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Centre Number						Candidate Number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

A221/02

**TWENTY FIRST CENTURY SCIENCE
BIOLOGY A**

Unit 1: Modules B1 B2 B3 (Higher Tier)

THURSDAY 14 JANUARY 2010: Morning

DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number on the first page.**
- **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.**
- **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 42.**

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Answer ALL the questions.

1 Mary and Steve are sister and brother.

The have both inherited sex chromosomes from their parents.

(a) Complete the labelling of Mary's and Steve's chromosomes.

[1]



X _____

Mary's chromosomes



X _____

Steve's chromosomes

(b) Which of Steve's sex chromosomes did he inherit from his mother?

Put a ring around the correct answer.

X

Y

BOTH

NEITHER

[1]

(c) Steve has an identical twin brother called Dave.

Steve and Dave do not look completely like each other.

Explain why.

[1]

[Total: 3]

2 A science class has students of many different heights.

Which two factors BEST explain why?

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

The students are all in the same age group.

Height is controlled by several different genes.

Height is affected by environmental factors such as lifestyle.

Height is affected by the number of children in the class.

All children grow at the same rate.

The students are all the same sex.

[2]

[Total: 2]

3 Fetuses can be tested to see if they have the alleles that cause genetic disorders.

(a) Which two decisions may parents have to make after the results of a genetic test on the fetus?

Put ticks (✓) in the boxes next to the TWO most important decisions.

They may have to decide whether or not to ...

... have a vaccination.

... have the pregnancy terminated.

... name the baby after a grandparent.

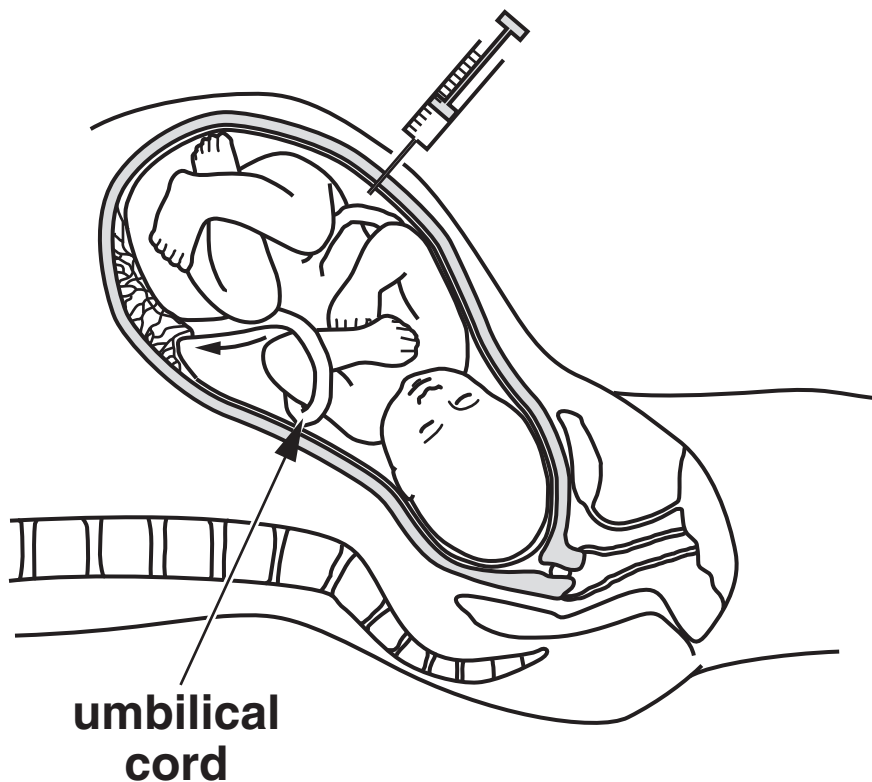
... have an anaesthetic during the baby's birth.

... have any more children.

... tell the grandparents the sex of the fetus before it is born.

[2]

(b) Fetuses are tested by removing a sample of amniotic fluid.



The fluid contains cells from the fetus that can then be tested.

There is a 1% risk that doing the test could result in the mother having a miscarriage.

