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**Tuesday 18 June 2013 – Morning**

**GCSE TWENTY FIRST CENTURY SCIENCE  
BIOLOGY A**

**A163/01** Module B7 (Foundation Tier)

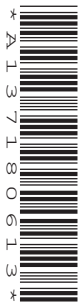
Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**Duration: 1 hour**

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**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 The skeleton and muscles are parts of the human body.

(a) Draw a straight line from each **definition** to the correct **word**.

**definition**

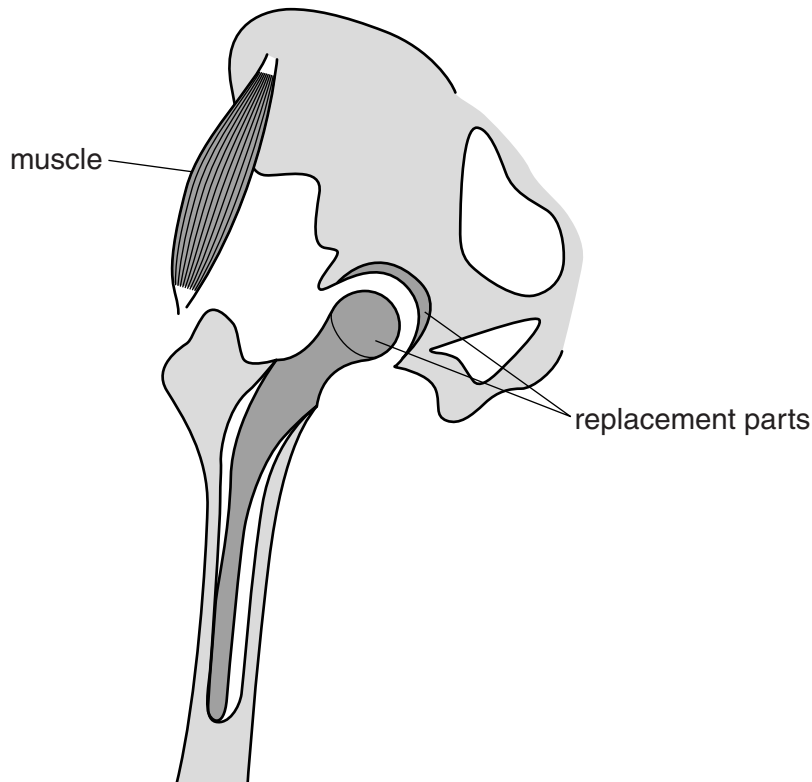
**word**

- what muscles do to move a joint
- a pair of muscles working in opposite directions
- what the skeleton does to keep the body upright

- antagonistic
- support
- contract
- relax
- protect

[3]

(b) The diagram shows an artificial hip joint. It has replaced a damaged hip joint.



Draw the following structures on the diagram in the position that they would appear on an undamaged joint. Label each structure that you draw.

- cartilage
- ligament
- tendon

[3]

- (c) There are different types of replacement hip joints.  
Look at the table of data.

Type		Average rate at which the socket lining wears in mm per year	Additional information
1	metal ball and metal socket	0.01	Metal ions diffuse into the blood and increase over time. There is no data to show whether these metal ions are safe or harmful. However they have been used for a long time and have proved to work well.
2	ceramic ball and ceramic socket	0.0001	Ceramic is smoother than any of the other materials. In early versions the ceramic sometimes cracked but newer versions have proved to be much more reliable.
3	metal ball and plastic socket	0.1	Metal ions diffuse into the blood and increase over time. There is no data to show whether these metal ions are safe or harmful. However they have been used for a long time and have proved to work well.
4	Ceramic ball and plastic socket	0.05	Ceramic is smoother than any of the other materials. In early versions the ceramic sometimes cracked but newer versions have proved to be much more reliable.

- (i) If a plastic socket lining on a **type 4** hip is 1 mm thick, how long is the joint likely to last before it wears out?  
Show your working.

.....

[2]

- (ii) Stephen is eighteen years old.  
He needs a hip replacement.  
His doctor advises him to have a ceramic ball and a ceramic socket.  
Use data from the table to suggest why.

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

- (iii) The rate at which the socket lining wears (wear rate) depends upon a number of factors. One of these factors is the material that the joint is made from. Suggest **two other** factors that could affect the wear rate.

.....

.....

.....

..... [2]

- (iv) Nothing is completely safe. Suggest why this type of hip replacement cannot be guaranteed to be 100% safe.

.....

