Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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 MAY 2009: Afternoon
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

DC (SLM/SW) OV90931 11125

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes 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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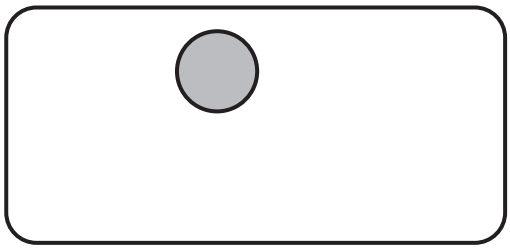
Answer ALL the questions.

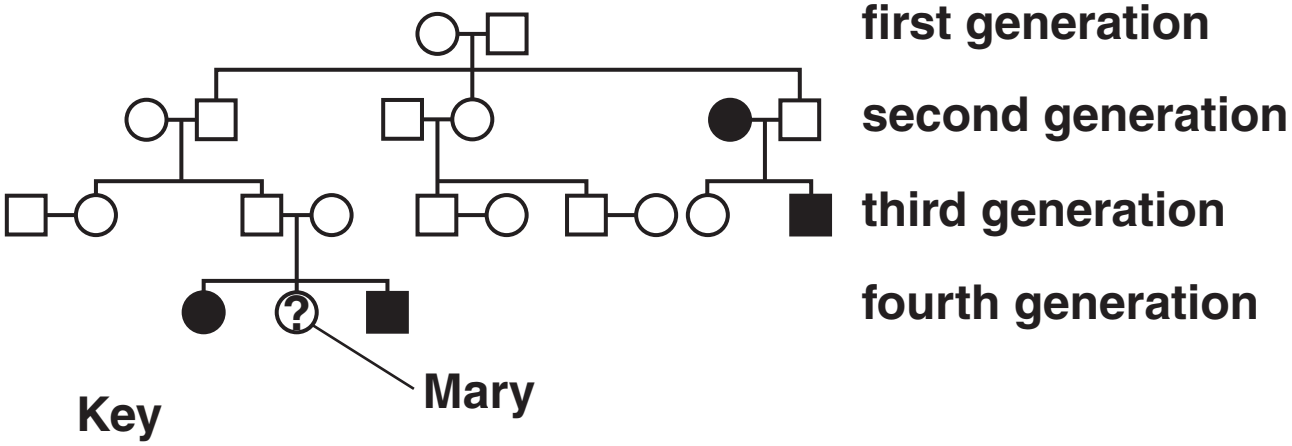
1 Look at the diagram of a cell.



instructions for how an organism develops are found here

(a) Draw a label line to connect the label with the correct part of the cell. [1]

(b) The instructions for how an organism develops are called alleles.
The family tree shows the inheritance of a faulty allele that causes cystic fibrosis.



Key

○ female without cystic fibrosis

● female with cystic fibrosis

□ male without cystic fibrosis

■ male with cystic fibrosis

(i) Which of the words BEST describes the allele that causes this disorder?

Put a (ring) around the correct answer.

DOMINANT MIXED RECESSIVE [1]

(ii) The second generation of the family tree consists of six people.

How many people in the second generation have cystic fibrosis?

answer _____ [1]

(iii) When Mary is born it is not known whether or not she has cystic fibrosis.

