OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

A161/02

TWENTY FIRST CENTURY SCIENCE BIOLOGY A/SCIENCE A

Modules B1 B2 B3 (Higher Tier)

Tuesday 12 May 2015: Afternoon

DURATION: 1 hour plus your additional time allowance

MODIFIED ENLARGED 24pt

Candidate forename		Candidate surname	

Centre number						Candidate number				

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)

READ INSTRUCTIONS OVERLEAF

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INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. 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).

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.

Any blank pages are indicated.

BLANK PAGE

Answer ALL the questions.

1 Harold has cystic fibrosis.

Hilda is a carrier for the disease.

(a) (i) Write down Harold and Hilda's genotypes.

Use F to represent the dominant allele and f to represent the recessive allele.

Harold's genotype: _____

Hilda's genotype: _____

[1]

(ii) Which row in the table correctly describes Harold and Hilda's genotypes?

Put a tick (✓) in the box at the end of the correct row.

HAROLD	HILDA	
heterozygous	homozygous dominant	
heterozygous	homozygous recessive	
homozygous dominant	heterozygous	
homozygous dominant	homozygous recessive	
homozygous recessive	homozygous dominant	
homozygous recessive	heterozygous	

[1]

(b) Hilda is pregnant.

Harold is the father of the unborn baby.

Harold thinks that, because he has cystic fibrosis, the baby will definitely have cystic fibrosis.

Explain why Harold is NOT correct.

_____

_____

_____ [2]

(c) Harold and Hilda are offered the chance to have a genetic test on their fetus before it is born.

Many people have concerns about the genetic testing of fetuses.

Describe THREE of these concerns.

1 _____

_____

2 _____

_____

3 _____

_____ [3]

[TOTAL: 7]

2 **Cathy is pregnant with triplets.**

All three babies have the same father.

When the babies are born, two of the babies, A and B, are genetically identical to each other.

The third baby, C, is genetically different.

Explain why babies A and B are genetically identical and why baby C is not genetically identical to babies A and B.

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

[6]

[TOTAL: 6]

3 **Blood vessels are tubes that carry blood.**

The diagram shows cross-sections through blood vessels A and B.

(a) (i) **The diameter of the lumen of blood vessel A is 1 cm in real-life.**

Calculate the cross-sectional area of the LUMEN of blood vessel A.

Use the formula, area = πr^2 (where π is 3.14).

Show your working. Give your answer to two decimal places.

cross-sectional area of A = _____ cm^2 [2]

(ii) The cross-sectional area of the lumen of blood vessel B is approximately 1.40 cm^2

Explain the reason for the difference between the cross-sectional area of the lumens of the two blood vessels.

_____

_____

_____

_____ [2]

(b) Leo is 40 years old. He is in hospital recovering from a heart attack.

His brother, Samson, is 64 years old. He has never had a heart attack.

Explain what causes a heart attack and suggest reasons why Leo has had a heart attack but his much older brother has not. [6]

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

_____

_____

_____

_____

_____

_____

(c) (i) **A doctor can prescribe drugs to treat heart disease.**

It is now possible to genetically test people before prescribing drugs.

What are the benefits of this type of genetic testing?

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

Each drug works in the same way in every person.	☐
Less money is wasted prescribing drugs that don't work.	☐
Doctors don't have to learn about so many drugs.	☐
People won't have to visit the doctor any more.	☐
The drugs will always cure the patient from the disease.	☐
It may reduce the number of people who suffer dangerous side effects.	☐
The doctor can adjust the dose of the drug to suit the patient.	☐

[3]

(ii) Some people believe that this type of genetic testing should be compulsory for everyone.

Which of the following are ETHICAL reasons why people might object to compulsory testing?

Put ticks (✓) in the boxes next to the TWO best ETHICAL reasons.

Some people might be discriminated against when the test result is known.	☐
Some people might find the test painful.	☐
It will cost too much money to test everyone.	☐
The results of the test might be inaccurate.	☐
Everyone should have the right to choose whether they are tested or not.	☐

[2]

(d) Some drugs needs to be converted into other molecules in the body before they will work effectively.

This conversion is done by the body's own enzymes.

Suggest why your genes might influence how drugs work in the body.

_____

_____

_____

_____ [3]

[TOTAL: 18]

4 **Measles is a very infectious and potentially deadly disease.**

It is caused by a virus.

(a) The graph shows the number of measles cases reported in South Wales between October 2012 and April 2013.

(i) Calculate the percentage increase in reported cases of measles in South Wales between February and April 2013.