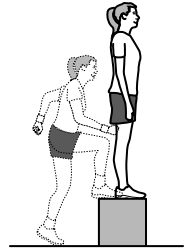
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..... [1]

[Total: 13]

2 Jarinder wants to measure her fitness. She does a fitness test.

- (a) She steps up and down on a box every two seconds for five minutes. She then waits one minute after finishing the test and takes her pulse rate. After a further one and two minutes she takes her pulse rate again.



These are her results.

	Pulse rate in beats per minute
1 minute after finishing test	114
2 minutes after finishing test	102
3 minutes after finishing test	90

Use this formula for calculating Jarinder’s fitness number.

$$\text{fitness number} = \frac{30\,000}{2 \times (\text{pulse rate 1} + \text{pulse rate 2} + \text{pulse rate 3})}$$

Show your working.

fitness number = .....

[3]

- (b) The table shows how a person’s fitness number relates to their actual fitness.

Use this table to determine Jarinder’s actual fitness.

Gender	Fitness				
	Excellent	Above average	Average	Below average	Poor
Male	more than 90	80–90	65–79	55–64	less than 55
Female	more than 86	76–86	61–75	50–60	less than 50

Jarinder’s fitness is .....

[1]

- (c) Obtaining the fitness number and using the table may not precisely show how fit Jarinder is. Suggest reasons why.

.....

.....

..... [2]

[Total: 6]



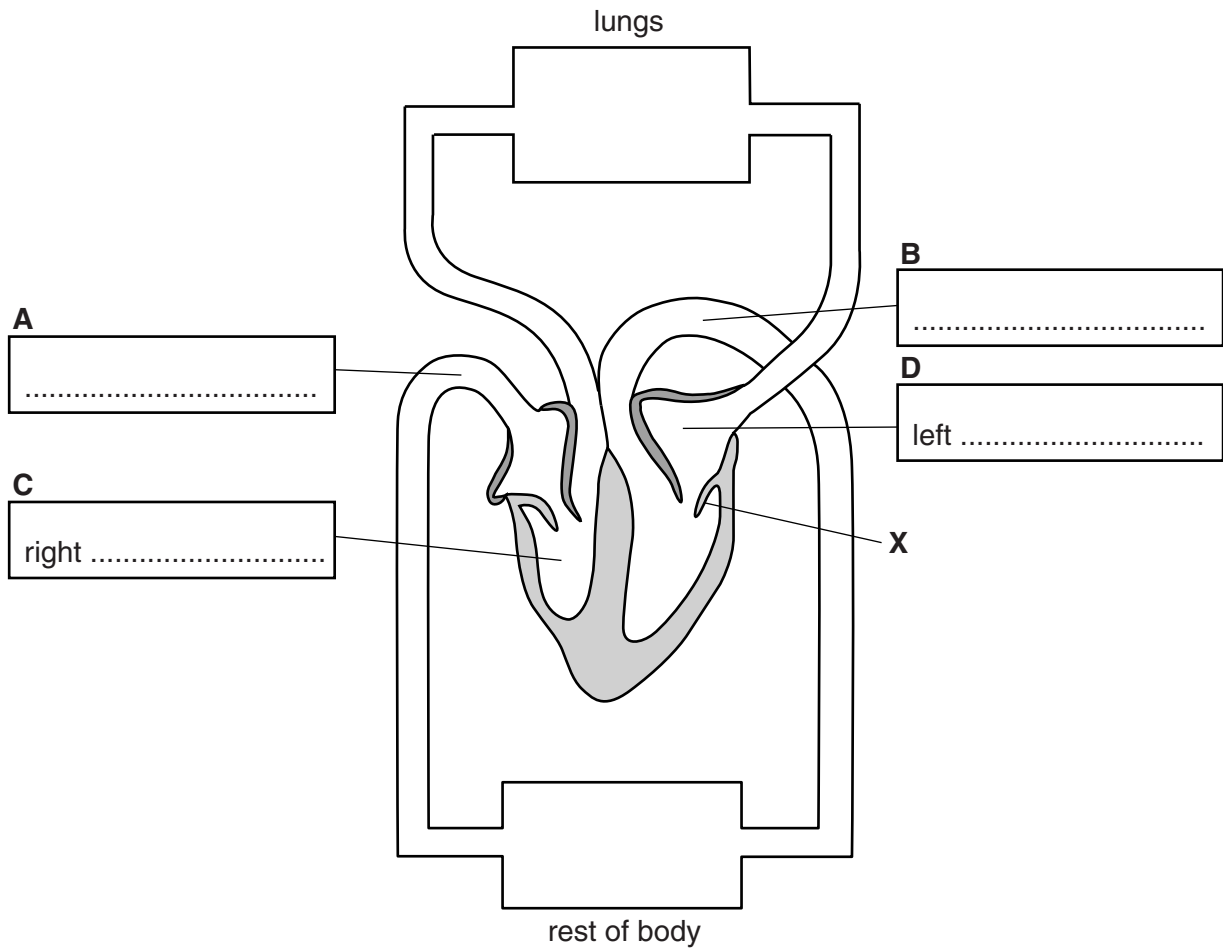
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4 The heart and blood vessels are adapted to the job that they do.

