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Oxford Cambridge and RSA

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Tuesday 12 May 2015 – Afternoon

GCSE TWENTY FIRST CENTURY SCIENCE BIOLOGY A/SCIENCE A

A161/01 Modules B1 B2 B3 (Foundation Tier)

2723240652

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

A161 01

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. 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

- 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** the questions.

1 Every person has two alleles for a gene.

These alleles can be dominant or recessive.

(a) Draw **one** straight line from each **pair of alleles** to the **characteristic** that the person would have.

Pair of alleles	Characteristic
two dominant alleles	the dominant characteristic
one dominant and one recessive allele	the recessive characteristic
two recessive alleles	

[2]

(b) Cystic fibrosis and Huntington's disease are genetic disorders.

Each disorder is controlled by one gene with two alleles.

Put **one** tick (✓) in each row to match the symptom with the correct disorder.

Symptom	Cystic fibrosis	Huntington's disease
Chest infections		
Memory loss		
Thick mucus		
Tremor		

[2]

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(c) Harold has cystic fibrosis.

Hilda is a carrier for the disease.

Hilda is pregnant.

Harold is the father of the unborn baby.

Harold draws a Punnett square to work out the probability of the baby having cystic fibrosis.

Harold thinks he may have made some mistakes in his Punnett square.

Key:

F = normal allele
f = cystic fibrosis allele

		Harold	
		f	f
Hilda	F	ff	Ff
	f	ff	FF

(i) Has Harold made mistakes in his Punnett square?

Explain your answer.

.....

.....

.....

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

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(ii) Write down the **correct** probability of Harold and Hilda's baby having cystic fibrosis.

probability = ... **[1]**

[Total: 7]

Turn over for the next question

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2 Poppy is two years old.

Her mother is pregnant with another baby.

The new baby has the same father as Poppy.

However, the new baby will look different to Poppy and to both of her parents.

Explain why.

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

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

[Total: 6]

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3 When a baby is born, stem cells are found in the fluid (amniotic fluid) surrounding it.

Another type of stem cell is found in the embryo itself.

These are called embryonic stem cells.

If a baby is born before it is due, its intestines may not be fully developed.

In the future, it may be possible to treat this problem using stem cells.

Look at the statements **A** to **F**.

A Embryonic stem cells can develop into all types of cells.

B Removal of amniotic fluid is not a difficult procedure.

C Stem cells from the amniotic fluid will not be rejected by the baby.

D It is difficult to store amniotic fluid from every birth just in case it is needed.

E Using stem cells to treat underdeveloped intestines has only been done on rats.

F Removing embryonic stem cells may result in the death of the embryo.

Which **one** of the statements, **A** to **F**, best suggests why it may be …

(a) … more ethical to use amniotic stem cells instead of embryonic stem cells?

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

(b) … easier to obtain stem cells from amniotic fluid than from embryos?

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

(c) … more successful to use the baby's own stem cells than stem cells from a donor?

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

(d) … that embryonic stem cells still have the best potential to treat many different conditions?

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

[Total: 4]

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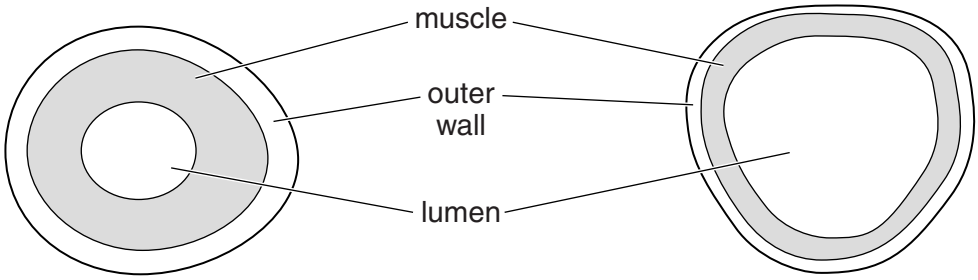
4 Blood vessels are the tubes that carry blood around the body.

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



blood vessel **A** blood vessel **B**

Not to scale

(a) (i) Fred thinks that **A** is an artery and **B** is a vein.

Is Fred correct? Describe the evidence **shown in the diagram** that supports your decision.

.....

.....

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

(ii) Suggest another feature **not shown** in the diagram that would be found in a vein.