Show your working.

_____ **% [2]**

(ii) This data is causing concern to doctors.

Explain why.

_____

_____

_____

_____

_____

_____ **[3]**

(b) The MMR vaccination against measles, mumps and rubella is offered to babies in the UK when they are one year old.

In some years, fewer than 60% of parents in South Wales chose to vaccinate their babies.

Scientists think this may help to explain the shape of the graph in part (a).

Put a tick (✓) in the boxes next to the TWO statements which, when put together, could explain the shape of the graph for people in South Wales.

There is more chance of coming into contact with an infected person.	☐
Measles is a potentially deadly disease.	☐
More people will have the antibodies for measles.	☐
A very high uptake of the MMR vaccine could eradicate measles forever.	☐
There are more people with the measles virus.	☐
Measles can be treated by antibiotics.	☐

[2]

(c) Hilary does not want to have her baby vaccinated against measles.

Hilary says ‘My friend told me that the risks of the MMR vaccination are too high.’

Hilary’s friend has a high perception of risk associated with the MMR vaccine.

Explain why it is important for Hilary to consider the actual risk of the MMR vaccine rather than just listen to her friend.

_____

_____

_____ [2]

[TOTAL: 9]

5 **Sewage (animal waste) from a farm is released directly into a river.**

Five samples of water are tested at each site, A, B, C, D and E.

The number of mayfly nymphs found in each sample is recorded in a table.

Mayfly nymphs are young stages of mayflies.

	Number of mayfly nymphs found in each sample				
Sample	Site A	Site B	Site C	Site D	Site E
1	12	0	0	6	9
2	11	0	2	5	11
3	13	0	1	5	10
4	11	1	1	6	11
5	12	0	0	5	2
mean (rounded to nearest whole number)	12	0	1	5	

(a) Joe calculates the mean number of mayfly nymphs found at site E as 9.

Fred calculates the mean for the same site as 10.

Explain why both answers could be considered to be correct.

_____

_____

_____

_____ [2]

(b) Suggest TWO conclusions that Joe could make from the data in the table.

1 _____

_____

2 _____

_____

[2]

(c) Sewage contains chemicals that can be broken down into nitrates.

Nitrates are found in the soil.

The diagram shows part of the nitrogen cycle.

Use the diagram to explain what is happening at arrows A, B and C. [6]

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

[TOTAL: 10]

6 In 2011, a huge earthquake in Japan caused a radiation leak from a nuclear power station.

Two months later, butterflies were collected from different areas near the power station.

Some of the butterflies had much smaller wings than normal butterflies, and irregular shaped eyes.

Some scientists believe that the radiation caused a random change in the genes of butterflies.

(a) Butterflies collected closer to the power station had more genetic changes than those collected further away.

Scientists start to draw a graph to show their results.

(i) On the graph:

complete the axis label

draw a line to show the relationship between the distance from the nuclear power station and the number of genetic changes. [2]

(ii) The graph does not prove that the radiation leak from the nuclear power station caused the mutations in the butterflies.

Suggest what evidence scientists would need to be more certain of the cause.

_____

_____

_____

_____ [2]

(b) Claire and Matt are discussing the possible mutations in the butterflies four years after the radiation leak.

Claire says 'I think that we are still seeing mutations in the butterflies because the radiation must have caused changes to the butterflies' body cells.'

Matt says 'I disagree. Four years have passed so the mutations must have been in the sex cells of the butterflies.'

Who do you agree with?

Give a reason for your answer.

_____

_____ [1]

[TOTAL: 5]

7 A supermarket is considering how they can make their shopping bags more sustainable.

(a) What is meant by sustainability?

_____

_____

_____ **[2]**

(b) What factors need to be considered when making shopping bags in a sustainable way?

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

- **The size and shape of the bag.** ☐
- **The cost of making the bag.** ☐
- **The materials used to make the bag.** ☐
- **The colour of the bag.** ☐
- **The energy used to make the bag.** ☐
- **The pollution created when the bag is made.** ☐

[2]

(c) Biodegradable bags are more sustainable than standard plastic bags.

It is still better to reduce the use of biodegradable bags.

Which statement best explains why?

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

- Biodegradable bags need energy to be transported to the shops. ☐
- Biodegradable bags don't look as good as standard plastic bags. ☐
- Biodegradable bags need oxygen to break down. ☐
- Biodegradable bags are not expensive to make. ☐

[1]

[TOTAL: 5]

END OF QUESTION PAPER

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