OCR
Oxford Cambridge and RSA

H

Friday 9 June 2017 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE BIOLOGY A/ADDITIONAL SCIENCE A

A162/02 Modules B4 B5 B6 (Higher Tier)

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

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

* A 1 6 2 0 2 *

* 6 8 6 4 8 3 1 0 2 8 *

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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The 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 **20** pages. Any blank pages are indicated.

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Answer **all** questions.

1 John has a suspected brain tumour.

His doctor decides to take a biopsy.

In a biopsy a small amount of brain tissue is removed.

His doctor tells John that after the biopsy he may find he is unable to remember some words.

(a) (i) Define the term memory.

.....

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

(ii) Name the part of the brain responsible for language.

..... **[1]**

(iii) John agrees to have the biopsy taken even though he may lose some of his memory.

Explain why John is willing to take this risk.

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

(b) John's friend Judith decides she would like to learn how to play the piano.

Describe the changes that will happen in Judith's brain to allow her to learn this new skill.

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.....

.....

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

[Total: 8]

2 **(a)** Aerobic and anaerobic respiration are two types of respiration used in human cells.

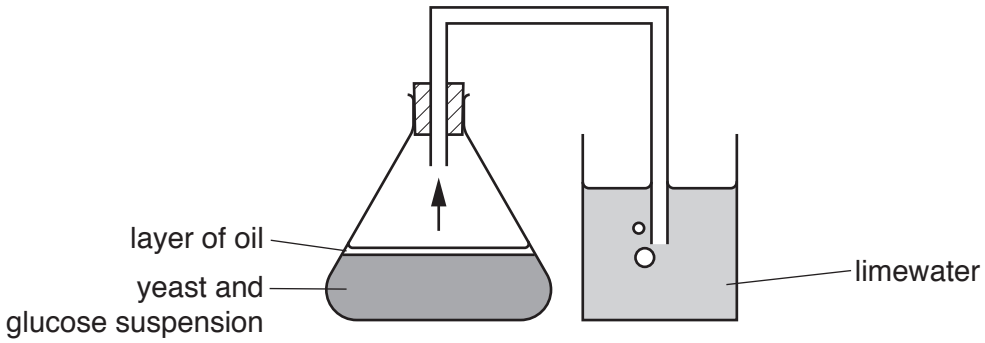
Put ticks (✓) in the boxes to show which type of respiration each statement describes.

Statement	Aerobic respiration	Anaerobic respiration	Both types of respiration
Uses oxygen			
Produces lactic acid			
Uses glucose			
Produces carbon dioxide			
Occurs in the mitochondria			

[3]

(b) A student investigates the effect of temperature on fermentation.

She uses this apparatus.



The student puts a layer of oil over the glucose and yeast suspension.

Explain why.

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

(c) The student does the experiment at three different temperatures.

Every 30 minutes, she counts the number of bubbles of carbon dioxide produced in one minute.

Her results are shown in the table.

Temperature (°C)	Number of bubbles of carbon dioxide produced in one minute after …				
	30 minutes	60 minutes	90 minutes	120 minutes	150 minutes
15	22	24	23	26	24
30	32	36	37	36	32
45	44	48	44	32	12

(i) Write down **two** conclusions that the student can make from this data **and** use your knowledge of respiration to explain each conclusion.

Conclusion 1 and explanation

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Conclusion 2 and explanation

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[4]

(ii) Counting bubbles may not be the best way to estimate the volume of carbon dioxide produced.

Suggest why.

..... **[1]**

(iii) Suggest an alternative way to measure the volume of carbon dioxide produced.

..... **[1]**

(d) Fermentation by yeast cells is an example of anaerobic respiration.

When oxygen is in short supply animal cells can also respire anaerobically.

