version 1.0

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Biology

Specimen Papers and Mark Schemes

Contents

Biology (4411)

ISAs

Contents continued

The specimen assessment materials accompanying the new AQA GCSE Sciences specifications are provided to give centres a reasonable idea of the general shape and character of the planned question papers in advance of the first operational examinations.

Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

General Certificate of Secondary Education
Specimen Paper

SCIENCE A
Human Biology (Unit Biology 1a)

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

Time allowed: 30 minutes

Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Human Biology' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 1 2 3 4 ○ ● ○ ○
- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 1 2 3 4 ○ ✖ ○ ●
- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown: 1 2 3 4 ○ ⊗ ○ ✖

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 16 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

In these questions match the letters with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The drawing shows a skater.
The skater has organs which contain different receptors.

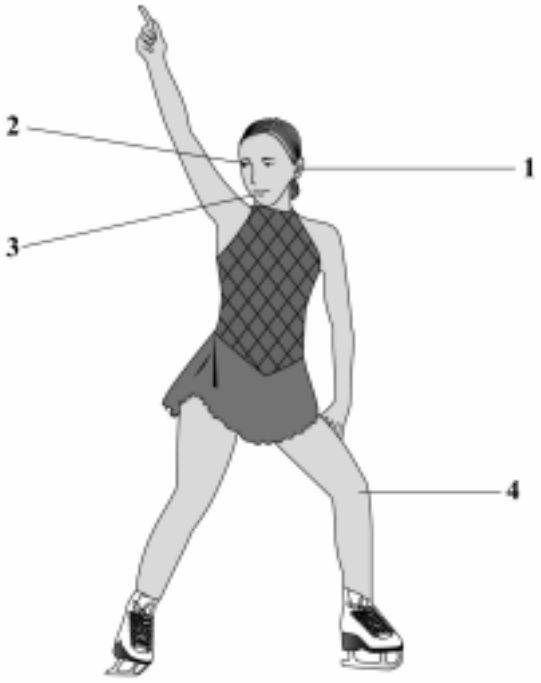
Match statements, **A**, **B**, **C** and **D**, with the labels **1 – 4** on the drawing.

A Contains light receptors

B Contains receptors sensitive to chemicals

C Contains sound receptors

D Contains temperature receptors



[6]

QUESTION TWO

The table is about the effects of some substances on the body.

Match words, **A**, **B**, **C** and **D**, with the statements **1 – 4** in the table.

A Alcohol

B Carbon monoxide

C Cannabis

D Nicotine

Substance	Effect on body
1	Is the addictive substance in cigarettes
2	Is thought to cause psychological problems in many people
3	Reduces the amount of oxygen which the blood carries
4	Slows down reaction time

Turn over for the next question

QUESTION THREE

The table is about substances which are effective against microorganisms.

Match words, **A**, **B**, **C**, and **D**, with the statements **1 – 4** in the table.

A Antibody

B Antitoxin

C Blood clot

D Penicillin

Substance	Feature
1	Kills bacteria but not viruses
2	Kills both bacteria and viruses
3	Neutralises poisons produced by microorganisms
4	Seals cuts to prevent entry of microorganisms

QUESTION FOUR

Many people are obese.

Match words, **A**, **B**, **C**, and **D**, with the spaces **1 – 4** in the sentences.

A Arthritis

B Exercise

C Food

D Mass

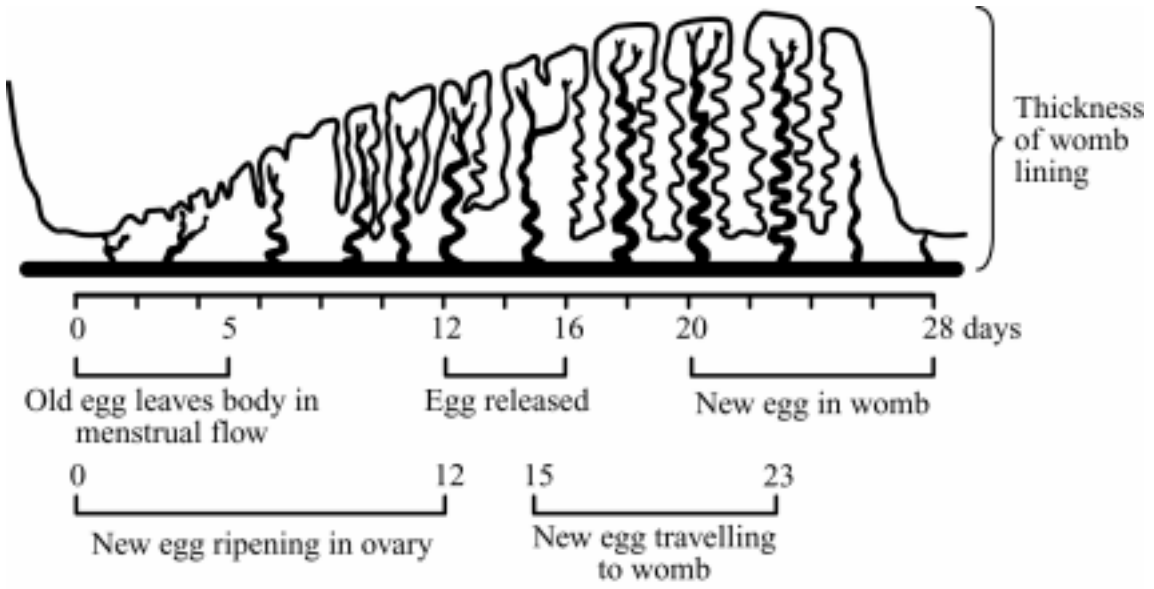
Obesity is caused by doing less …**1**… and taking in more …**2**… .

This causes an increase in body …**3**… which can lead to …**4** … .

[8]

QUESTION FIVE

The diagram shows some of the events in a woman's monthly cycle.



Match numbers, **A**, **B**, **C**, and **D**, with the statements **1 – 4** in the table.

A 4

B 14

C 21

D 26

1	A day when an egg could be released
2	A day when the when an old egg is leaving the body
3	A day when the womb lining is breaking down
4	The day when the womb lining is thickest

QUESTION SIX

The parts of blood help to keep us healthy in different ways.

Table 1 shows the number of these parts in a healthy person.

Table 1

Part of blood	Number per mm^3 in healthy person
White blood cells	4000 to 11 000
Red blood cells	4.5 to 6.5 million
Platelets	150 000 to 350 000

Table 2 shows the blood test results for four people.

Table 2

Test	James	John	Michael	Paul
White blood cells	6500	1000	4100	30 000
Red blood cells	5.3 million	5.2 million	3.0 million	5.5 million
Platelets	70 000	210 000	200 000	180 000

Match words, **A**, **B**, **C**, and **D**, with the spaces **1 – 4** in the sentences.

A James

B John

C Michael

D Paul

The person with the least red blood cells is …**1**… .

The person whose blood would clot most slowly is …**2**… .

The person who would be most likely to catch an infection is …**3**… .

One of the symptoms of leukaemia is a large increase in the number of white blood cells.

The person most likely to be suffering from leukaemia is …**4**… .

[10]

Turn over for the next question

SECTION B

Questions **SEVEN** to **NINE**.
Each of these questions has four parts.

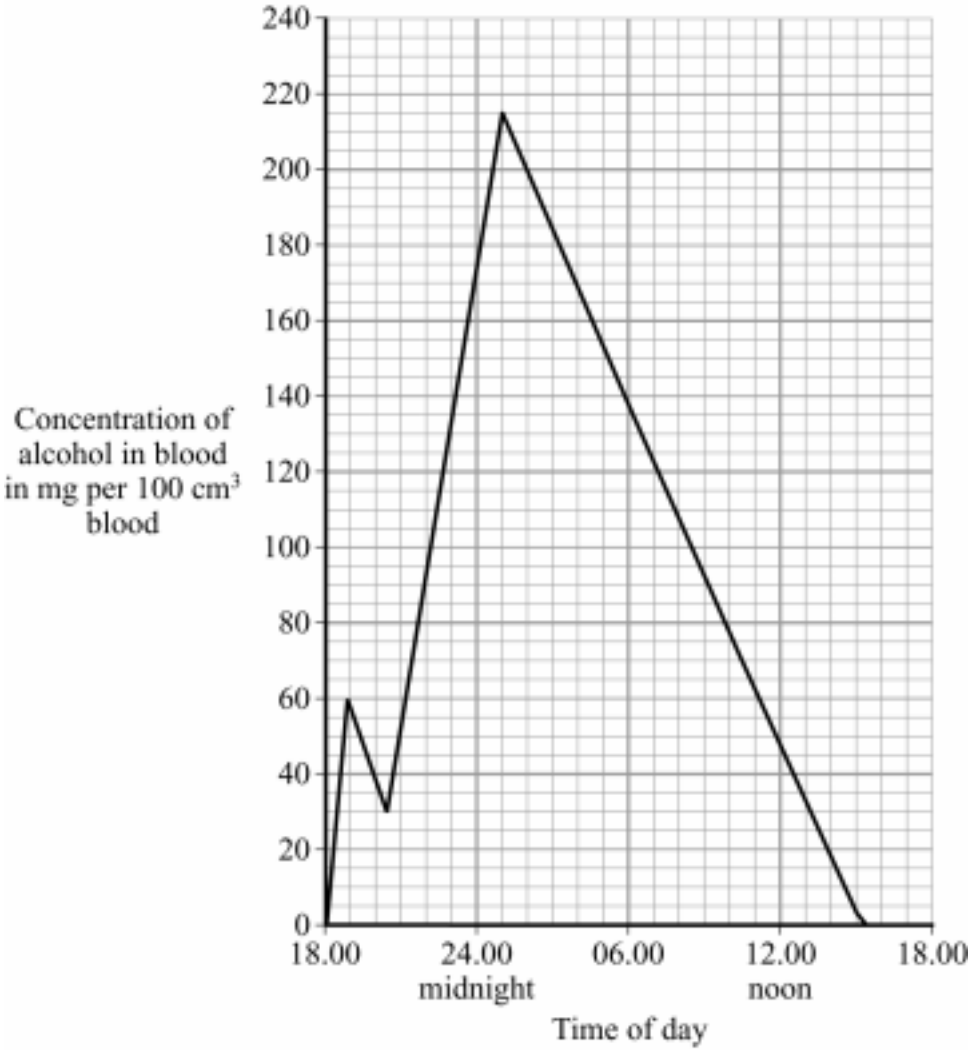
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SEVEN

A man had some alcoholic drink at home.
Later he went out and had some more alcoholic drink.