(a) Complete the diagram of the blood system by writing the correct labels in the boxes **A**, **B**, **C** and **D**.



[2]

(b) Draw an arrow in the box labelled **lungs** and the box labelled **rest of body** to show the direction of blood flow. [1]

(c) What type of structure is **X** and what is its job?

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

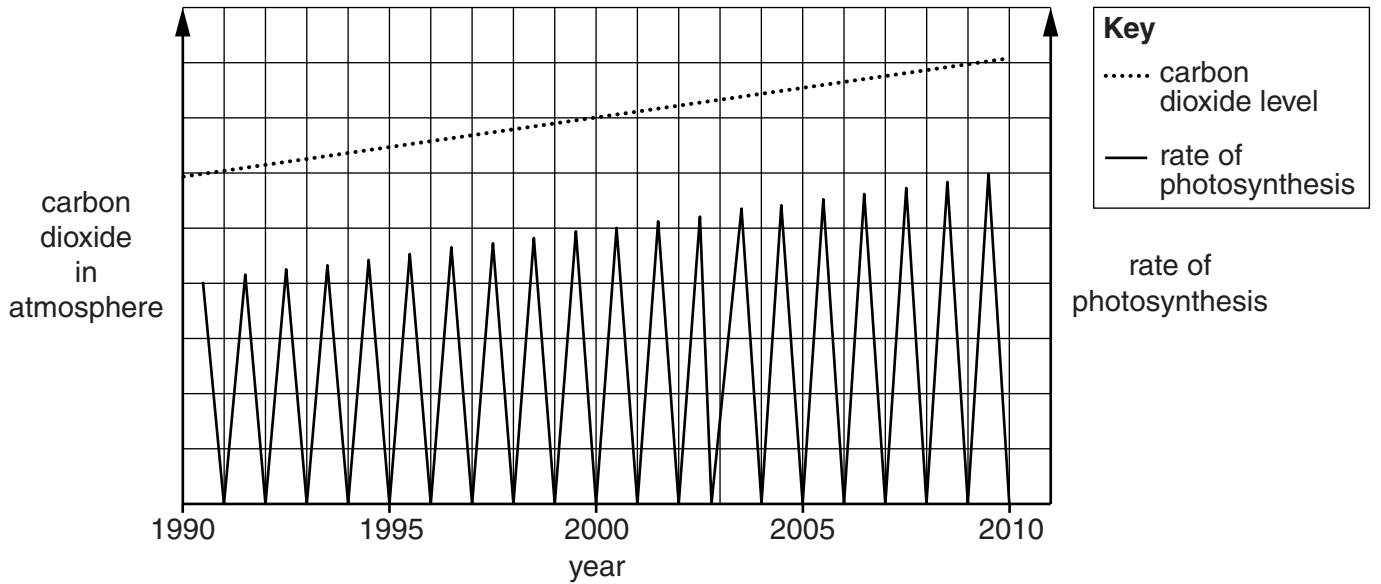
[Total: 5]



6 Scientists study the effect of increasing levels of atmospheric carbon dioxide on an ecosystem.

(a) They measure carbon dioxide levels in the atmosphere and the rate of photosynthesis in plants over a twenty-year period.

Look at the graph.



(i) The graph shows a correlation.  
Name the **factor** and the **outcome** in this correlation.

factor .....

outcome .....

[2]

(ii) A student thinks that the graph shows evidence that the ecosystem being studied is a closed loop system.

Use data from the graph to explain why the student is wrong.