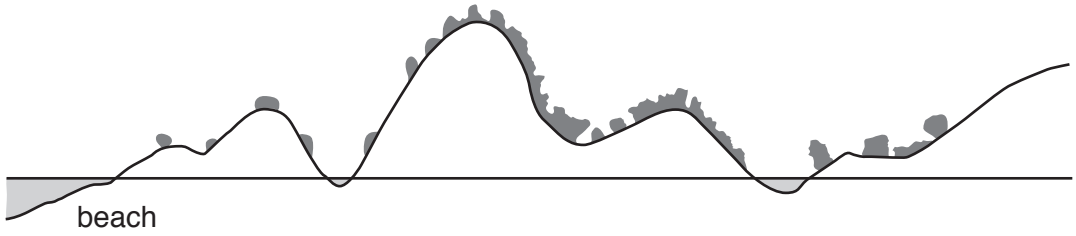
Give an example of when animal cells would respire anaerobically.

..... **[1]**

[Total: 12]

3 Emilia is at the beach.

She walks through the sand dunes and notices that the types of plants in the dunes change the further she gets from the beach.



(a) Describe a field investigation that she could carry out to show that her observations are correct.

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

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..... **[6]**

(b) (i) Plants require water for photosynthesis.

Write down the name of the process which moves water into plant roots.

..... **[1]**

(ii) The rate of photosynthesis may be limited by **two** of the following factors.

Put a tick (✓) in the boxes next to the **two** correct answers.

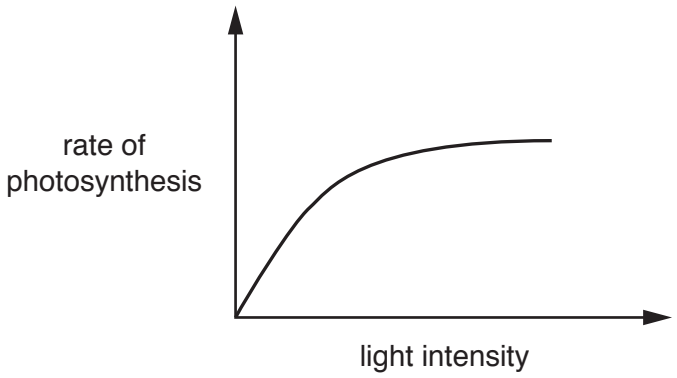
carbon dioxide concentration	☐
glucose concentration	☐
nitrate concentration	☐
oxygen concentration	☐
temperature	☐

[2]

(iii) Light intensity also limits the rate of photosynthesis.

The graph shows how light intensity affects the rate of photosynthesis.

Draw an X on the graph where light intensity is **not** a limiting factor.



[1]

(c) (i) Plants grow towards a source of light.

Write down the name given to this directional growth.

..... **[1]**

(ii) Explain why this directional growth benefits the plant.

..... **[1]**

(d) (i) Plants need to make amino acids.

Which **two** molecules do plants use to make amino acids?

Put a tick (✓) in the boxes next to the **two** correct answers.

cellulose	☐
glucose	☐
nitrate	☐
protein	☐
starch	☐

[2]

(ii) Which type of large molecule are amino acids used to make?

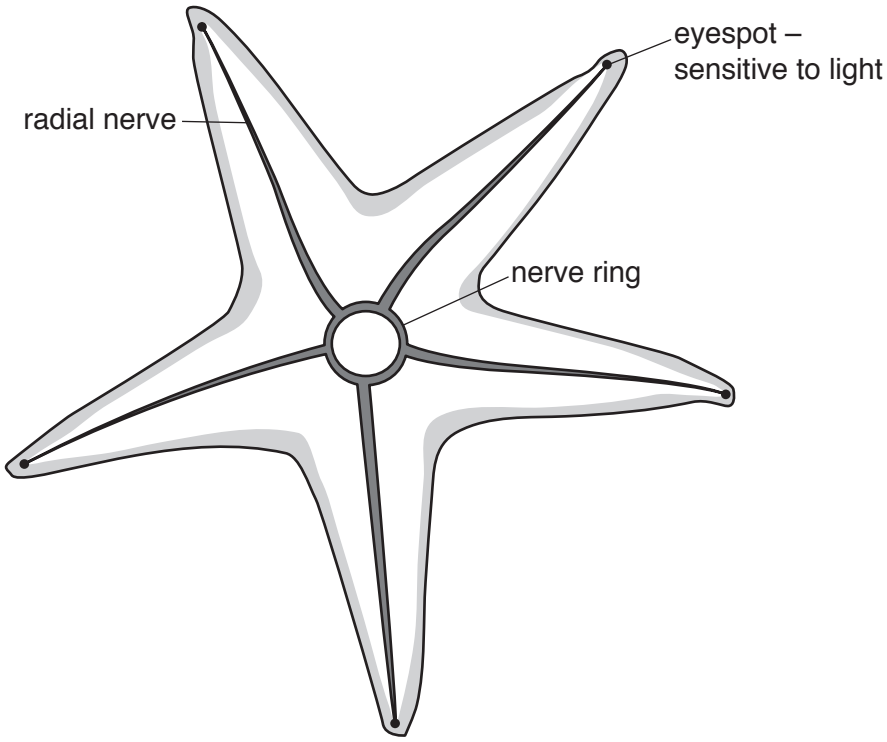
Put a tick (✓) in the box next to the correct answer.