Using this information, explain clearly THREE things that the parents need to think about BEFORE they decide whether to have the test.

[3]

[Total: 5]

4 This question is about producing clones.

(a) Animal clones can be produced artificially.

A nucleus from the body cell of a donor can be put into an egg cell.

Which of these statements about this type of cloning process are true?

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

The clone is genetically different to the donor.

The clone has two nuclei in each cell.

A new nucleus is placed in an empty egg cell.

A nucleus is removed from an adult body cell.

A nucleus is removed from an egg cell.

[2]

(b) Stem cells can also be used to produce clones.

Which of these statements are true?

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

Embryos can be used to make stem cells.

Each clone cell has different DNA.

Half the clone cells are male, the other half are female.

The clone cells never become highly specialised.

The stem cells may be used to treat some diseases.

[2]

[Total: 4]

5 The human body has natural barriers to reduce the risk of harmful microorganisms entering the body.

(a) Complete this table.

Put ticks (✓) in the correct boxes.

	TYPE OF BARRIER TO MICROORGANISMS		
	CHEMICAL ONLY	PHYSICAL ONLY	BOTH PHYSICAL AND CHEMICAL
skin with sweat glands			
stomach acid			
tears			

[3]

(b) When a person has had a disease they are unlikely to get it again.

Which statements, when taken together, explain why?

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

Antibodies are made by our bodies to destroy microorganisms.

Cells in the body can still make antigens to destroy the microorganism's antibodies.

Red blood cells retain the memory of the invading microorganism.

Once made, antibodies can be made again very quickly by our bodies.

Antibiotics from the first infection remain in our blood stream.

The brain unconsciously remembers how to fight the infection.

[2]

[Total: 5]

6 Some diseases can be prevented by vaccination.

(a) Complete the sentence about vaccines.

Choose the best words from this list.

A DIFFERENT

AN INFECTIOUS

A LARGE

A SAFE

A TOXIC

Vaccines are usually made from

_____ form of the

disease-causing microorganism.

[1]

(b) People argue about vaccination.

JANE

Nothing is ever completely safe so I will not have my children vaccinated.

RAFI

On rare occasions vaccines have side effects. Vaccination is not worth the risk.

PETER

As a Government Health Officer I think all children should be vaccinated.

STELLA

The more children that are vaccinated, the less likely we are to have an epidemic.

(i) Which person is using a correlation in their argument?

answer _____ [1]

(ii) Summarise in not more than 15 words both sides of the argument about vaccination.

_____ [1]

[Total: 3]

7 Trials are carried out to test new drugs.

Drugs can be tested using BLIND, DOUBLE-BLIND, or NON-BLIND trials.

Complete the table to show which type of trial is being used in each example.

Put ticks (✓) in the correct boxes.

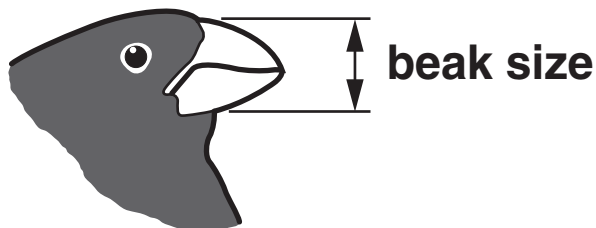
	BLIND	DOUBLE-BLIND	NON-BLIND
The patient does not know if they are taking the drug or a placebo but the doctor does.			
Both the patient and the doctor know if the patient is taking the drug.			
Neither the patient nor the doctor know if they are taking the drug or a placebo.			

[2]

[Total: 2]

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8 The graphs show data collected from one of the Galapagos Islands about the size of finch beaks measured vertically.



The graphs show the numbers of finches with different beak sizes before and after 1977.

Finches feed on seeds. In 1977 there was a severe drought.

The vegetation died and the small seeds were soon eaten.

Only larger, tougher seeds that the birds usually ignore were left.