The graph shows the concentration of alcohol in the man's blood over this period and the following few hours.



[12]

7.1 What was the highest concentration of alcohol in the man's blood?

A 205 mg per 100 cm^3

B 208 mg per 100 cm^3

C 215 mg per 100 cm^3

D 218 mg per 100 cm^3

7.2 The legal limit for driving in Britain is 80 mg alcohol per 100 cm^3 of blood.

During which of the following complete periods would it be illegal for the man to drive?

A 18.30 to 14.45

B 19.00 to 01.00

C 21.00 to 01.00

D 22.15 to 09.15

7.3 It is dangerous to drive a car after drinking alcohol because . . .

A alcohol causes psychological problems.

B alcohol is a drug.

C alcohol is addictive.

D alcohol slows reactions.

7.4 Which one of the following is most likely to be caused by drinking too much alcohol?

A Babies with low birth mass

B Heart disease

C Liver disease

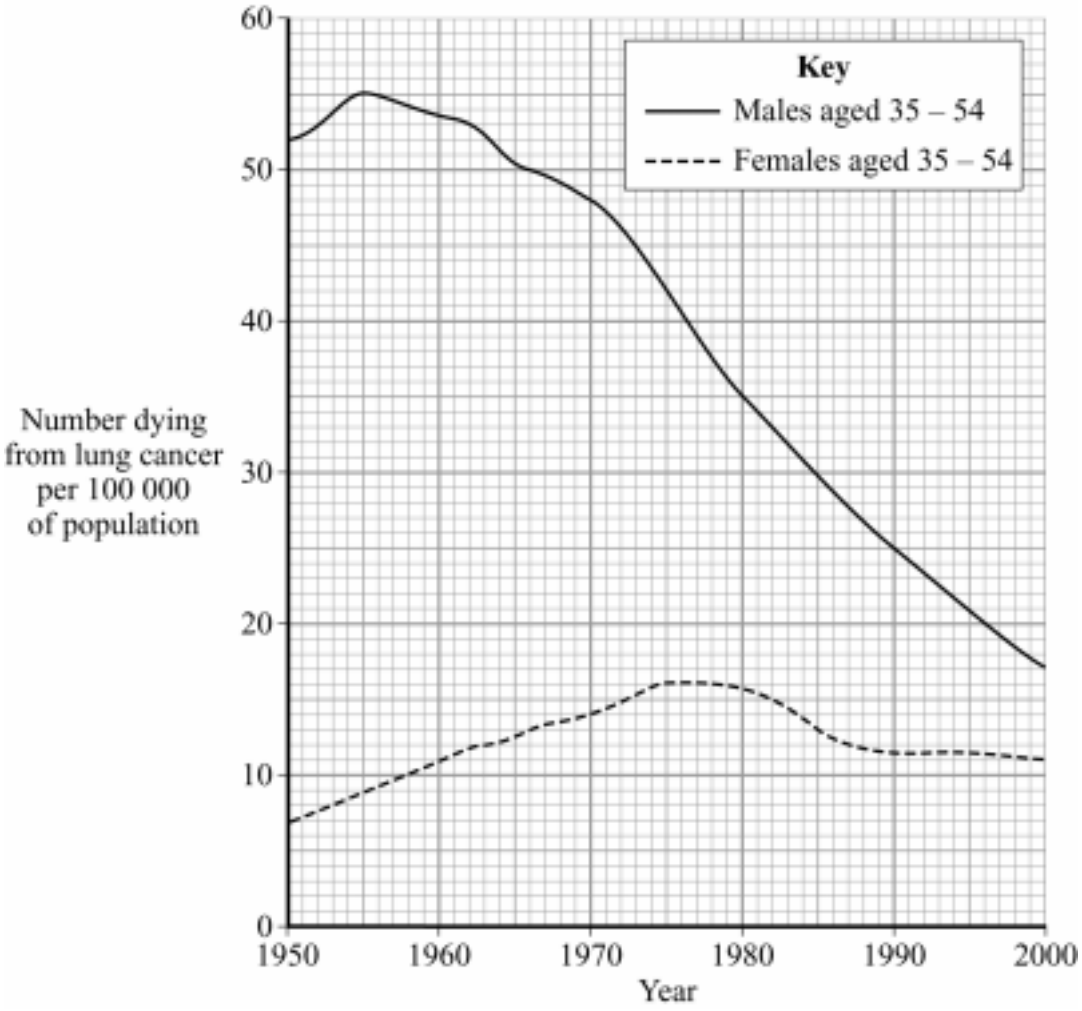
D Obesity

QUESTION EIGHT

Scientists study the effect of smoking on the number of people dying from lung cancer.

Graph 1 shows the number of people aged 35–54 who died from lung cancer in this country between 1950 and 2000.

Graph 1



[14]

8.1 How did the number of men, aged 35 – 54 who died from lung cancer, change between 1960 and 2000?

A It rose then fell.

B It rose to 11 per 100 000.

C It fell to 17.

D It fell by 37 per 100 000.

8.2 A town in this country had 500 000 inhabitants in 1955.

How many men aged 35–54 from that town are likely to have died from lung cancer in 1955?

A 45

B 55

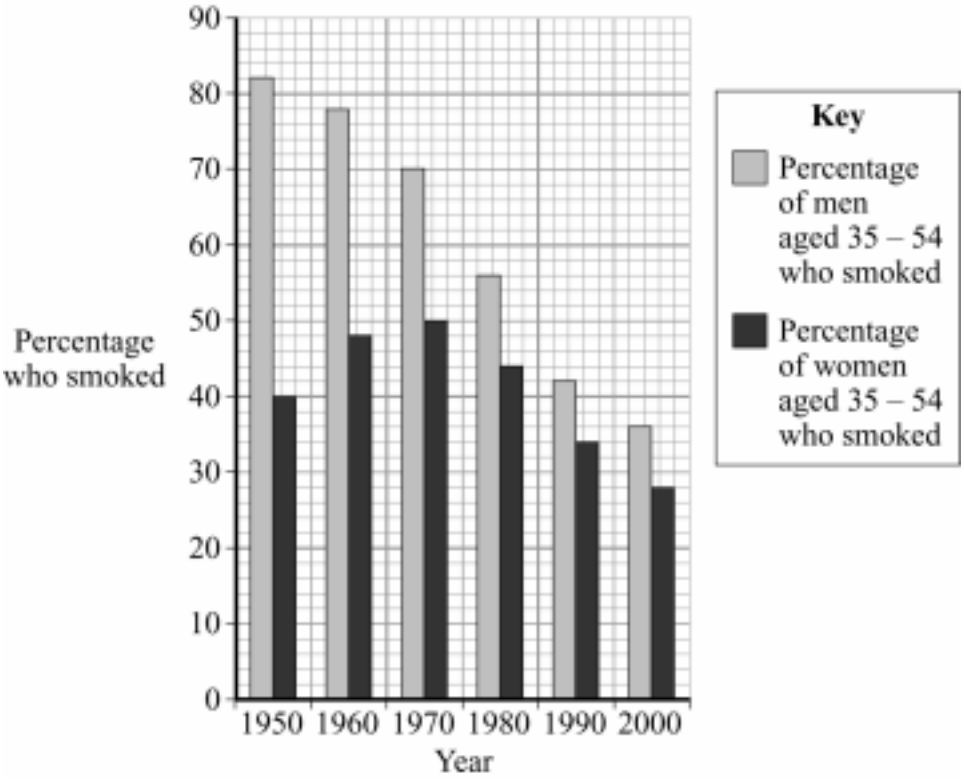
C 275

D 550

Question 8 continues on the next page

Graph 2 shows the percentage of the population who smoked between 1950 and 2000.

Graph 2



8.3 What conclusion can be drawn from the data in **Graphs 1** and **2**?

A Smoking causes lung cancer.

B The more cigarettes you smoke, the more likely you are to get lung cancer.

C The younger you start smoking, the more likely you are to get lung cancer.

D There is a correlation between the percentage of people who smoke and the number of deaths from lung cancer.

8.4 How was the data in **Graphs 1** and **2** most likely to have been collected?

A Scientists carried out telephone surveys.

B Scientists collated information from medical databases.

C Scientists did experiments.

D Scientists did internet searches.

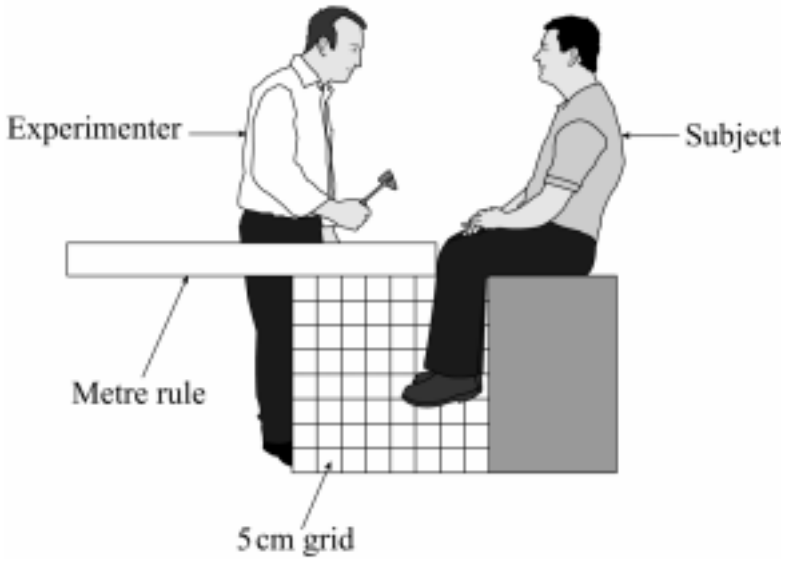
[16]

Turn over for the next question

QUESTION NINE

When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action. A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

The diagram shows how the experiment was set up.