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

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(b) (i) Leo is in hospital recovering from a heart attack.

A, **B**, **C** and **D** describe stages in a heart attack.

The stages are not in the correct order.

A The heart muscle is starved of oxygen.

B Fatty deposits build up in blood vessels supplying the heart.

C Cells in the heart muscle die.

D Less blood reaches the heart muscle.

Write the letters **A** to **D** in the boxes to show the correct order.

[2]

(ii) Leo is 40 years old.

This is quite young for someone to have heart disease.

Write about reasons why Leo might have heart disease **at age of 40**.

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

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

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(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]

[Total: 16]

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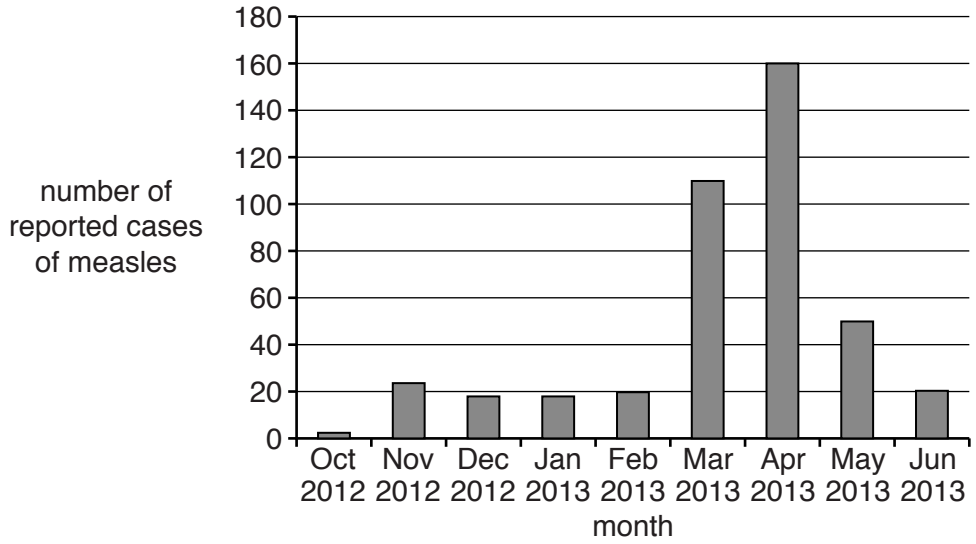
5 Measles is a very infectious and potentially deadly disease.

It is caused by a virus.

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



Describe the **pattern** shown by the data on the graph.

Use figures from the graph in your answer.