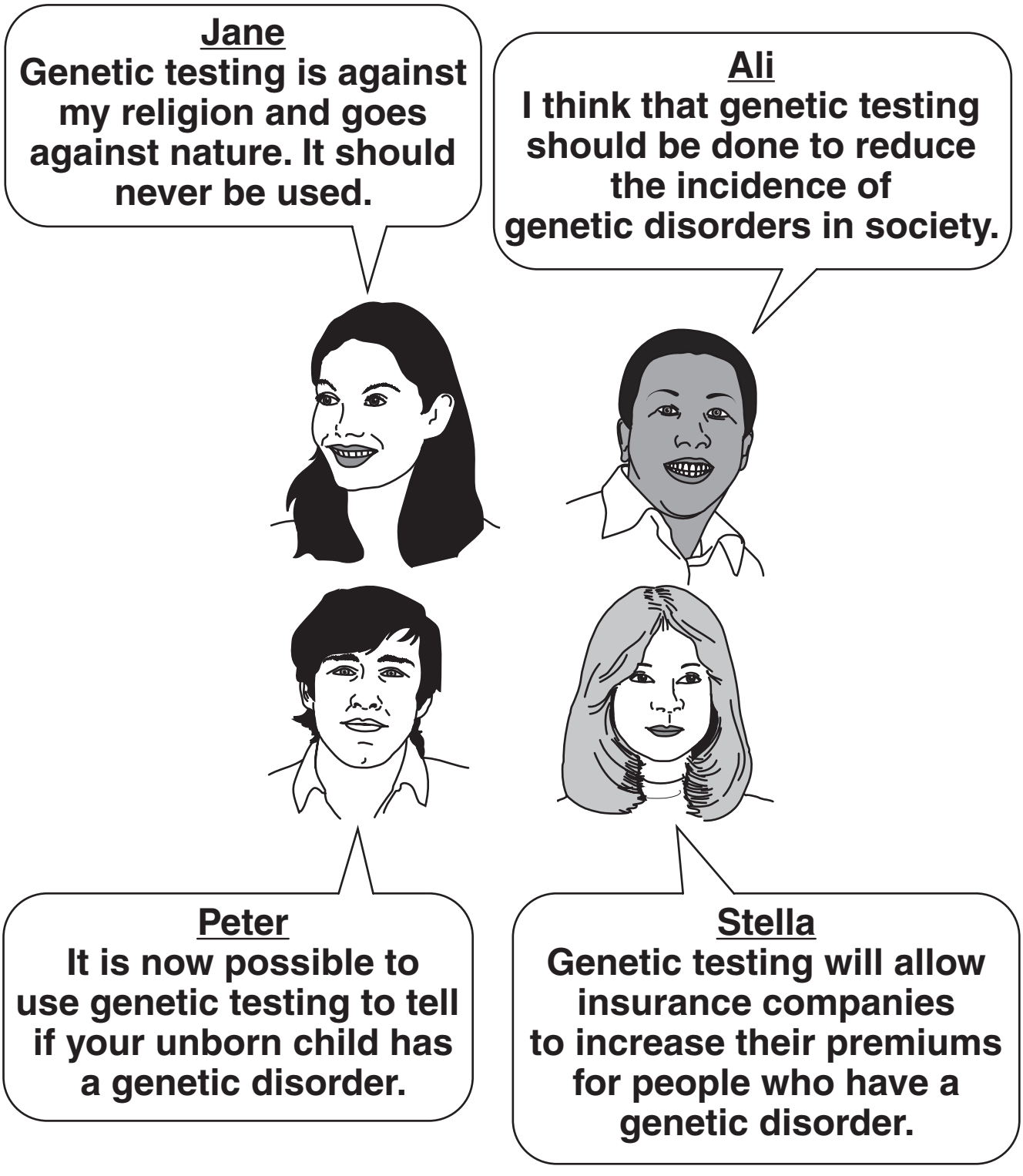
What is the chance that Mary is a carrier?

Put a (ring) around the correct answer.

100% 50% 30% 25% 0% [1]

[Total: 4]

2 Embryos can be tested to find out if they have any genetic defects.
Four friends are discussing genetic testing.



(a) Which person is making a statement about technical feasibility?

answer _____ [1]

(b) Which TWO people are making statements about values?

answer _____ and _____ [1]

(c) Which TWO people are talking about an implication of genetic testing?

answer _____ and _____ [1]

[Total: 3]

3 Steve and Anita are brother and sister.

(a) Which pair of sex chromosomes will Steve and Anita have?

Choose from this list.

XX YY XY YZ ZZ

(i) Steve _____ [1]

(ii) Anita _____ [1]

(b) Which statements best explain how their sex is determined?

Draw ONE straight line linking the correct statement about GENES ON CHROMOSOMES to the correct statement about WHAT THE GENE DOES.

GENES ON CHROMOSOMES	WHAT THE GENE DOES
Sex is determined by a gene on both the X and the Y chromosome.	It causes the embryo to develop into a female.
Sex is determined by a gene on the X chromosome.	It stops the sex organs from developing into either ovaries or testes.
Sex is determined by a gene on the Y chromosome.	It causes the sex organs to develop into either ovaries or testes.
Sex is determined by the absence of a gene on the X and the Y chromosome.	It causes the embryo to develop into a male.