Each trial was recorded on a video. A frame was taken every 33 milliseconds. The video was then played using single-frame advance. The number of frames for the hammer to move to the knee was found. The faster the speed, the smaller was the number of frames. The video was also used to find the distance moved by the toe.

In each trial, the experimenter held the hammer 20 cm from the subject's knee then hit the subject's tendon. For each trial the experimenter used the hammer at a different speed.

The table shows some of the results.

Trial number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Distance hammer moved to knee (in cm)	20	20	20	20	20	20	20	20	20	20
Number of frames it took the hammer to move to the knee	15	16	12	10	9	8	7	6	2	2
Distance moved by toe (in cm)	0	0	5	5	10	10	10	10	15	15

[18]

9.1 What was the control variable in this experiment?

A The distance moved by the hammer

B The distance moved by the toe

C The number of frames

D The speed of the hammer

9.2 One advantage of using the video to record the results was that . . .

A it took less time to record the results.

B it was easier to work out an average.

C the distance moved by the hammer could be measured more accurately.

D the speed of the hammer could be measured more accurately.

9.3 Which is the best conclusion that can be drawn from the results?

A The faster the hammer moves, the further the foot moves.

B The distance the foot moves is related to the speed of the hammer.

C The speed at which the foot moves is directly proportional to the speed of the hammer.

D The slower the hammer moves, the further the foot moves.

9.4 The precision of the experiment could be improved by . . .

A using a 1 cm grid rather than a 5 cm grid.

B using a greater range of hammer speeds.

C using a stop watch instead of a video.

D using a tape measure rather than a metre rule.

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**

In these questions match the letters with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The parts of blood help to keep us healthy in different ways.

Table 1 shows the number of these parts in a healthy person.

Table 1

Part of blood	Number per mm^3 in healthy person
White blood cells	4000 to 11 000
Red blood cells	4.5 to 6.5 million
Platelets	150 000 to 350 000

Table 2 shows the blood test results for four people.

Table 2

Test	James	John	Michael	Paul
White blood cells	6500	1000	4100	30 000
Red blood cells	5.3 million	5.2 million	3.0 million	5.5 million
Platelets	70 000	210 000	200 000	180 000

[20]

Match words, **A**, **B**, **C**, and **D**, with the spaces **1 – 4** in the sentences.

A James

B John

C Michael

D Paul

The person with the least red blood cells is …**1**… .

The person whose blood would clot most slowly is …**2**… .

The person who would be most likely to catch an infection is …**3**… .

One of the symptoms of leukaemia is a large increase in the number of white blood cells.

The person most likely to be suffering from leukaemia is …**4**… .

QUESTION TWO

The table is about the effects of some conditions on the body.

Match words, **A**, **B**, **C**, and **D**, with the words **1 – 4** in the table.

A Being overweight

B High blood cholesterol

C High level of salt in the diet

D Lack of food

Substance	Effect on body
1	arthritis
2	disease of the blood vessels
3	high blood pressure
4	irregular periods

SECTION B

Questions **THREE** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.

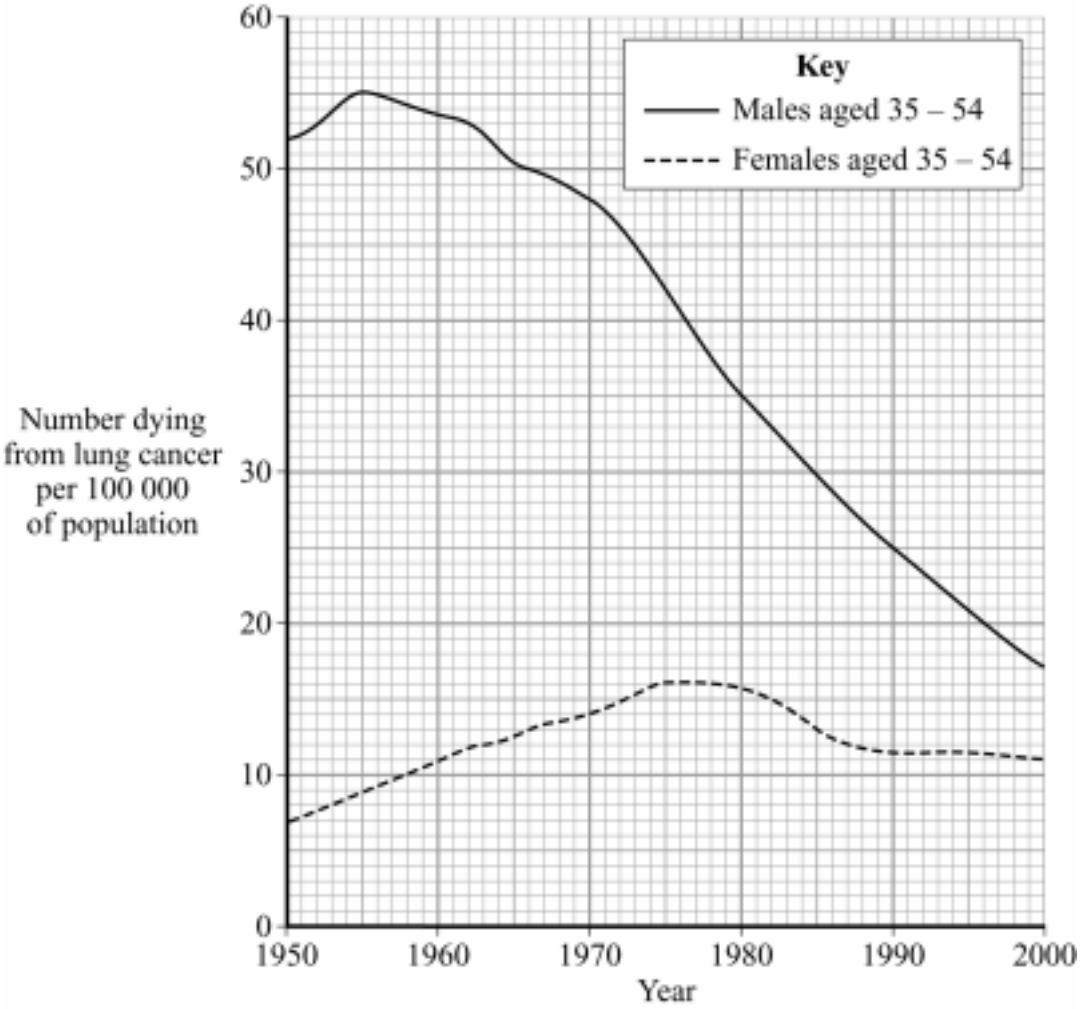
Mark your choices on the answer sheet.

QUESTION THREE

Scientists study the effect of smoking on the number of people dying from lung cancer.

Graph 1 shows the number of people aged 35–54 who died from lung cancer in this country between 1950 and 2000.

Graph 1



[22]

3.1 How did the number of men, aged 35–54 who died from lung cancer, change between 1960 and 2000?

A It rose then fell.

B It rose to 11 per 100 000.

C It fell to 17.

D It fell by 37 per 100 000.

3.2 A town in this country had 500 000 inhabitants in 1955.

How many men aged 35–54 from that town are likely to have died from lung cancer in 1955?

A 45

B 55

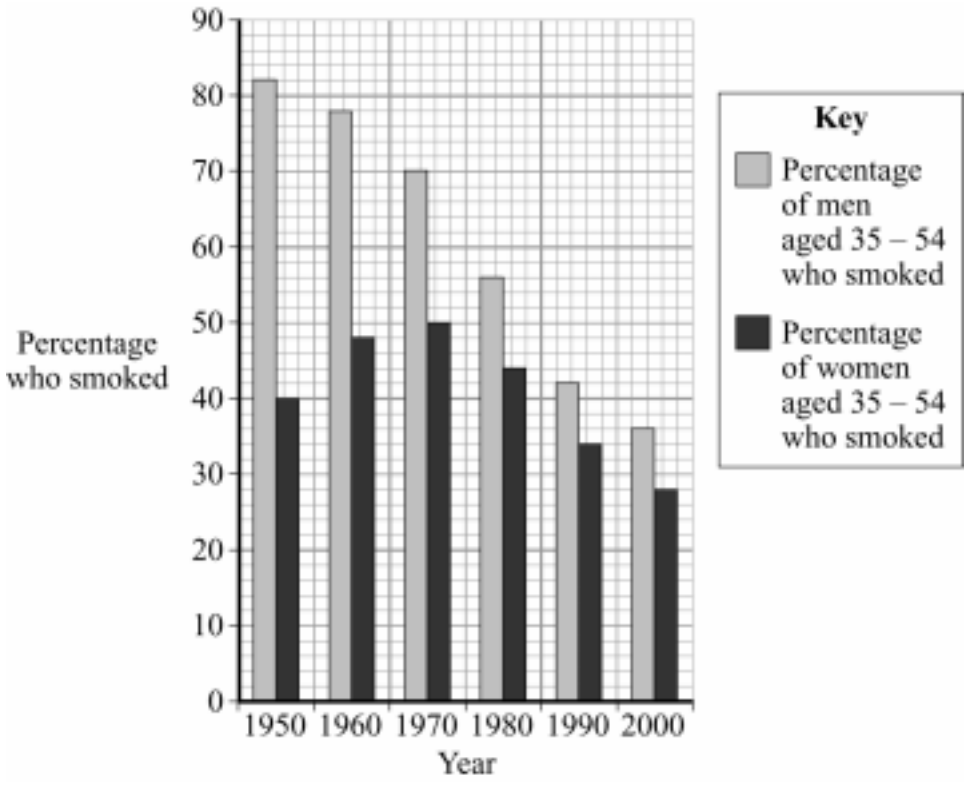
C 275

D 550

Question 3 continues on the next page

Graph 2 shows the percentage of the population who smoked between 1950 and 2000.