cellulose	☐
glucose	☐
nitrate	☐
protein	☐
starch	☐

[1]

[Total: 15]

4 The diagram below shows the structure of the nervous system of a starfish.



Describe the structure of the human nervous system and compare it to the nervous system of the starfish. You should include similarities and differences in your answer.

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

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..... **[6]**

[Total: 6]

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5 Cystic fibrosis is a disease caused by a DNA mutation.

In a mutation the order of the bases in a gene changes.

This mutation leads to the production of a faulty protein.

(a) Describe the structure of DNA and explain how a change in the order of the bases in a gene can lead to the production of a faulty protein.

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

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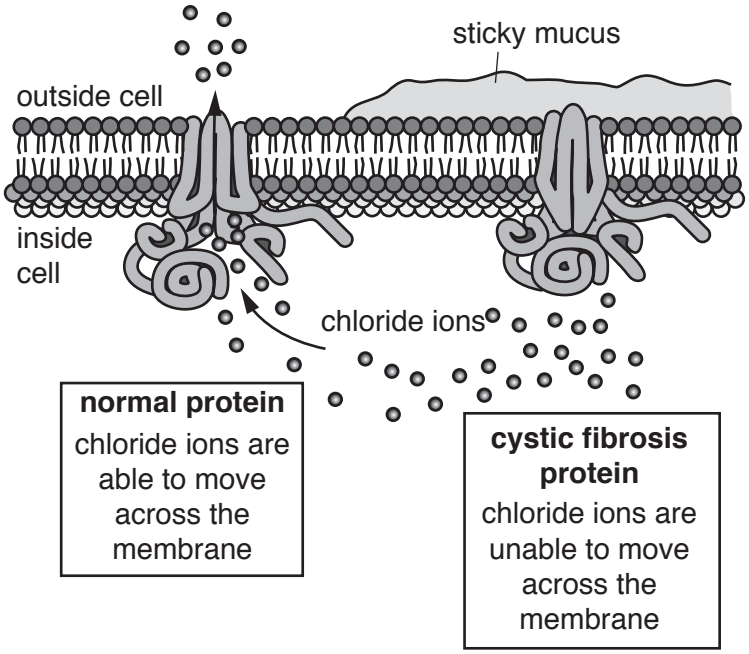
..... **[6]**

(b) The DNA mutation which causes cystic fibrosis changes the 3-D shape of a protein responsible for transporting chloride ions.

This change stops the protein transporting chloride ions into the mucus of the affected person.

This is shown in the diagram below.



Using the diagram and your knowledge of osmosis explain why the mucus in a cystic fibrosis patient is stickier than in a person without cystic fibrosis.

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

(c) **(i)** There are 250 000 DNA bases that make up the cystic fibrosis gene.

In the most common mutation three DNA bases are removed.

Calculate the percentage of bases removed from the gene in this mutation.

Show your working.

percentage = ... % **[2]**

(ii) There are over a thousand different mutations that cause cystic fibrosis.

90% of cystic fibrosis patients have one type of mutation.

In the UK there are approximately 10 000 cystic fibrosis patients.

How many patients would you expect to have this mutation?