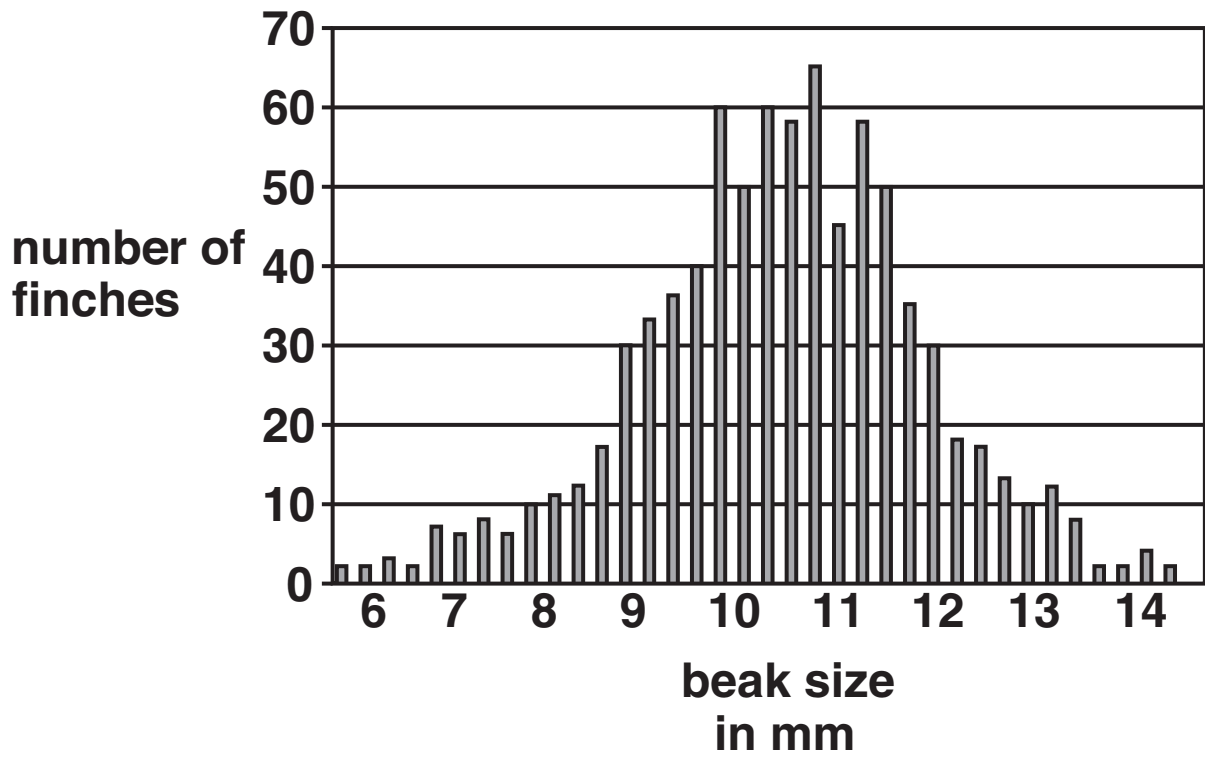
Look at the graphs opposite.

(a) Describe two effects on finches shown by the graphs.