Graph 2



3.3 What conclusion can be drawn from the data in **Graphs 1** and **2**?

A Smoking causes lung cancer.

B The more cigarettes you smoke, the more likely you are to get lung cancer.

C The younger you start smoking, the more likely you are to get lung cancer.

D There is a correlation between the percentage of people who smoke and the number of deaths from lung cancer.

3.4 How was the data in **Graphs 1** and **2** collected?

A Scientists carried out telephone surveys.

B Scientists collated information from medical databases.

C Scientists did experiments.

D Scientists did internet searches.

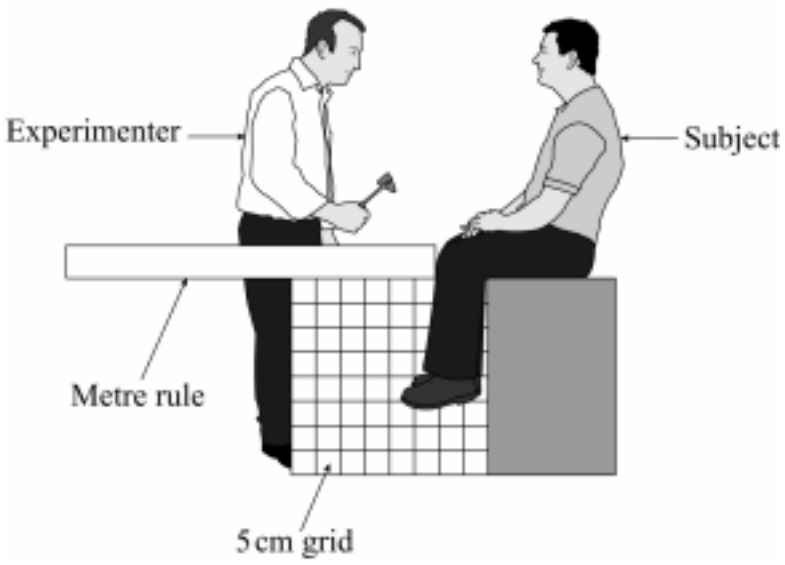
[24]

Turn over for the next question

QUESTION FOUR

When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action. A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

The diagram shows how the experiment was set up.



Each trial was recorded on a video. A frame was taken every 33 milliseconds. The video was then played using single-frame advance. The number of frames for the hammer to move to the knee was found. The faster the speed, the smaller was the number of frames. The video was also used to find the distance moved by the toe.

In each trial, the experimenter held the hammer 20 cm from the subject's knee then hit the subject's tendon. For each trial the experimenter used the hammer at a different speed.

The table shows some of the results.

Trial number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Distance hammer moved to knee (in cm)	20	20	20	20	20	20	20	20	20	20
Number of frames it took the hammer to move to the knee	15	16	12	10	9	8	7	6	2	2
Distance moved by toe (in cm)	0	0	5	5	10	10	10	10	15	15

[26]

4.1 What was the control variable in this experiment?

A The distance moved by the hammer

B The distance moved by the toe

C The number of frames

D The speed of the hammer

4.2 One advantage of using the video to record the results was that . . .

A it took less time to record the results.

B it was easier to work out an average.

C the distance moved by the hammer could be measured more accurately.

D the speed of the hammer could be measured more accurately.

4.3 Which is the best conclusion that can be drawn from the results?

A The faster the hammer moves, the further the foot moves.

B The distance the foot moves is related to the speed of the hammer.

C The speed at which the foot moves is directly proportional to the speed of the hammer.

D The slower the hammer moves, the further the foot moves.

4.4 The precision of the experiment could be improved by . . .

A using a 1 cm grid rather than a 5 cm grid.

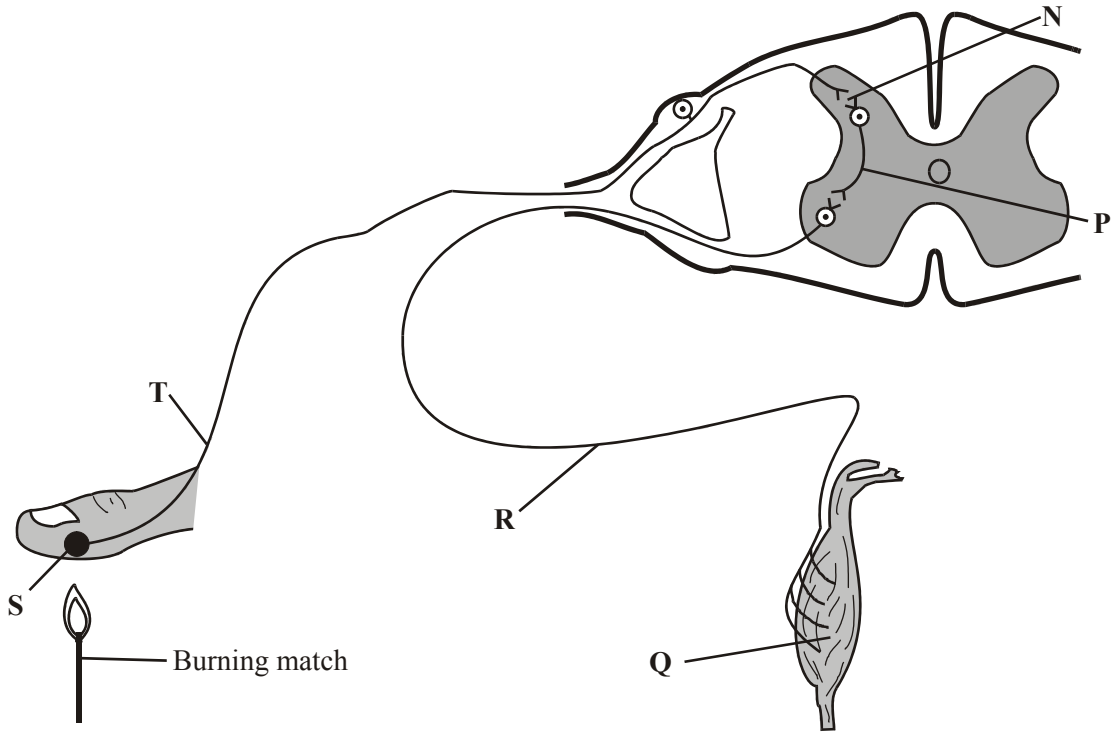
B using a greater range of hammer speeds.

C using a stop watch instead of a video.

D using a tape measure rather than a metre rule.

QUESTION FIVE

A person accidentally puts their hand close to a burning match. Their hand automatically moves away from the flame. The drawing shows the parts involved in this reflex action.



5.1 In this reflex action, the sensory neurone is found at . . .

A **P**

B **R**

C **S**

D **T**

5.2 In this reflex action, the relay neurone is found at . . .

A **P**

B **Q**

C **R**

D **T**

[28]

5.3 In this reflex action, a synapse is found at . . .

A **N**

B **P**

C **Q**

D **S**

5.4 Which of the following describes the path taken by an impulse in this reflex action?

A effector → motor neurone → relay neurone → sensory neurone

B receptor→ sensory neurone → relay neurone → motor neurone

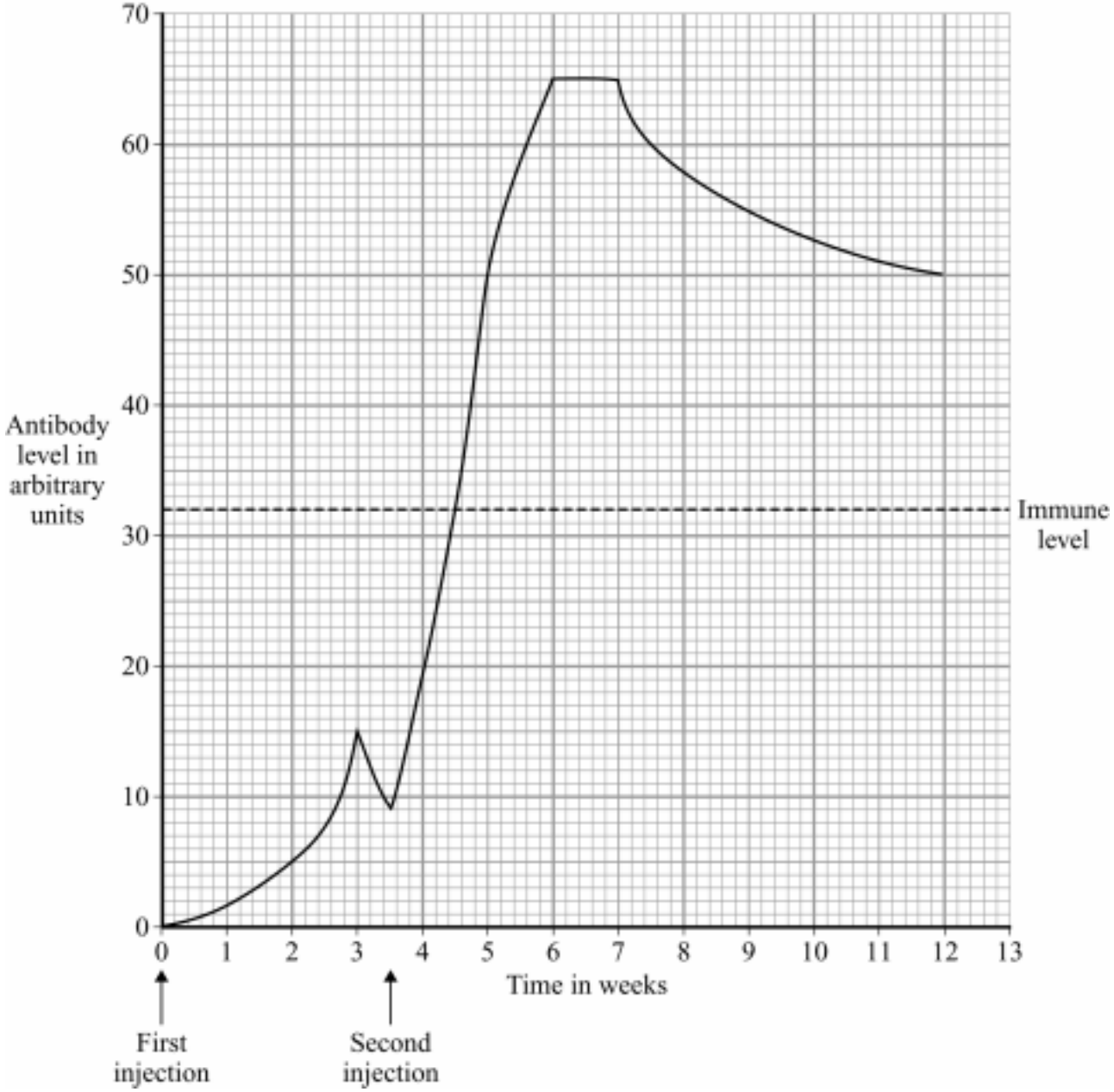
C sensory neurone → motor neurone → relay neurone → synapse