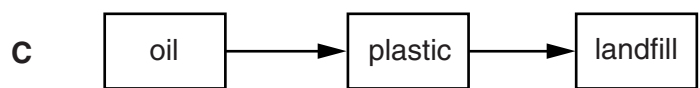
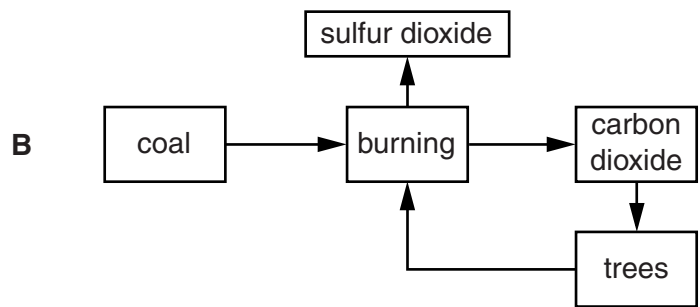
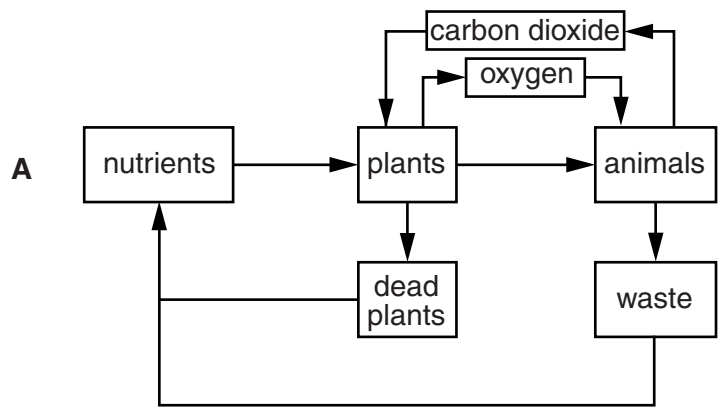
.....  
 .....  
 ..... [1]

(iii) All the following statements are true.  
 Which two statements explain why the rate of photosynthesis varies more than the levels of carbon dioxide?  
 Put ticks (✓) in the boxes next to the **two** statements that explain this.

- Plants release oxygen and animals release carbon dioxide.
- Deforestation reduces the amount of photosynthesis.
- Photosynthesis stops during winter months.
- Animals cannot photosynthesise.
- The amount of carbon dioxide in the air is much larger than the amount used in photosynthesis.

[2]

(b) Look at the three diagrams.



(i) Which diagram, **A**, **B**, or **C**, best shows a closed loop system?

..... [1]

(ii) Which statement describes a closed loop system?  
Put a tick (✓) in the box next to the correct answer.

There is no waste because the output from one part of the system becomes the input for another part of the system.

The waste output is always greater than the input.

There is no waste because the output from one part of the system is less than the input to another part of the system.

The waste output is always less than the input.

There is no waste because output from one part of the system is greater than the input to another part of the system.

[1]

(c) In a stable ecosystem such as a rainforest, vegetation is important in maintaining stability. How does vegetation help to keep an ecosystem stable?  
Put ticks (✓) in the boxes next to the **three** correct answers.

prevents soil erosion

reduces productivity

promotes cloud formation

produces large numbers of fruits

produces new species

only photosynthesises during the daytime

prevents extremes of temperature

[2]

[Total: 9]



8 It is important in science to understand scale. Nanotechnology involves using structures that are about the same size as small molecules.

(a) Look at the list.

- 1 cells
- 2 DNA
- 3 nucleus
- 4 nanotechnology structures
- 5 human
- 6 heart

Write the list in the correct order starting with the smallest structure and ending with the largest structure.

The first one has been done for you.

4 ..... [2]

(b) The structures used in nanotechnology are smaller than 100 nanometres in size. A nanometre is one thousand millionth of a metre. Put a ring around the correct size for a nanometre.

0.001 m

0.000 001 m

0.000 000 001 m

0.000 000 000 001 m

0.000 000 000 000 001 m

[1]

(c) It is possible to see structures as small as 100 000 nm with the naked eye. A light microscope can be used to see structures as small as 2000 nm. To see structures smaller than that, an electron microscope is used.

A typical human cheek cell is 20 000 nm in diameter.

A virus is about 20 times smaller.

What device could be used to see a virus?

Explain your answer.

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

(d) Read the article about ‘smelly socks’ and nanoparticles.

**No more smelly socks**

Scientists have developed socks that no longer smell after they have been worn. The socks are impregnated with silver nanoparticles that kill the bacteria that cause socks to smell.

A scientist said “One problem is that silver nanoparticles may be dangerous if released into the environment. We just do not know enough yet about nanoparticles.”

When the socks are washed, 10% of the silver nanoparticles are released into the washing water.

(i) Explain, using the example of the ‘smelly socks’, why this use of nanotechnology may not be completely safe.

.....

.....

..... [2]

(ii) Using the example of the ‘smelly socks’, suggest how scientists could reduce the risk in this case.

.....

..... [1]

(e) Some people think that goods containing nanoparticles should be labelled. This could help people decide whether or not to buy the goods. A nanoparticle is defined as a particle smaller than 100nm in size. Suggest why this definition may not be very useful when deciding whether or not to label goods containing nanoparticles.

.....

.....

..... [1]

[Total: 9]

**END OF QUESTION PAPER**



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