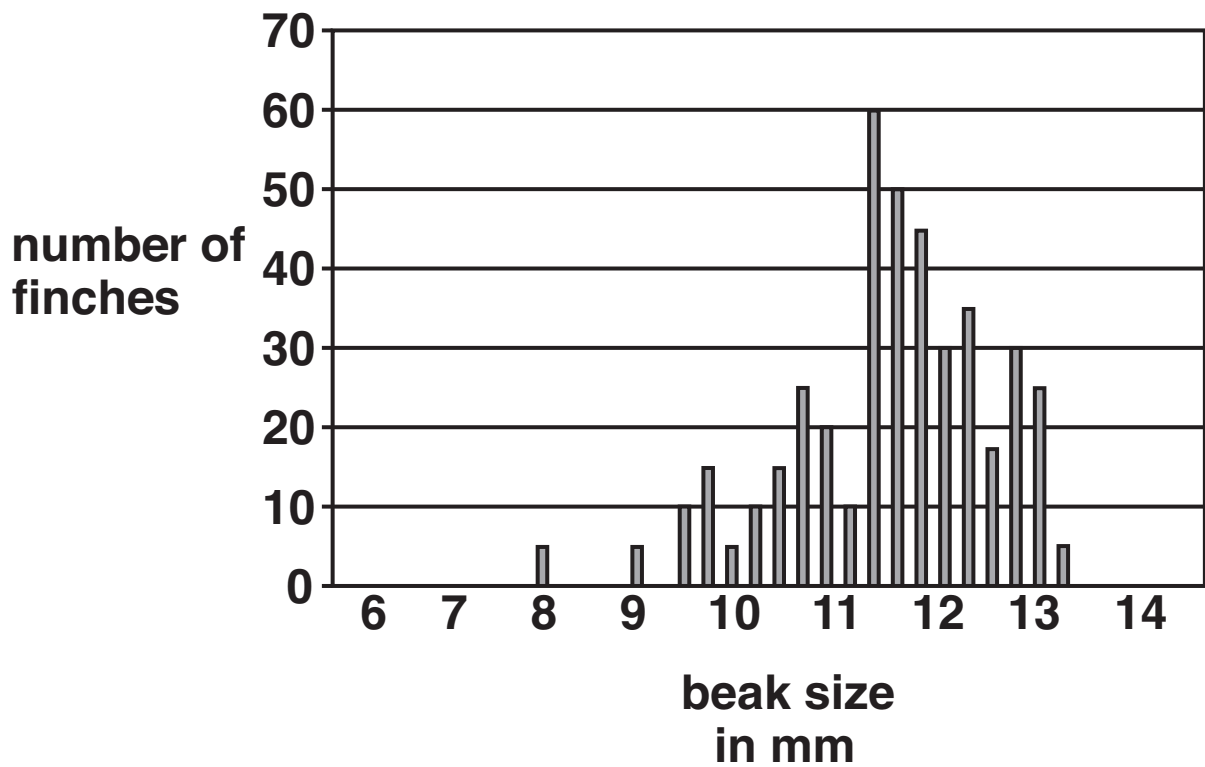
1 _____

2 _____ **[2]**

BEFORE 1977



AFTER 1977



(b) Darwin described this effect as “evolution in action”.

He used a theory to explain how evolution occurs.

What is the name of his theory?

_____ [1]

(c) Breaking open large, tough seeds needs a bigger beak.

Suggest why finches with a large beak size of 14 mm or more were NOT found on the island after 1977.

_____ [2]

[Total: 5]

9 Scientists sometimes have different views.

Read the views of the different scientists discussing how the dinosaurs became extinct.

SCIENTIST A

I think the dinosaurs became extinct because of a giant asteroid impact at Chicxulub.

SCIENTIST B

I think the dinosaurs became extinct because of poisonous gases and dust released from volcanoes.

SCIENTIST C

Some dinosaurs were still alive 300 000 years after the Chicxulub meteor impact. So how could the impact have made them extinct?

SCIENTIST D

I am not making my mind up until more data is available.

(a) Which TWO scientists are providing an explanation?

answer _____ and _____ [1]

(b) Suggest TWO reasons why Scientist A is reluctant to change her opinion, even when data appears to conflict with it.

_____ [2]

[Total: 3]

10 One way the human body is coordinated is by the nervous system.

(a) Which of these statements about the nervous system are true?

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

The nervous system uses ...

... effectors that detect stimuli.

... short-lived electrical impulses.

... receptors to link nerve cells with effectors.

... effectors to link receptors with nerve cells.

... nerve cells to link receptors with effectors.

... long-lived impulses.

... slow electrical impulses.

[2]

(b) The body is also coordinated by the hormonal system.

The hormonal system is DIFFERENT from the nervous system.

Write down THREE ways that the hormonal system is different.