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

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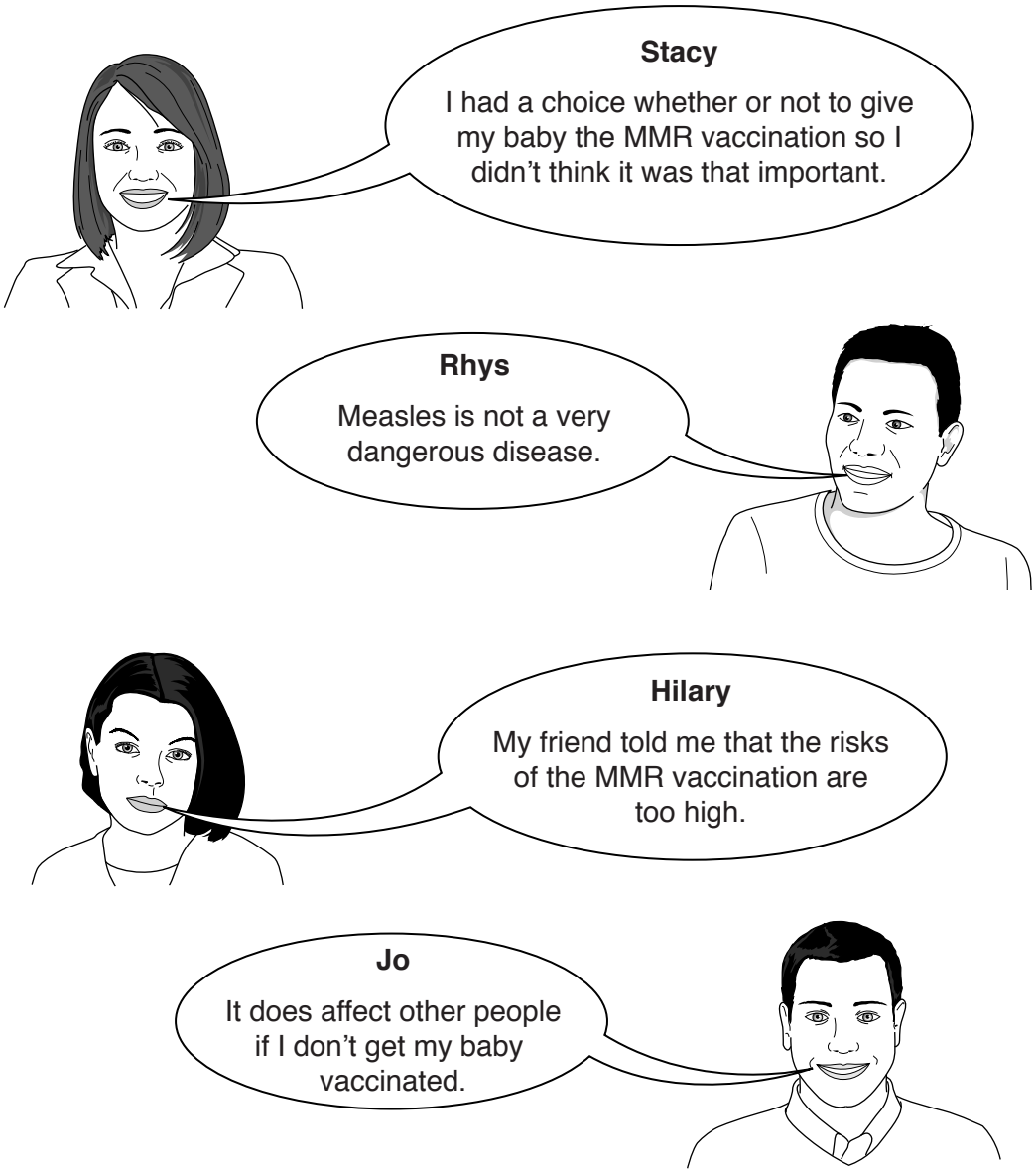
(b) The MMR vaccination against measles, mumps and rubella is offered to babies in the UK when they are one year old.

Some parents do not have their babies vaccinated.

Here are some reasons why.



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(i) Who has properly considered their social responsibilities?

…… **[1]**

(ii) Which person gives a reason why the MMR vaccination should be made compulsory?

…… **[1]**

(iii) Which **two** people have not properly considered the scientific evidence about the dangers of measles?

…… and …… **[1]**

(iv) Hilary is worried that the MMR vaccine is too risky.

Write down **one risk** and **one benefit** to the baby being vaccinated.

risk .....

.....

benefit .....

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

[Total: 8]

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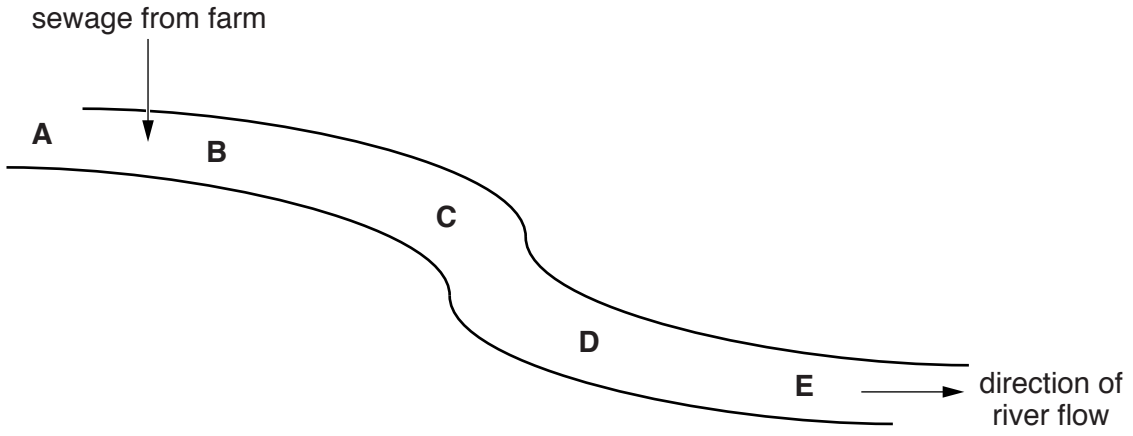
6 Sewage (animal waste) from a farm is released directly into a river.