[1]

[Total: 3]

4 Here are seven statements about genes.
Some are correct and some are not.

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

A single gene contains several chromosomes. ☐

A single gene contains several nuclei. ☐

Genes can code for structural proteins. ☐

Each allele can consist of many genes. ☐

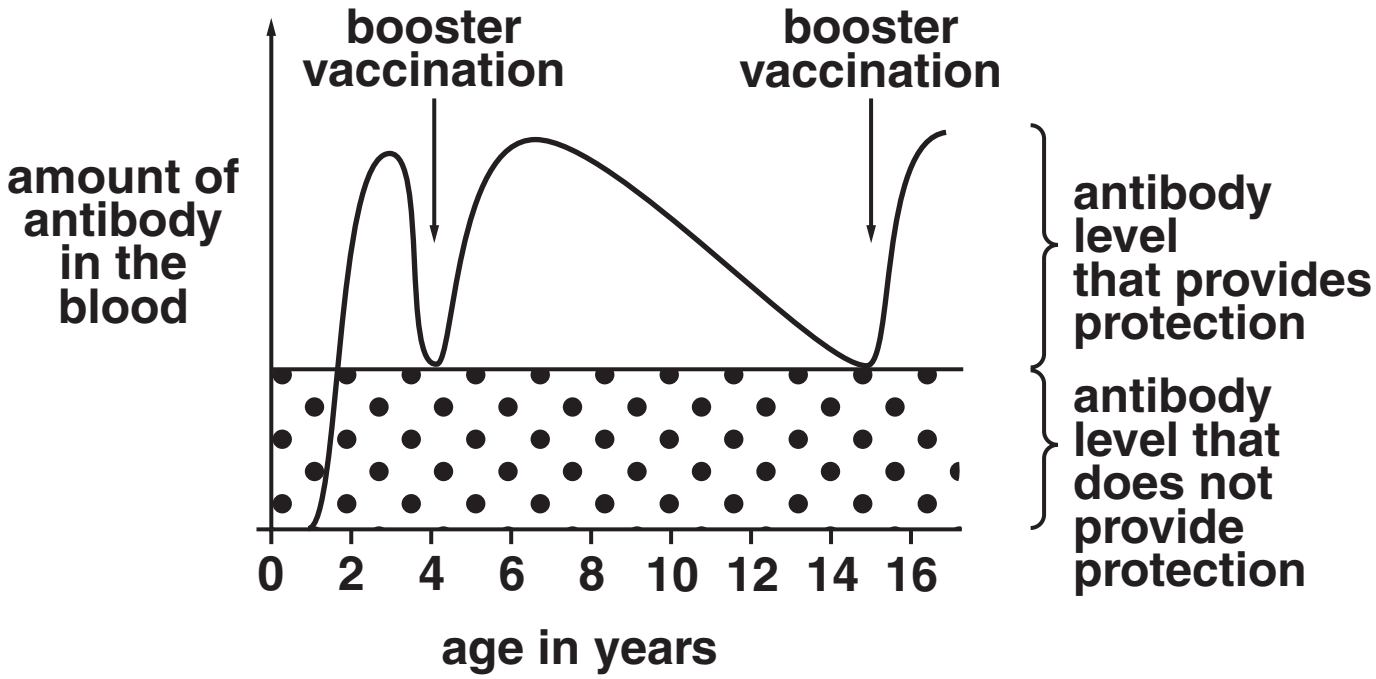
Genes can code for enzymes. ☐

Genes are sections of a DNA molecule. ☐

Genes can code for fats. ☐ [3]

[Total: 3]

5 Steve has been vaccinated three times against polio.
Two of the vaccinations were boosters.
The graph shows what effect the vaccinations have on the amount of antibodies in Steve's blood.



(a) At what age (in years) was Steve most likely to get polio?

answer _____ [1]

(b) At what age (in years) did Steve have his first vaccination?

answer _____ [1]

(c) At what ages (in years) did Steve have booster vaccinations?

Put a (ring) around the correct answer.

2 and 6 0 and 4 4 and 15 3 and 6 [1]

(d) The scientist Louis Pasteur developed a vaccine against rabies.
It was injected into people after they had been bitten by a dog carrying the rabies virus.
The vaccine was not completely successful in saving lives.

Which statement explains why?

Put a tick (✓) in the box next to the BEST statement.

Several injections were needed. ☐

Vaccinations work best if given after getting an infection. ☐

The side effects of the vaccine lasted too long. ☐

People's bodies did not have time to make enough antibodies. ☐

[1]

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(e) The government has a measles, mumps and rubella (MMR) vaccination policy.
It wants all children to be vaccinated with the MMR vaccine.
Different people have different views about this policy.