1 _____

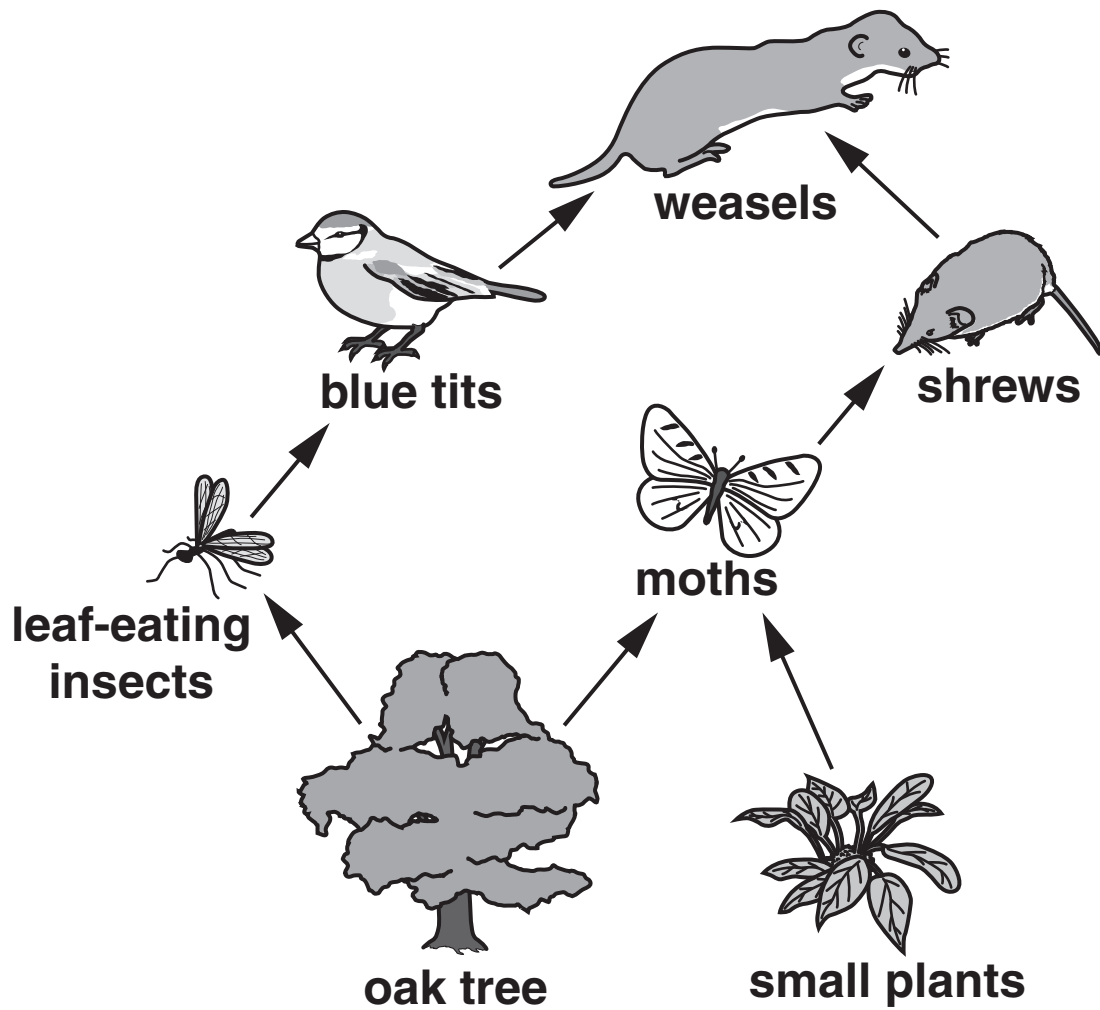
2 _____

3 _____

_____ **[3]**

[Total: 5]

11 Look at the food web.



(a) Which TWO organisms are directly competing with each other for food in the web?

_____ [1]

(b) A farmer sprays a pesticide and kills off most of the leaf-eating insects.

This could produce several changes in the food web.

Put ticks (✓) in the boxes to show the effect of each of the following changes on shrew numbers.

CHANGE TO FOOD WEB	PRODUCES INCREASE IN SHREW NUMBERS	PRODUCES DECREASE IN SHREW NUMBERS	COULD PRODUCE INCREASE OR DECREASE IN SHREW NUMBERS
blue tit numbers decrease			
more predators of shrews			
more food for moths			
more food for shrews			

[2]

(c) Which of these changes could cause one of the species to become extinct?

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

a rapid change in environmental conditions

the introduction of a new competitor species

the normal cycle of the seasons

a different species in the food web becoming extinct

the introduction of a disease-causing organism

an increase in food supply

[2]

[Total: 5]

END OF QUESTION PAPER

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