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Wednesday 1 November 2017 – Afternoon

GCSE TWENTY FIRST CENTURY SCIENCE BIOLOGY A/SCIENCE A

A161/01 Modules B1 B2 B3 (Foundation 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



Candidate forename	Candidate	
lorename	Sumamo	

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 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 **16** pages. Any blank pages are indicated.

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PLEASE DO NOT WRITE ON THIS PAGE

Answer all the questions.

1 Sandra investigates human characteristics.

Many characteristics are controlled by genes.

(a) Look at the statements about genes.

Put ticks (\checkmark) in the boxes next to the **two** correct statements.

Genes are ...

- ... proteins that describe how to make DNA.
- ... sections of very long DNA molecules.
- ... instructions that describe how to make proteins.
- ... the cells that join together at fertilisation.
- ... enzymes found in the nucleus of cells.
- (b) Sandra knows that dimples are a characteristic controlled by a dominant allele.

Sandra does not have dimples but both Sandra's parents do.

Complete the genetic diagram to show how this is possible.

Label Sandra on your diagram.

Use **D** to represent the dominant allele and **d** to represent the recessive allele.

	Sandra's	s mother
	D	d
Sandra's	 	
father	 	



[3]

(c) Sandra looks at each student in her science class.

She records whether or not they have dimples.

She plots her results on a graph.



(i) Calculate the ratio of dimples to no dimples.

Show your working.

ratio[2]

(ii) Which two statements, when taken together, could explain the ratio you calculated in (c)(i)?

Put ticks (\checkmark) in the boxes next to the **two** correct statements.

Most of the parents of the students have dimples.	
There are more boys than girls in Sandra's class.	
It is an advantage not to have dimples.	
There must be identical twins in Sandra's class.	
Dimples are controlled by a dominant allele.	

[1]

[Total: 8]

Some genetic disorders are caused by faulty alleles of a single gene.
Two of these disorders are Huntington's disease and cystic fibrosis.
The symptoms and the way these two disorders are inherited are different.

Describe these differences.

You can include genetic diagrams in your answer. Write a key to explain the symbols you use.

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

	[6]
[Tot	al: 6]

3 Read the newspaper article.

Stem cell therapy causes tumours

Four years ago, embryonic stem cells were injected into a boy's brain and spinal cord to treat him for a genetic disorder.

The boy now has tumours (growths) in his brain and spinal cord.

Doctors think that the tumours may have grown from the stem cells.

They have tested the tumours and they are **not** cancerous.

Some people think that stem cell therapy is unethical.

(a) What are stem cells?

.....[1]

(b) The table contains statements about the use of stem cells.

Put one tick (\checkmark) in the correct box in each row.

One has been done for you.

Statement	Arguments for the use of stem cells	Arguments against the use of stem cells	Arguments neither for nor against the use of stem cells
It is unethical to use embryonic stem cells.		\$	
The boy has tumours in his brain and spinal cord.			
Stem cells have the potential to treat serious diseases.			
The stem cells were injected into the brain.			

(c) William reads the article and thinks that the title 'Stem cell therapy causes tumours' is misleading.

Suggest why William thinks this.

[Total: 6]

Turn over for the next question

4 Whooping cough is an infectious disease caused by bacteria.

The infection can lead to pneumonia, brain damage and sometimes death.

Since 1957, babies have been vaccinated against whooping cough in the UK.

The vaccination is given when the babies are 8 weeks old.

(a) The statements A, B, C and D describe how the vaccination works.

The statements are in the wrong order.

- **A** Antibodies recognise the antigens on the surface of the microorganism.
- **B** The vaccine containing a safe form of the disease-causing microorganism is injected into the baby.
- **C** Memory cells produce antibodies quickly when the baby is reinfected.
- **D** The body produces memory cells.

Put the statements in the correct order.

One has been done for you.



[2]

(b) The graph shows the number of cases of whooping cough in England and Wales between January 2011 and August 2012.



(i) Put ticks (\checkmark) in the boxes next to the **two** correct statements about the graph.

[2]

(ii) Rory looks at the graph. He predicts that, by the end of 2012, there will be over 2000 cases of whooping cough in England and Wales.

On the graph show how Rory made this prediction.

(c) In October 2012, the whooping cough vaccine was offered to all pregnant women in the UK.

Discuss the factors that should be considered before the introduction of this vaccine for pregnant women.

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

- (d) Whooping cough, and other diseases caused by bacteria, can be treated by antibiotics.Over the years antibiotics have become less effective.
 - (i) Suggest what has happened to the bacteria to make the antibiotics less effective.

.....[1]

(ii) It is important that we try to stop antibiotics becoming less effective.

Suggest two precautions that we can take to stop this happening.

[Total: 14]

- 5 Automatic control systems in the body maintain water levels.
 - (a) Put a (ring) around the body organ that controls water balance.

heart

lung

kidney

stomach

liver

(b) The table shows the water loss from Lucy's body on Monday.

Method of water loss	Water loss in cm ³
breathing	400
sweating	600
urine	1500
faeces	100

(i) Estimate the total volume of water that Lucy **took into** her body on Monday.

Show your working and explain your answer.

volume of water	cm ³
explanation	
	[2]

(ii) On Tuesday, Lucy has exactly the same to eat and drink, but she plays tennis after work.

Predict whether the water loss data would **increase**, **decrease** or **stay the same** when comparing Tuesday with Monday.

Put one tick (\checkmark) on each row to show your predictions.

	Increase	Decrease	Stay the same
breathing			
sweating			
urine			

(iii) On Wednesday, Lucy goes to a party after work. She drinks two glasses of wine.

Suggest what effect drinking this alcohol would have on the urine that Lucy produces.

[1] [Total: 6] 6 In 2010, 'killer shrimps' were discovered in Grafham Water in Cambridgeshire.



Here are some features of the 'killer shrimp'.

- A It has powerful mouth parts.
- B It has a very fast reproductive rate.
- C It has two cone-shaped structures on its tail.
- D It has stripes on its back.
- E It can survive in sea water.
- (a) Which of the features, A, B, C, D or E, provides the best evidence for:
 - (i) why the 'killer shrimp' is a vicious predator?

.....

(ii) how the 'killer shrimp' is believed to have moved to the UK from Europe?

.....

(iii) why the 'killer shrimp' is outcompeting the native shrimp?

.....

- (b) Scientists are worried that the 'killer shrimp' will affect the biodiversity of lakes and reservoirs in the UK.
 - (i) Write down what is meant by **biodiversity**.

[1]

(ii) Suggest and explain how the presence of the 'killer shrimp' might affect biodiversity.

......[2]

[Total: 6] Turn over

[1]

[1]

[1]

7 In 1859, Darwin published his theory of natural selection in the book, 'On the Origin of Species'. This theory explained the process of evolution.

Suggest why Darwin's theory was not accepted by many people in 1859 and why it is much more widely accepted now.

[6] [Total: 6] 8 Look at the following food chain.

It shows the energy transferred from each organism to the next and to the environment.



(a) (i) Calculate how much energy is transferred from the grasshopper to the toad. Show your working.

energy transferred......kJ [1]

(ii) The amount of energy transferred from each organism to the next changes along the food chain.

Describe how the amount of energy transferred changes **and** explain why.

[3]

(b) Malcolm calculates the percentage efficiency of energy transfer between the grass and the grasshopper as 10%.

Use data from the food chain to show how Malcolm worked out this value.

(c) The diagram shows the energy transferred from the food chain to the environment.

Describe how this energy can be made available to other food chains.

......[2]

[Total: 8]

END OF QUESTION PAPER



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