D synapse → effector → relay neurone → sensory neurone

Turn over for the next question

QUESTION SIX

The graph shows the level of antibodies in a person's blood after a first injection and then a second injection (booster dose) a few weeks later.



[30]

6.1 How long after the first injection did it take to reach the immune level?

A 1 week

B 3.5 weeks

C 4.5 weeks

D 6 weeks

6.2 By how many arbitrary units did the antibody level rise after the second injection?

A 15

B 17

C 56

D 65

6.3 We are immune to a virus after the second injection because . . .

A the number of antitoxins stays at a high level.

B the number of antibodies in the body stays at a high level.

C the virus is poisoned.

D the white cells can rapidly produce antibodies if the virus enters the body.

6.4 Antibiotics cannot be used against viruses because . . .

A viruses are too small.

B viruses can mutate.

C viruses live inside living cells.

D viruses produce toxins.

QUESTION SEVEN

Thalidomide is a controversial drug.

7.1 Thalidomide was developed as . . .

A a contraceptive pill.

B a sleeping pill.

C a slimming pill.

D an antibiotic.

7.2 Thalidomide had not been tested for use by . . .

A children.

B heart patients.

C obese people.

D pregnant women.

7.3 Thalidomide caused . . .

A breathing difficulties.

B cancer.

C deformed limbs in some babies.

D heart attacks.

7.4 It has now been fully tested for use in treating . . .

A high blood pressure.

B infertility.

C leprosy.

D obesity.

Turn over for the next question

QUESTION EIGHT

The level of cholesterol in the blood is influenced by the amount and type of fat in the diet.

8.1 Blood cholesterol levels may be reduced by eating . . .

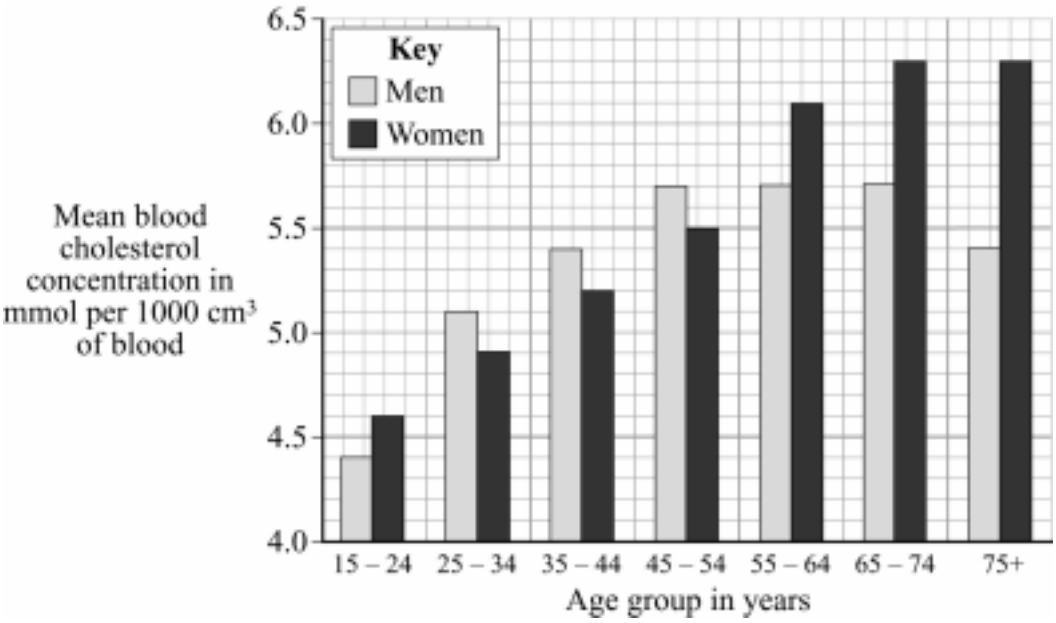
A low density lipoprotein.

B polyunsaturated fat.

C salt.

D saturated fat.

The graph shows the mean blood cholesterol concentrations of men and women in different age groups.



8.2 This data was obtained by measuring the blood cholesterol concentrations of large numbers of people. Why were a large number of people used?

A To calculate a mean

B To find the highest cholesterol level

C To get more reliable data

D To make it a fair test

8.3 From this data, which group of people has the highest risk of developing heart disease?

A Men aged 45 years and over

B Men aged 75 years

C Women aged 65 years and over

D Women aged 75 years

8.4 An ancient Indian natural medicine called Gum Guggal is said by its manufacturer to reduce blood cholesterol concentration. The manufacturer wants to market Gum Guggal in the UK.

What must happen before the Gum Guggal is allowed to be advertised for sale as a cholesterol-reducing drug in the UK?

A It must be tested for its cholesterol level.

B It must be tested for its purity.

C It must be trialled on animals.

D It must be trialled on human volunteers.

Turn over for the next question

QUESTION NINE

The menstrual cycle is controlled by hormones.

9.1 Which hormone stimulates the wall of the uterus to increase in thickness?

A FSH

B LH

C Nicotine

D Oestrogen

9.2 Which hormone stimulates egg release?

A FSH

B LH

C Nicotine

D Oestrogen

9.3 Which organ produces FSH?

A Brain

B Ovary

C Pituitary gland

D Womb

9.4 Oestrogen can be used in contraceptive pills because . . .

A it inhibits FSH production.

B it inhibits LH production.

C it stimulates FSH production.

D it stimulates LH production.

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1a - FOUNDATION TIER

Question No.	KEY
One	1 – C 2 – A 3 – B 4 – D
Two	1 – D 2 – C 3 – B 4 – A
Three	1 – D 2 – A 3 – B 4 – C
Four	1 – B 2 – C 3 – D 4 – A
Five	1 – B 2 – A 3 – D 4 – C
Six	1 – C 2 – A 3 – B 4 – D
Seven	7.1 – C, 7.2 – D, 7.3 – D, 7.4 – C
Eight	8.1 – D, 8.2 – C, 8.3 – D, 8.4 – B
Nine	9.1 – A, 9.2 – D, 9.3 – B, 9.4 – A
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1a - HIGHER TIER

Question No.	KEY
One	1 – C 2 – A 3 – B 4 – D
Two	1 – A 2 – B 3 – C 4 – D
Three	3.1 – D, 3.2 – C, 3.3 – D, 3.4 – B
Four	4.1 – A, 4.2 – D , 4.3 – B, 4.4 – A
Five	5.1 – C, 5.2 – A, 5.3 – A, 5.4 – B
Six	6.1 – C, 6.2 – C, 6.3 – D, 6.4 – C
Seven	7.1 – B, 7.2 – D, 7.3 – C, 7.4 – C
Eight	8.1 – B, 8.2 – C, 8.3 – C, 8.4 – D
Nine	9.1 – D, 9.2 – B, 9.3 – C, 9.4 – A
	Overall marks = 36

Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

General Certificate of Secondary Education
Specimen Paper

SCIENCE A
Evolution and Environment (Biology 1b)

Date and Time

For this paper you must have:
- a black ball-point pen
- an objective test answer sheet

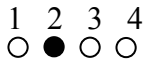
You may use a calculator.

Time allowed: 30 minutes

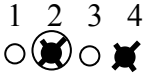
Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Evolution and Environment' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown: 

- Do **not** extend beyond the circles.
- If you want to change your answer, **you must** cross out your original answer, as shown: 

- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown: 

Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **SIX**.