Jane
I think the risk of catching measles is greater than the risk of developing autism. But some people think the reverse.

Ranjit
The MMR vaccine may cause autism.

Peter
The MMR vaccine protects against measles, mumps and rubella.

Stella
Parents should be forced by law to have their children vaccinated.

(i) Which person is summarising two different views?

answer _____ [1]

(ii) Which person is describing an action which is hard to justify?

answer _____ [1]

[Total: 6]

6 (a) Drug companies often use double-blind trials when testing a new drug.

Which of the statements describe a double-blind trial?

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

Only the doctor knows which patients are receiving the drug. ☐

Only the patient knows if they are receiving the drug. ☐

Both drugs and placebos are used in the trial. ☐

Neither the doctor nor the patient knows who is receiving the drug. ☐

Side effects of the drug may cause blindness. ☐

The drugs being tested are to prevent blindness in both eyes. ☐

[2]

(b) A new type of antibiotic gradually becomes less effective over a period of time.

Put ticks (✓) in the boxes next to the TWO statements that best explain why.

The antibiotic has a short shelf life. ☐

Bacteria become used to the antibiotic. ☐

Bacterial mutations can produce varieties that are less affected by the antibiotic. ☐

Bacteria become resistant to antibiotics. ☐

The antibiotic has passed its sell by date. ☐

[2]

[Total: 4]

7 Look at the statements about heart disease.

A Mary has a heart attack after eating a banana.

B As ice-lolly sales increase, more people die of heart attacks.

C Fatty foods cause a build up of cholesterol which can block the coronary artery.

D Eating fatty foods increases the level of blood cholesterol which increases the risk of getting heart disease.

(a) Which statement, A, B, C or D, shows a correlation but not a causal link?

statement _____ [1]

(b) Which two statements, A, B, C or D, contain a causal link?

statements _____ and _____ [2]

(c) Which statement, A, B, C or D, is an example of individual cases not providing sufficient evidence for a correlation?

statement _____ [1]

[Total: 4]

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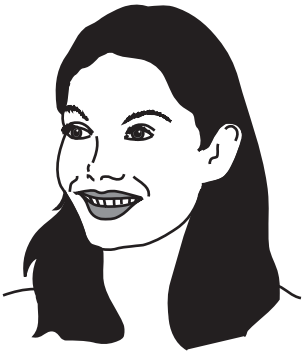
8 People have different ideas about how life evolved on Earth.

Jane
Scientists think life evolved on Earth. Organisms that were better adapted to their environment had a better chance of survival.



Ranjit
It took millions of years for humans to evolve. How come some people think that life began 1000 years ago?

Peter
The Earth formed billions of years ago, but we do not have enough data to say how or when life started.

Stella
Some people think that God made the world and everything in it.

(a) Which TWO people make statements which include data?

answer _____ and _____ [2]

(b) Which person is making a statement which includes an agreed scientific explanation?

answer _____ [1]

(c) Which person is suggesting a reason why scientists disagree?

answer _____ [1]

[Total: 4]

9 Biodiversity means all the different types of living organism that exist in the environment.

(a) Which of the following is likely to reduce biodiversity?

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

reduced competition between species ☐

direct and indirect human activity ☐

increased food supplies ☐

a stable, non-changing environment ☐

introduction of conservation areas ☐

introduction of a new predator species ☐ [1]

(b) Maintaining biodiversity is an important part of using the environment in a sustainable way.

Which of the statements EXPLAIN why?

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

Species depend upon each other, not the environment. ☐

A food web consists of lots of food chains. ☐

Many species have a better chance of survival if they have a diverse food supply. ☐

Organisms usually have only one source of food. ☐

The extinction of a species in a food web has implications for many other species. ☐

[1]

(c) Extinction of a species can have several causes. Some of the statements are reasons for extinction, others are not.

Complete the table by entering the letter of each statement, A, B, C, D, E and F, into the correct column.

A Environmental conditions change.

B The environment remains isolated from the outside world.

C Biodiversity remains unchanged.

D A new disease-causing organism is introduced.

E Another organism in the food web becomes extinct.