Show your working.

number of patients = ... **[1]**

(d) One way to diagnose cystic fibrosis (CF) is to conduct a sweat test.

People with cystic fibrosis have more chloride in their sweat than people without cystic fibrosis.

In this test the levels of chloride are measured.

Age	Chloride level mmol/L	Result
Infants and up to 6 months	= or < 29	negative – unlikely to have CF
	30–59	intermediate – could have CF
	> or = 60	positive – likely to have CF
Older than 6 months	= or < 39	negative – unlikely to have CF
	40–59	intermediate – could have CF
	> or = 60	positive – likely to have CF

(i) Thomas takes his 5 month old baby for a test.

The baby's chloride level is measured and the result is 29 mmol/L.

Use the information in the table to explain what this result means.

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..... **[1]**

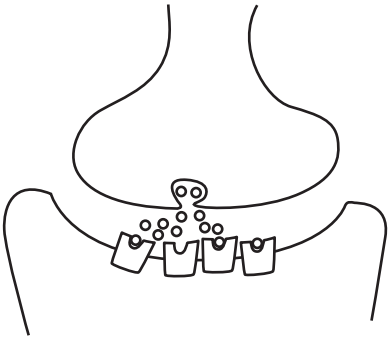
(ii) Suggest what doctors would do if the result of the test was classed as intermediate.

.....

..... **[1]**

[Total: 13]

6 The diagram below shows a synapse.



Ecstasy (MDMA) has an effect on synaptic transmission.

The statements **A**, **B**, **C**, **D** and **E** describe how ecstasy has an effect on synaptic transmission. The statements are not in the correct order.

A Impulses arrive at the first neuron and serotonin is released.

B Serotonin remains bound to the receptors.

C Ecstasy blocks the serotonin reuptake channels.

D This increases the number of electrical impulses transmitted in the second neuron.

E There is an increase in the amount of serotonin in the gap between the two neurons.

(a) Put the statements **A**, **B**, **C**, **D** and **E** in the correct order.

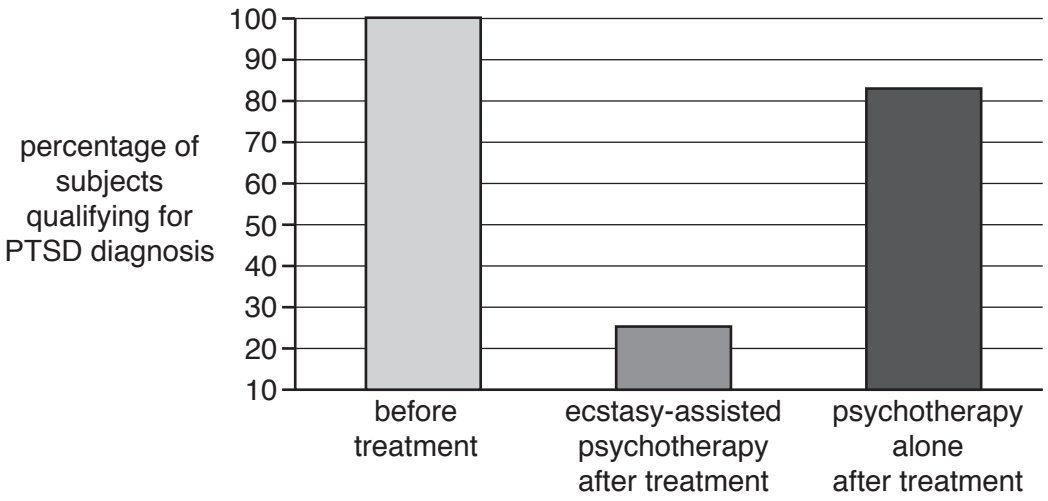
The first one has been done for you.

C				

[3]

(b) In the USA trials have been conducted on the use of ecstasy to treat patients with Post Traumatic Stress Disorder (PTSD).

The graph below shows the results of one trial.



(i) What conclusion can be made from this data?

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..... **[1]**

(ii) The results of this study were published in the Journal of Psychopharmacology.

Scientists can be sceptical about claims made about new findings.

What would make scientists more confident about the findings of this trial?

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

[Total: 6]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).