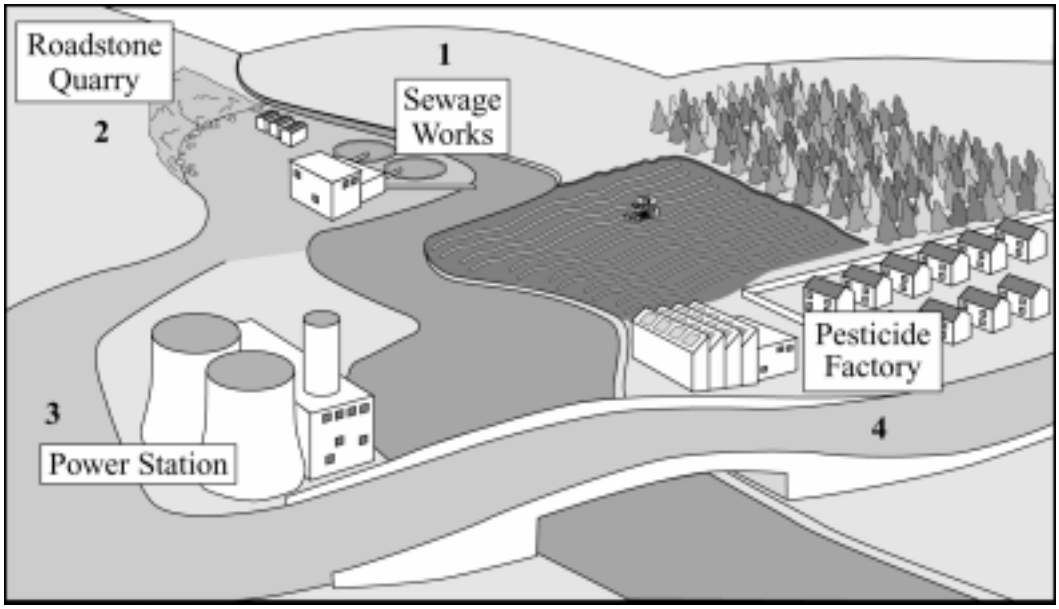
In these questions match the letters with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The drawing shows some of the ways in which humans affect the environment.



Match statements, **A**, **B**, **C** and **D**, with the parts of the drawings **1 – 4**.

A Every year, this place destroys more homes of animals and plants.

B This place causes most water pollution.

C This place produces chemicals that pollute soil.

D This place produces most carbon dioxide.

[40]

QUESTION TWO

These young rabbits look like their parents.

This is because information about characteristics such as fur colour is passed from parent to their young.

Match words, **A**, **B**, **C** and **D,** with the spaces **1 – 4** in the sentences.

A Chromosomes

B Genes

C Nucleus

D Sex

Information is passed from parents to their young in …**1**… cells.

Each characteristic, eg fur colour, is controlled by …**2**… .

The structures which carry information for a large number of characteristics are called …**3**… .

The part of the cell which contains these structures is called the …**4**… .

QUESTION THREE

Some substances affect the environment.

Match words, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the sentences.

A Carbon dioxide

B Fertiliser

C Methane

D Sulfur dioxide

The main substance that produces acid rain is …**1**… .

The main substance given off by cars is …**2**… .

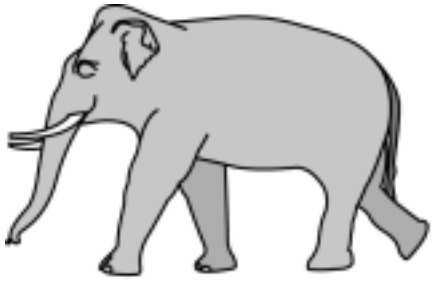
The substance produced mainly by cattle and rice fields is …**3**… .

The substance that may pollute both land and water is …**4**… .

QUESTION FOUR

Animals are adapted to survive in their environments.

The drawings show four animals.



African elephant

Arctic hare

Musk ox

Walrus

Match words, **A**, **B**, **C**, and **D**, with the spaces **1 – 4** in the sentences.

A A large amount of body fat

B Camouflage

C Increased surface area

D Thick fur

A white coat in the Arctic hare acts as …**1**… .

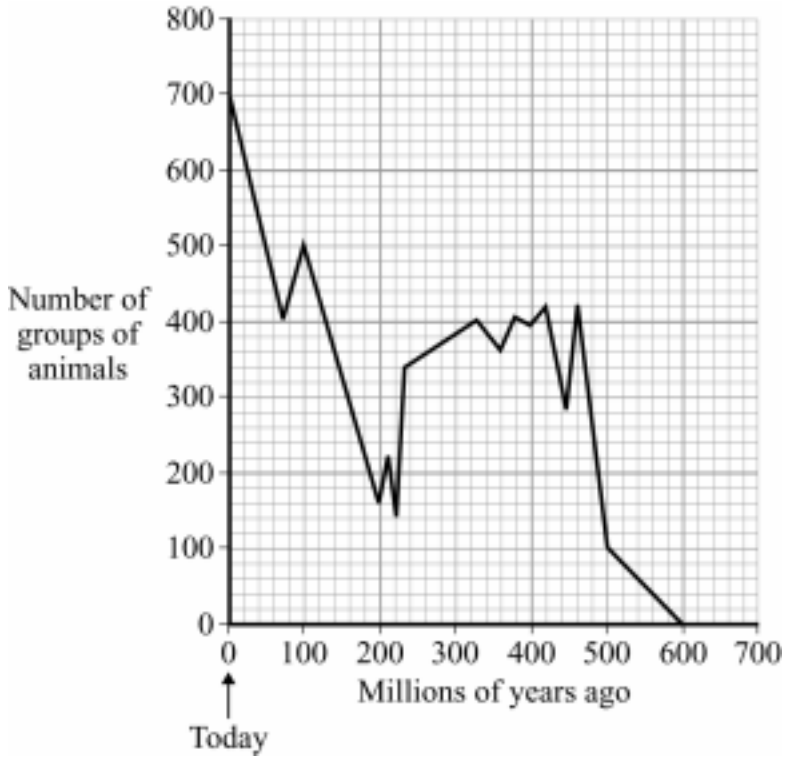
The large ears of an African elephant give it an …**2**… .

The musk ox is insulated by …**3**… .

The walrus is insulated by …**4**… .

QUESTION FIVE

The diagram shows how the number of groups of animals has changed during the history of life on Earth.



Match numbers, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the sentences.

A 20

B 400

C 500

D 600

Animals first appeared on Earth …**1**… million years ago.

400 million years ago there were …**2**… groups of animals.

It took …**3**… million years for the number of animals to rise to 500.

The proportion of animals that became extinct between 100 and 80 million years ago was …**4**… .

QUESTION SIX

We can now produce animals and plants with characteristics that we prefer.

Match words, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the sentences.

A Splitting apart cells

B Taking cuttings

C Transferring genes

D Using small groups of cells

Plants can be produced cheaply by …**1**… from an older plant.

Tissues culture involves …**2**… from part of an organism.

Genetic engineering involves …**3**… from one organism to another.

Embryo transplantation involves …**4**… from an organism before they specialise.

Turn over for the next question

SECTION B

Questions **SEVEN** to **NINE**.

Each of these questions has four parts.

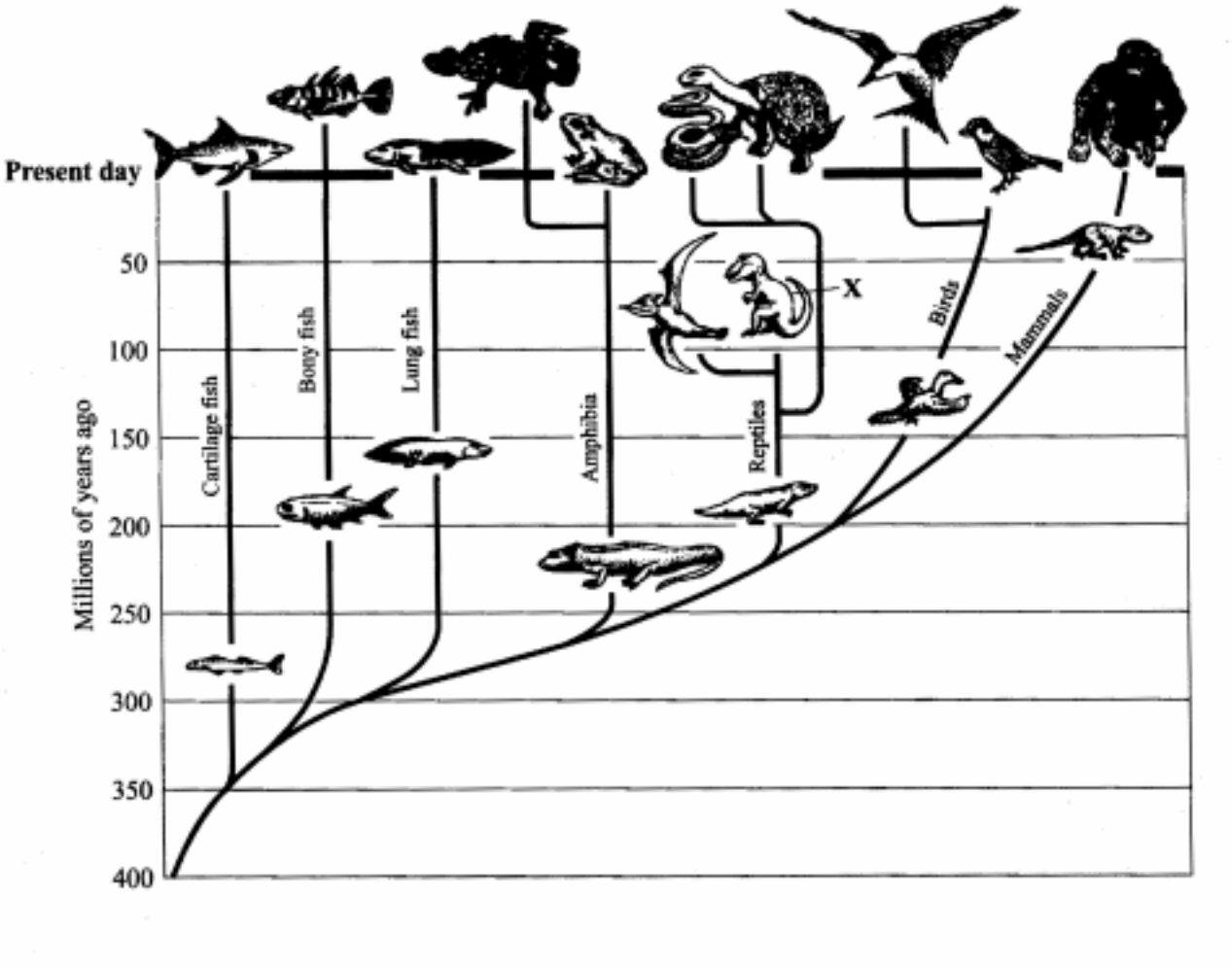
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SEVEN

The diagram shows a timeline for the evolution of some groups of animals.