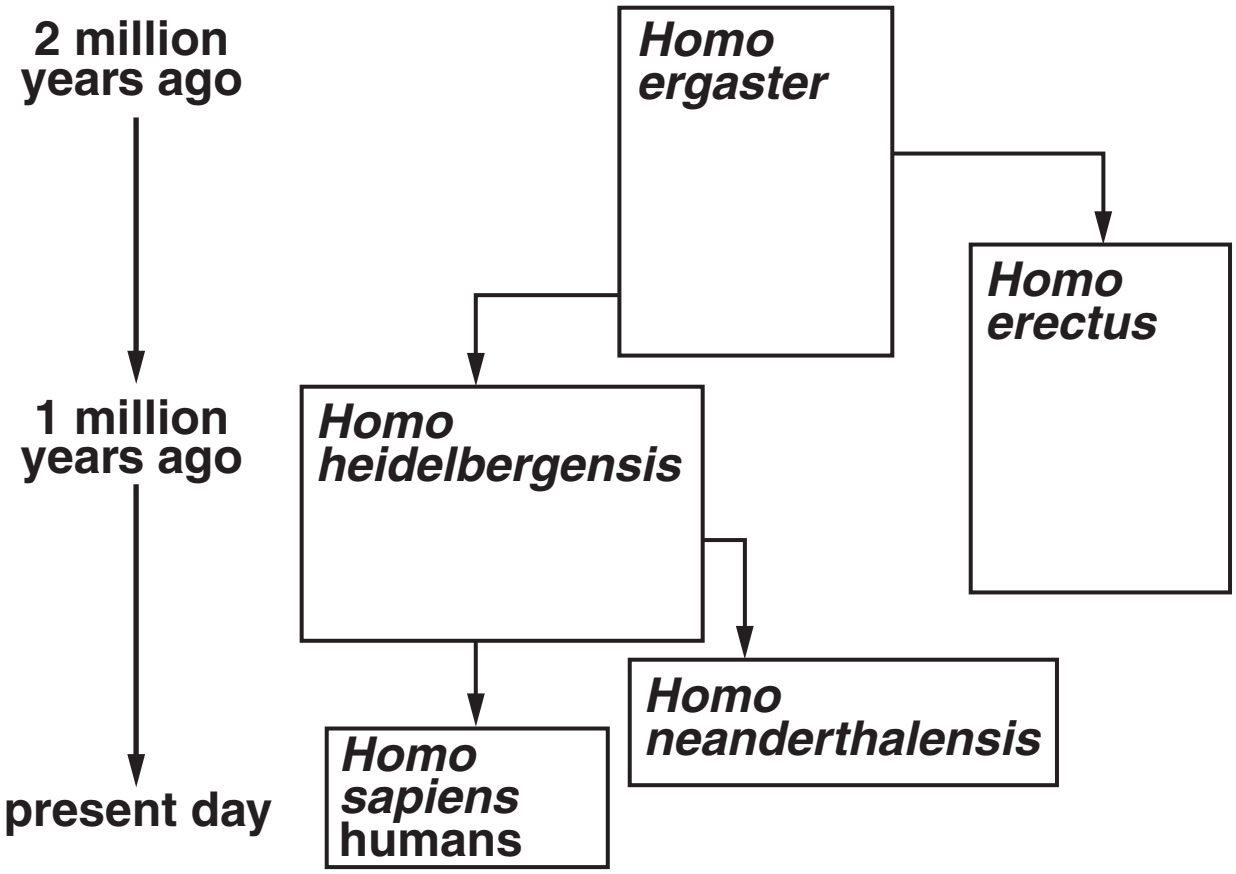
F The environment is millions of years old.

NOT LIKELY TO CAUSE EXTINCTION	MAY CAUSE EXTINCTION

[3]

[Total: 5]

10 The diagram shows the possible evolution of human beings over the last two million years.



(a) Which conclusions can be drawn from <u>THIS</u> diagram?

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

Humans evolved from single-celled organisms. ☐

Some *Homo* species were tool users. ☐

Only five different hominid species have ever existed. ☐

Human evolution shows different groups evolving from one common group. ☐

Some species became extinct. ☐

Homo sapiens evolved from *Homo erectus*. ☐

[2]

(b) During evolution the human brain got larger.

Put ticks (✓) in the boxes next to the BEST explanations.

