A copy of a gene is produced to carry the genetic code to the cytoplasm.

Complete the sentence to explain why.

Use the correct words from the list.

- cell membrane
- cell wall
- cytoplasm
- nucleus
- vacuole

Genes are found in the ..... of the cell but protein synthesis takes place in the ..... of the cell. [1]

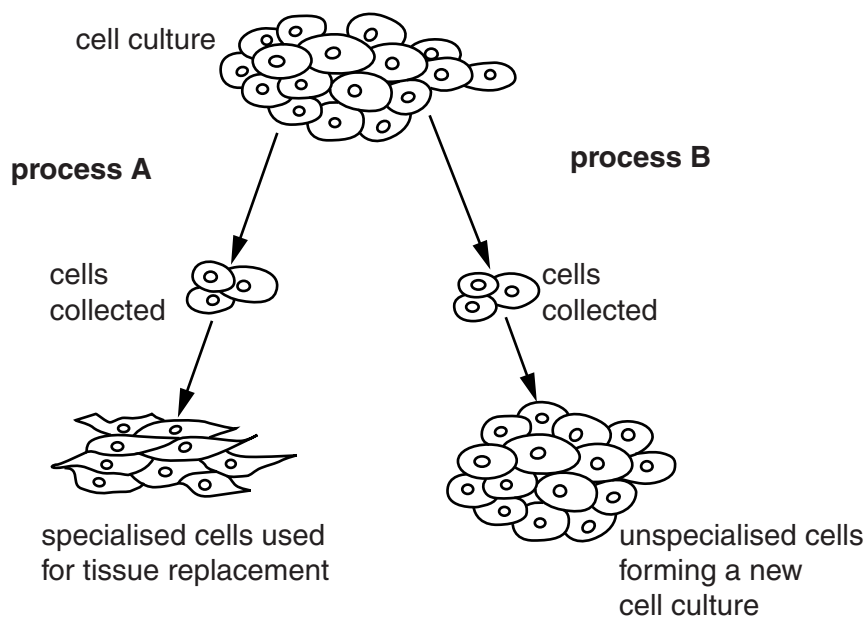
(d) Dr Amrani is a researcher studying embryonic stem cells.

She grows some embryonic stem cells from one embryo in a petri-dish.

These cells are unspecialised.

Dr Amrani removes some of the embryonic stem cells and produces some specialised cells needed to replace damaged tissues (**process A**).

The remaining embryonic stem cells stay unspecialised and are used to create a new cell culture (**process B**).



Use your knowledge of growth and development in cells to explain the differences between the cells produced by processes **A** and **B**.



*The quality of written communication will be assessed in your answer.*

..... [6]

(e) The use of **embryonic** stem cells for research and treatment of patients is subject to Government regulation.

Suggest **two** ethical issues to be considered when carrying out this work.

..... [2]

**[Total: 15]**

4 Mirek blinks when he gets dust in his eyes.

(a) Blinking is a reflex action.

What features are typical of a reflex action?

Put a (ring) around the **three** correct features.

involuntary

long-lasting

rapid

short-lived

slow

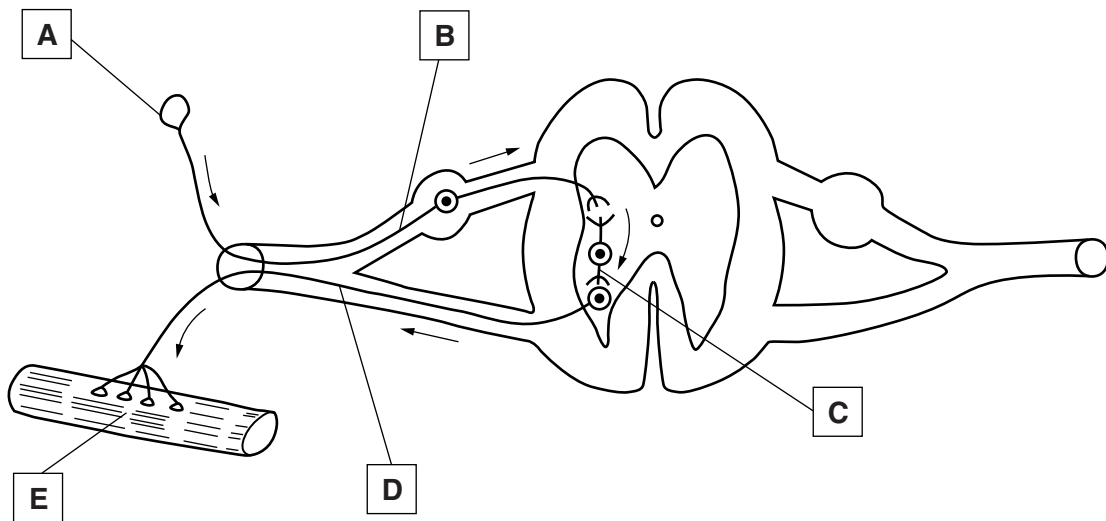
voluntary

[2]

(b) The spinal reflex arc involves a number of structures.

Look at the structures **A, B, C, D** and **E** in the diagram of a spinal reflex arc.

The arrows show the direction of the impulse.



Write the letter, **A, B, C, D** or **E**, in each box next to the correct structure in the table.

effector	
motor neuron	
receptor	
relay neuron	
sensory neuron	

[2]

(c) Reflex responses can be learned by a process called conditioning.

Read the following information about the ‘little Albert’ experiment.

The ‘little Albert’ experiment was a case study of conditioning in humans.

- Albert, aged nine months, was allowed to play with a pet white rat.
- He showed no fear of the rat.
- After a while, researchers made a loud noise behind Albert’s back whenever he touched the rat. This made Albert frightened and he cried.
- After this happened a number of times, Albert became upset every time he saw the rat, even without the loud noise.

Justify the conclusion that

“Humans learn through conditioning in the same way as the dogs in Pavlov’s experiments.”

In your answer, use your knowledge of Pavlov’s experiments with dogs and the information provided about the ‘little Albert’ experiment.



*The quality of written communication will be assessed in your answer.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**[6]**

**[Total: 10]**

5 The human brain is an organ of the nervous system.

(a) Which part of the nervous system in humans is made up of only the brain and spinal cord?

answer ..... nervous system [1]

(b) The human brain has a centre for memory.

Which part of the brain acts in this way?

answer ..... [1]

(c) A team of scientists is investigating the ability of humans to remember information.

The scientists ask three groups of people to remember a series of ten numbers.

List of numbers									
Start									End
5	10	15	21	24	28	31	34	35	36

One group of ten people is in a quiet room. The second group is in a noisy room and the third group is in a very noisy room.

Each person is given 10 minutes to memorise the numbers in the correct order.

The results are recorded in a table.

Results recorded	People in the quiet room	People in the noisy room	People in the very noisy room
all 10 numbers correctly recalled and in the correct order	4	2	1
all 10 numbers correctly recalled but a few in the incorrect order	2	3	2
5 or fewer numbers correctly recalled and in the correct order	3	3	3
5 or fewer numbers correctly recalled but a few in the incorrect order	1	2	4

(i) Describe a correlation shown by the results and suggest a reason for this.

.....  
 .....  
 ..... [2]

(ii) State **two** factors which may have influenced the results but were **not** considered in this experiment.

1 .....

2 .....

[2]

(iii) Describe how different **learning techniques** can help with memorising this information.

Give examples of how these learning techniques could help people memorise the list of numbers.



*The quality of written communication will be assessed in your answer.*

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

[6]

[Total: 12]

**END OF QUESTION PAPER**

**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.