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	

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(a) (i) One of the results for site **E** is an outlier.

Draw a circle around this result in the table. **[1]**

(ii) Calculate the mean number of mayfly nymphs found at site **E**.

You should ignore the outlier.

Show your working.

mean (average) number of mayfly nymphs = ... **[2]**

(b) Joe makes some conclusions from the data.

Which **two** statements, when taken together, correctly explain the data?

Put ticks (✓) in the boxes next to the **two** statements.

The water at site **B** is most polluted.	☐
Mayfly nymphs are adapted to living in polluted water.	☐
Mayfly nymphs cannot survive well in polluted water.	☐
Pollution in the river increases away from the farm.	☐
Mayfly nymphs are present in the sewage entering the river.	☐
Mayfly nymphs are eaten by fish in the river.	☐

[2]

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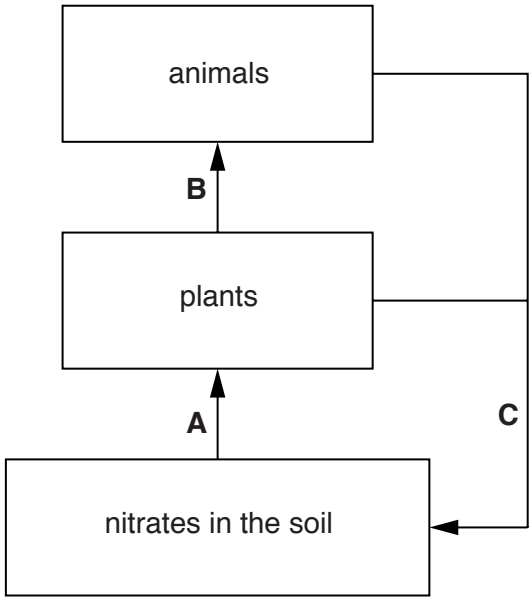
(c) Sewage contains chemicals that can be broken down into nitrates.

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**.

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

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

[Total: 11]

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

Two months later, butterflies were collected in a number of different areas near the power station.

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

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

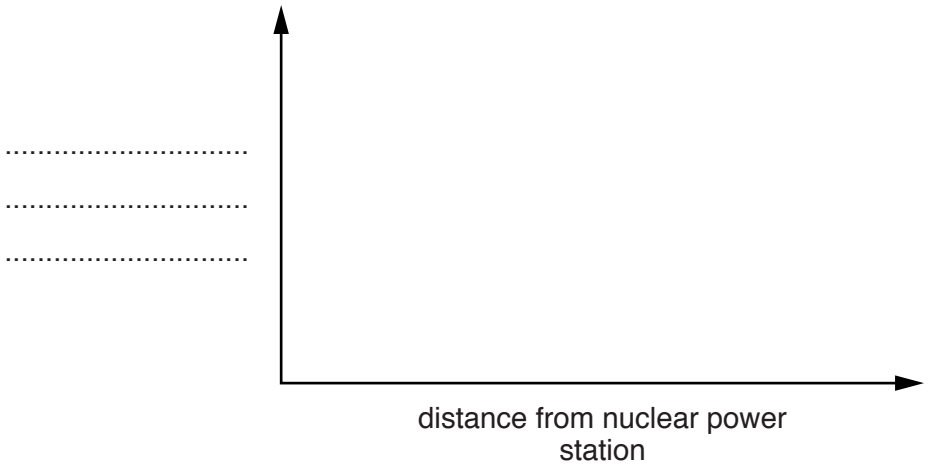
What name is given to a random change in a gene?

Put a (ring) around the correct answer.

evolution **isolation** **mutation** **variation** **[1]**

(b) 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) Scientists cannot be certain that radiation is causing the genetic changes in the butterflies.

Suggest why.

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

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(c) Genetic changes can contribute to the process of natural selection.

Explain how.

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

[Total: 8]

END OF QUESTION PAPER

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