A larger brain increases the chance of survival. ☐

The skull expanded allowing the brain to get bigger. ☐

The brain grew in size to match the growth in size of the human body. ☐

Humans thought a lot about making tools. ☐

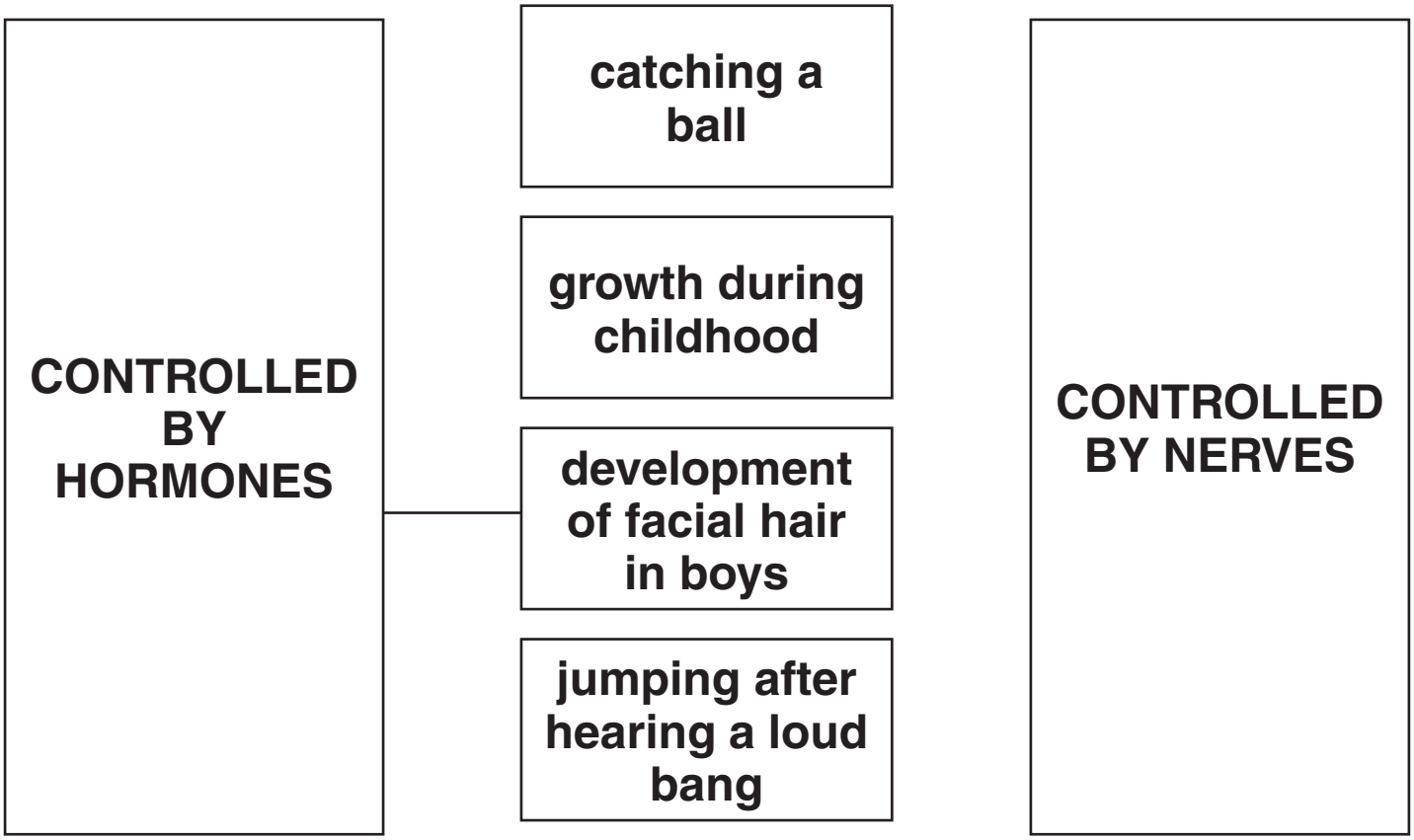
A larger brain allowed the development of new skills. ☐

[2]

(c) The human brain coordinates responses within the body.
Hormones or nerves are used to control these responses.

Complete the diagram by drawing straight lines to correctly join each of the EXAMPLES OF RESPONSES with either CONTROLLED BY HORMONES or CONTROLLED BY NERVES.
One has been done for you.

EXAMPLES OF RESPONSES



[2]

[Total: 6]

END OF QUESTION PAPER