All the groups shown below the line for **Present Day** are extinct.



[46]

7.1 Which four groups of animals developed legs?

A Amphibians, reptiles, birds and mammals

B Bony fish, lung fish, amphibians and reptiles

C Cartilaginous fish, bony fish, lung fish and amphibians

D Lung fish, amphibians, reptiles and birds

7.2 Which group of animals, shown in the diagram, evolved first?

A Amphibians

B Bony fish

C Cartilaginous fish

D Lung fish

7.3 The animal, labelled **X**, has been extinct for over 50 million years. How do scientists know that it once lived?

A From blood samples

B From DNA samples

C From fossils

D From stories passed down through generations

7.4 Animals may become extinct because of new . . .

A diseases.

B enzymes.

C hormones.

D rocks.

QUESTION EIGHT

Lichens are simple plants that are easily damaged by air pollution.

The table show how many different species of lichen were recorded at set distances from a city centre.

Distance from city centre in km	Number of species of lichen found in a given area
0	4
2	7
3	10
5	20
6	25
7	40

8.1 The least polluted air is found . . .

A in the city centre.

B 2 km from the city centre.

C 5 km from the city centre.

D 7 km from the city centre.

8.2 What is the relationship, if any, between the number of lichen species and distance from the city centre?

A The number of lichen species is directly proportional to the distance from the city centre.

B The number of lichen species is inversely proportional to the distance from the city centre.

C The number of lichen species is **not** related to the distance from the city centre.

D The number of lichen species is related to the distance from the city centre.

Lichens are also indicators of the age of a forest. The more species of lichen present, the older the forest.

8.3 What would be the best way of collecting data on lichens to compare the ages of two very large forests?

A Examine every tree in the two forests.

B Examine 10 trees from each forest.

C Examine the oldest trees in each forest.

D Examine the trees in one square kilometre of each forest.

8.4 Which computer application would be best for storing results from a survey of lichen in a large number of different forests?

A Communications package

B Database

C Graphics package

D Word processor

.

Turn over for the next question

QUESTION NINE

Professor John Lawton researches into the problem of controlling the spread of bracken. He is waiting for government permission to release the *Conservular* caterpillar which feeds on the bracken. The Secretary of State has to decide whether the *Conservular* caterpillar can be released.

The article printed below describes some of the problems faced by the Secretary of State.

David the caterpillar to bracken's Goliath

Bracken is one of the most widespread and dangerous weeds known to man. Professor Lawton is researching a new method of controlling bracken with *Conservular* caterpillars which could have done the job for nothing.

His research has shown that bracken is the caterpillar's only food. However, can scientists predict what will happen when insects are released into the wild?

Bracken is poisonous – more than 20 000 sheep and 1000 cattle are poisoned by it each year. Its spores can cause hill walkers to develop cancer. Bracken cost £4 m a year to control. It destroys grazing land worth £5 m each year.

The National Farmers Union is concerned about the caterpillar getting out of control. What if it started eating potatoes? However, the caterpillar might help to preserve important habitats for rare animals and plants.

World-wide, scientists are trying to control 94 species of weeds by using insects. Professor Lawson says that there is good control in approximately one-third of these cases.

9.1 A student performs an experiment to find whether caterpillars prefer eating garden ferns to bracken.

What would be the independent variable in this experiment?

A The amount of plant eaten

B The number of caterpillars

C The number of plants

D The types of plant

[50]

9.2 How could the validity of the experiment be improved?

A By increasing the number of caterpillars and the number of plants

B By increasing the number of plants of each type

C By increasing the number of types of caterpillar

D By increasing the number of types of plant

9.3 The Secretary of State might decide **not** to allow the caterpillar to be released. One reason for this could be that . . .

A it would cost too much money.

B it would upset the National Farmers Union.

C it would upset the Ramblers Association.

D there is insufficient scientific evidence about the effects of releasing the caterpillar.

9.4 What will be the effect on hill farms if the Secretary of State decides that the caterpillar should **not** be released?

A Hill farms will become less profitable.

B More ramblers will use the countryside.

C Some hill farms will be turned into forests.

D There will be more grazing land for sheep on hill farms.

END OF TEST

You must do **one Tier** only, **either** the Foundation tier **or** the Higher Tier.
The Foundation Tier starts earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** to **TWO**.

In these questions match the letters with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

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Match words, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the sentences.

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Plants can be produced cheaply by …**1**… from an older plant.

Tissue culture involves …**2**… from part of an organism.

Genetic engineering involves …**3**… from one organism to another.

Embryo transplantation involves …**4**… from an organism before they specialise.

QUESTION TWO

The Earth's climate is affected by several factors.

Match words, **A**, **B**, **C** and **D**, with the spaces **1 – 4** in the sentences.

A Carbon dioxide

B Energy

C Methane

D Temperature

Deforestation increases the amount of …**1**… in the air.

Growing rice crops increases the amount of …**2**… in the air.

Some gases absorb …**3**… radiated by the Earth.

This causes the Earth's …**4**… to increase.

Turn over for the next question

SECTION B

Questions **THREE** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION THREE

Lichens are simple plants that are easily damaged by air pollution.

The table shows how many different species of lichen were recorded at set distances from a city centre.

Distance from city centre in km	Number of species of lichen found in a given area
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2	7
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3.1 The least polluted air is found . . .

A in the city centre.

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A Communications package

B Database

C Graphics package

D Word processor

Turn over for the next question

QUESTION FOUR

Professor John Lawton researches into the problem of controlling the spread of bracken. He is waiting for government permission to release the *Conservular* caterpillar which feeds on the bracken. The Secretary of State has to decide whether the *Conservular* caterpillar can be released. The article printed below describes some of the problems faced by the Secretary of State.

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What would be the independent variable in this experiment?

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A Hill farms will become less profitable.

B More ramblers will use the countryside.

C Some hill farms will be turned into forests.

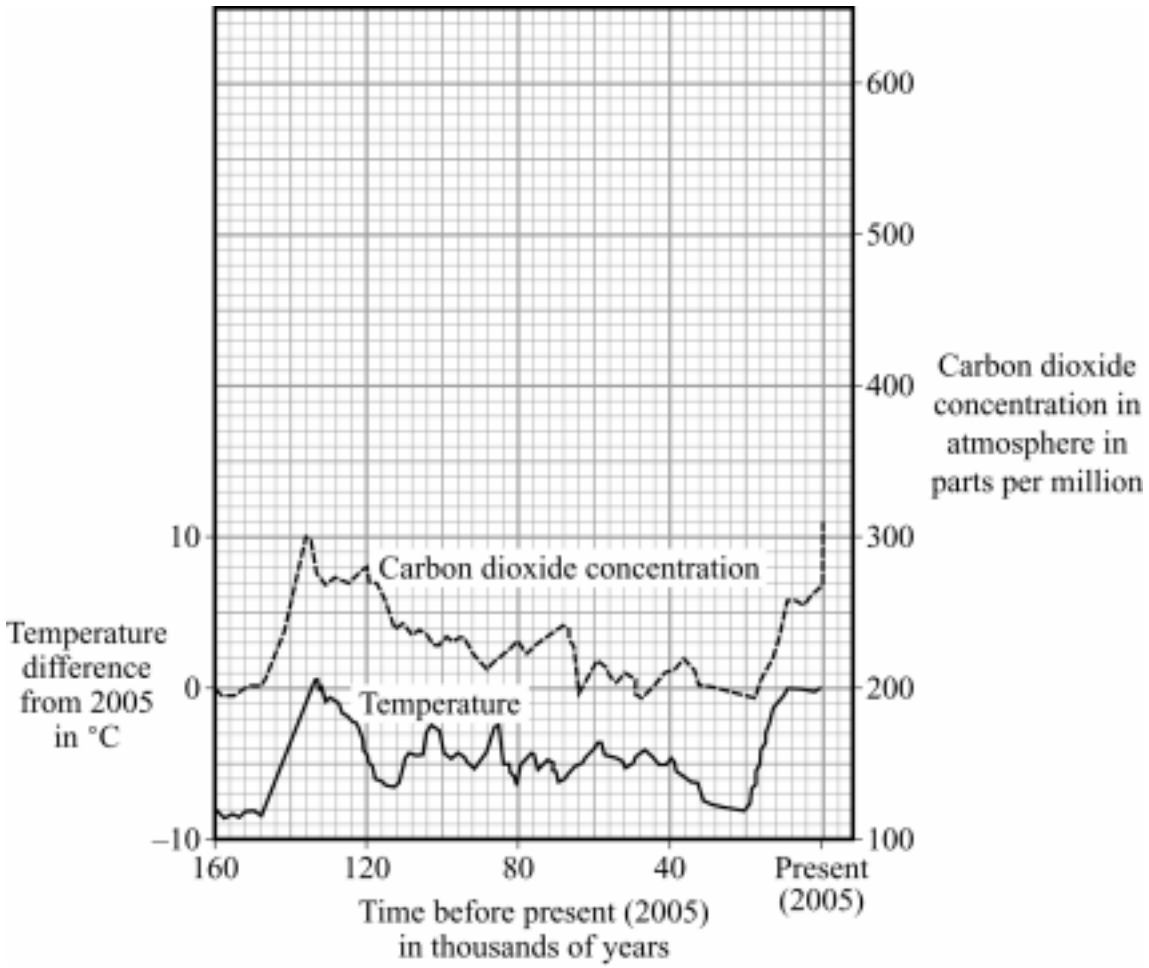
D There will be more grazing land for sheep on hill farms.

