

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
BIOLOGY A**

A223/02

Unit 3: Ideas in Context plus B7
(Higher Tier)

**Friday 12 June 2009
Morning**

Duration: 1 hour

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:

- Insert (inserted)

Other Materials Required:

- Pencil
- Ruler (cm/mm)




Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- 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 **55**.
-  Where you see this icon you will be awarded a mark for the quality of written communication in your answer.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Look at the article '**Wide hips increase risk of breast cancer**'.

Use the information to answer the questions.

- (a)** Before this study, scientists had already discovered that high levels of oestrogen could increase the risk of breast cancer.

How did they discover this?

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

- (b)** Scientists call wide hips a **risk factor** for developing breast cancer.

Explain what is meant by a risk factor.

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

- (c)** The study used data from more than 6000 women.

Why did the study use such a large number of women?

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

- (d)** The research used data from a previous study using a synthetic hormone.

The scientists' research was published in a scientific journal.

Before the magazine agreed to publish the research it was **peer reviewed**.

Explain what is meant by peer review and why scientists regard it as important.

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

3

- (e) Suggest how this research can be used to reduce the risk of breast cancer in future generations.

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

- (f) The risk factor of wide hips, which is linked to breast cancer, could be passed from one generation to the next.

Use scientific ideas to explain what this means.

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

- (g) David reads the research article. He thinks that the article concludes that wide hips in a mother cause breast cancer in her children.

Is David's conclusion correct?

Explain your answer.

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

[Total: 12]

4

- 2 Energy is transferred between living organisms in a food web.

Explain how this process happens.

Use the following terms in your answer.

autotrophs chemical energy heterotrophs Sun

.....

.....

.....

..... [2]

[Total: 2]

- 3 Rachael wants to find the percentage (%) of biomass in a soil sample.

This is the data she collected.

	mass in g
soil sample	150
soil after drying at 80°C	140
soil after heating at 200°C	110

Calculate the percentage biomass in Rachael's soil sample of 150 g.

Show your working.

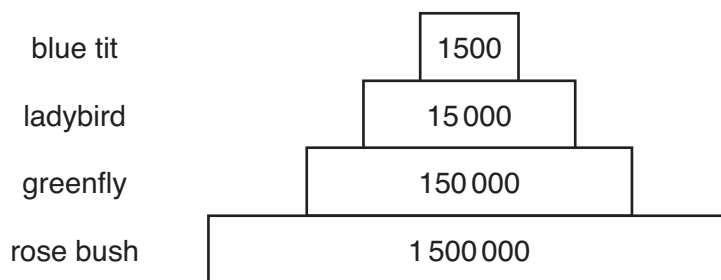
..... % [2]

[Total: 2]

5

- 4 Neil collects data about the feeding of different organisms.

He draws a diagram to show the energy in joules at each stage of a food chain.



- (a) What is the percentage of energy transferred at each stage of the food chain?

..... % [1]

- (b) The percentage of energy transferred is not 100%.

Explain why.

.....

 [2]

- (c) Food chains and pyramids rarely have more than four stages.

Explain why.

.....

 [1]

[Total: 4]

6

5 Plants produce food by the process of photosynthesis.

(a) Complete the **word** equation to show this process.

..... + $\xrightarrow{\text{light}}$ + [2]

(b) The rate of photosynthesis can be limited.

Which of the following pairs of factors may limit the rate of photosynthesis?

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

glucose and oxygen ☐

temperature and carbon dioxide ☐

light and oxygen ☐

oxygen and temperature ☐

carbon dioxide and light ☐

glucose and temperature ☐

light and glucose ☐

[2]

(c) The energy transferred by photosynthesis is released in respiration.

This energy can be used by plants to make polymers.

(i) Name a polymer that a plant can make from just glucose.

..... [1]

(ii) Name a polymer that can be made from amino acids.

..... [1]

[Total: 6]

6 This question is about sickle-cell anaemia.

(a) Describe what happens in sickle-cell anaemia by completing the following sentences.

People with sickle-cell anaemia have a faulty allele which can cause
their cells to become sickle shaped.

Not all people with this allele show the serious symptoms of sickle-cell anaemia. This is
because the allele is [1]

(b) The table shows some different genotypes.

description	genotype
healthy person	HH
carrier of sickle-cell anaemia	Hh
person with sickle-cell anaemia	hh

Write down the genotype that **does not** give some protection from malaria.

..... [1]

(c) The frequency of the sickle-cell allele is greater in some populations than others.

Explain why.

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

[Total: 4]

8

7 This question is about new technologies.

(a) The diagram shows the structure of a bacterium.

Complete the labels.



[2]

(b) Bacteria can be genetically modified.

Describe the main stages in the process of genetic modification.

Use the following words in your explanation.

isolated

transferred

vector

.....

.....

.....

.....

[3]

(c) Plants can be genetically modified.

Some genetically modified plants have been released into the environment.

There are implications for releasing genetically modified organisms into the environment.

Some of the implications are **economic**, some are **social** and some are **ethical**.

Look at the following statement.

- Some people think that we should not alter an organism's DNA under any circumstances.

Which of these three implications applies to this statement?

Explain your answer.

.....

.....

..... [2]

[Total: 7]

10

- 8** Energy released during aerobic respiration is used to make a chemical called ATP which is used by our muscles.

(a) Which of the following statements about ATP are true?

Put ticks (✓) in the boxes next to the correct answers.

ATP contains a readily available supply of energy for our muscles.

☐

Surplus energy from respiration is transferred to ATP as a long term energy store.

☐

Energy from ATP causes muscle tissue to contract.

☐

ATP is converted to lactic acid during anaerobic respiration.

☐

During respiration more ATP is used than is released.

☐

[2]

(b) Muscles can also use anaerobic respiration.

Complete the word equation for anaerobic respiration in muscle cells.

..... → + energy

[2]

11

(c) Anaerobic respiration is an example of a biochemical process.

Draw a straight line to join each **biochemical process** with its correct statement in **column A** and its correct statement in **column B**.

column A	biochemical process	column B
uses light energy to make glucose	aerobic respiration	releases a small amount of energy per glucose molecule
does not involve carbon dioxide	photosynthesis	releases energy during rest
releases a large amount of energy per glucose molecule	anaerobic respiration in muscles	does not take place in muscles

[4]

(d) Anaerobic respiration results in an oxygen debt.

Describe what is meant by oxygen debt.



One mark is for a clear, ordered answer.

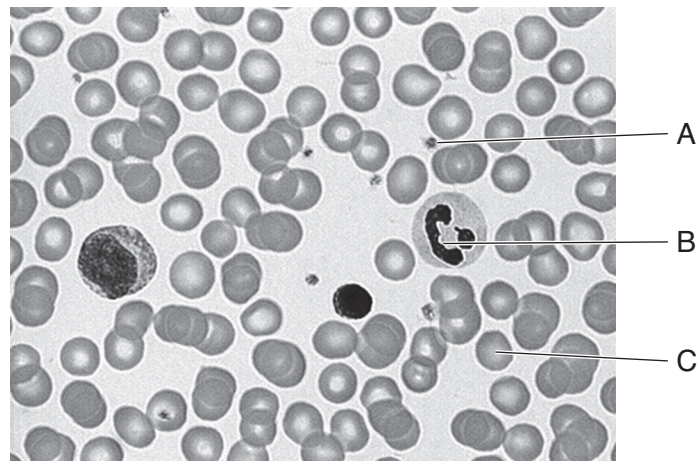
.....

.....

..... [2 + 1]

[Total: 11]

9 Look at the picture of human blood.



(a) Complete the table.

	name of component	function of component
A		
B		
C		

[3]

(b) Nina's blood group is AB.

Five different students were asked to explain what this means.

These are their answers. Some are correct and some are not.

Nina has ...

... AB antibodies on her red blood cells.
... no AB antibodies in her plasma.
... AB antigens in her plasma.
... no AB antigens on her red blood cells.
... AB antigens on her red blood cells.

Use the answers to help you explain what being blood group AB means.

.....
 [2]

[Total: 5]

10 Ann sprains her elbow.

After Ann was treated in hospital she starts physiotherapy.

The physiotherapist takes measurements to assess Ann's progress.

What factors need to be taken into account when analysing these measurements?

.....

.....

..... [2]

[Total: 2]

END OF QUESTION PAPER

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