Turn over for the next question

QUESTION FIVE

Scientists have analysed air bubbles trapped in ice in Antarctica.

The graph shows some of the data they have collected.



5.1 What was the carbon dioxide concentration 120 thousand years ago?

A 200 parts per million

B 220 parts per million

C 280 parts per million

D 300 parts per million

[58]

5.2 The mean temperature in Antarctica today is – 2 °C. What was the mean temperature in Antarctica 160 thousand years ago?

A 0 °C

B – 1 °C

C – 8 °C

D – 10 °C

5.3 Over the last 160 thousand years, the concentration of carbon dioxide in the atmosphere has . . .

A fallen steadily.

B fluctuated, but shown an overall decrease.

C fluctuated, but shown an overall increase.

D risen steadily.

5.4 The data . . .

A proves that carbon dioxide causes the greenhouse effect.

. **B** shows an exact correlation between carbon dioxide concentration and the air temperature.

C shows partial correlation between carbon dioxide concentration and the air temperature.

D shows that air temperature depends on carbon dioxide concentration.

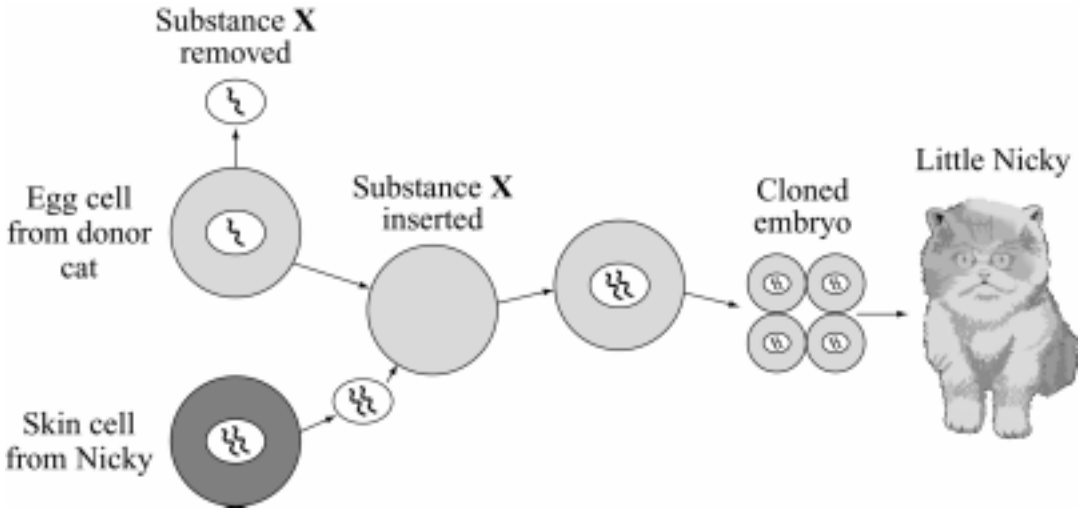
Turn over for the next question

QUESTION SIX

Read the passage below about cloning.

> The first cloned-to-order pet sold in the United States is named Little Nicky, a 9-week-old kitten delivered to a Texas woman saddened by the loss of a cat she had owned for 17 years. The kitten cost its owner $50,000 and was created from substance **X** from her beloved cat, named Nicky, who died last year.
>
> "He is identical. His personality is the same," the owner, Julie, told The Associated Press in a telephone interview. She asked that her last name and home town not be disclosed because she said she fears being targeted by groups opposed to cloning.

The diagram shows how Nicky was cloned.



6.1 Substance **X** is . . .

A carbohydrate.

B DNA.

C fat.

D protein.

[60]

6.2 This technique involves . . .

A asexual reproduction.

B fertilisation.

C mutations.

D sexual reproduction.

6.3 Nicky and little Nicky are identical because they have the same . . .

A cells.

B enzymes.

C genes.

D personality.

6.4 On which grounds are people most likely to object to this technique?

A Economic

B Ethical

C Scientific

D Social

Turn over for the next question

QUESTION SEVEN

Most scientists accept the theory of evolution.

7.1 The theory of evolution states that all living things alive today have evolved from . . .

A chemicals.

B dead organisms.

C meteorites.

D simple life forms.

7.2 Scientists are uncertain about how life began on Earth because . . .

A humans were one of the most recent species to evolve.

B living things first appeared a long time ago.

C the evidence has been destroyed.

D there are religious arguments about it.

7.3 The most likely reason for the extinction of all the dinosaurs is that . . .

A conditions on Earth changed.

B there were too many of them.

C they caught a disease.

D they had too many predators.

7.4 New forms of genes arise by . . .

A asexual reproduction.

B changes to cells.

C mutation.

D sexual reproduction.

Turn over for the next question

QUESTION EIGHT

Coastal marshes can provide grazing for cattle and sheep. They also support huge numbers of birds and a wide range of water, plant and animal communities. Some of these communities include nationally rare species.

There has been a dramatic reduction in the extent of the grazing marshes in the estuary of the River Thames in recent years. These grazing marshes are downstream from the capital city, London. The table shows what some of the grazing marshes have been converted into.

Converted to	**Mean Annual Rate of Conversion to Other Land Uses (Hectares/Year)**			
	1935–68	**1968–72**	**1972–81**	**1981–89**
Arable (crop-growing)	49	188	90	102
Formal open spaces (parks)	11	30	12	27
Open water	9	9	7	4
Roads and buildings	83	186	142	45
Woodland	3	1	3	2

8.1 How many hectares of marshes were converted into roads and buildings between the years 1968 and 1972?

A 142

B 186

C 744

D 930

8.2 What was the percentage change in the mean annual rate of conversion of marshes to formal open spaces (parks), from the period 1972–81 to the period 1981–89?

A 15.0

B 44.4

C 55.5

D 125.0

8.3 What is the most likely effect on the environment of converting marshes to crop growing?

A More air pollution

B More land pollution

C More water pollution

D More land and water pollution

8.4 What is the most likely effect on plant life of converting marshes to crop growing?

A There are likely to be more plants.

B There are likely to be fewer plants.

C There are likely to be more plant species.

D There are likely to be fewer plant species.

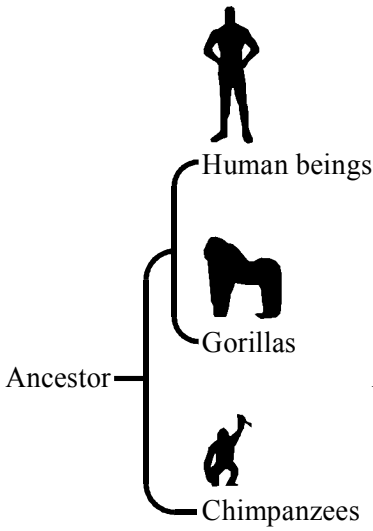
Turn over for the next question

QUESTION NINE

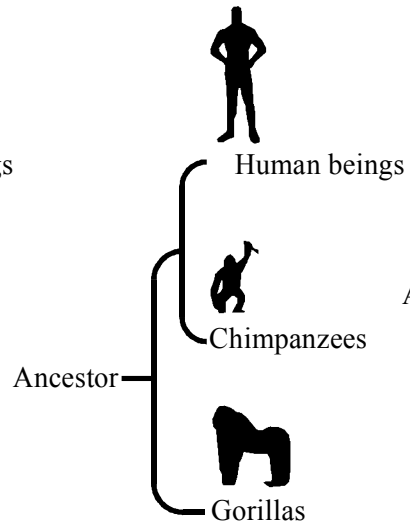
Biologists believe that human beings, gorillas and chimpanzees share a common ancestor. They do not agree as to how this common ancestor evolved into these three species.

The diagram shows three models representing the evolutionary relationship between the three species and the ancestor.

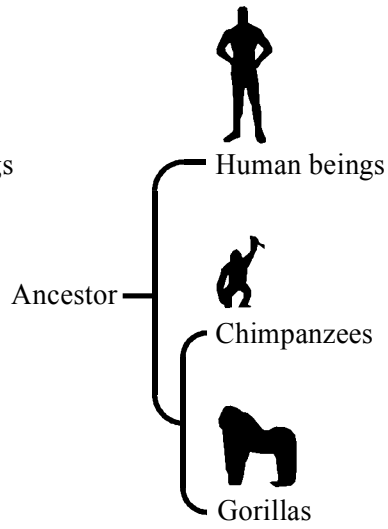
Relationship 1
Human beings and gorillas closely related



Relationship 2
Human beings and chimpanzees closely related



Relationship 3
Chimpanzees and gorillas closely related



The table summarises some of the available evidence concerning the relationship between the three species.

Characteristic	Gorillas	Humans	Chimpanzees	Relationship indicated (if any)
Bones/teeth	Legs shorter than arms	Arms shorter than legs	Legs shorter than arms	**3**
	Large canine teeth	Small canine teeth	Large canine teeth	**2**
	Short thumbs	Long thumbs	Short thumbs	**W**
Soft parts of body	Short head hair	Long head hair	Short head hair	**3**
	Thin buttocks	Fat buttocks	Thin buttocks	**3**
Chromosomes	Total number = **X**	Total number = 46	Total number = 48	**3**
	Structure of chromosomes 5 and 12 differs from other primates	Structure of chromosomes 5 and 12 like other primates	Structure of chromosomes 5 and 12 = **Y**	**3**
	Fluorescence of chromosome Y same as humans	Fluorescence of chromosome Y same as gorilla	Fluorescence of chromosome Y same as other primates	**1**
Molecules	Slight difference from human haemoglobin		Identical to human haemoglobin	**Z**

9.1 What relationship, (**W**), if any, is indicated by thumb length?

A Relationship **1**

B Relationship **2**

C Relationship **3**

D No relationship

9.2 What relationship, (**Z**), if any, is indicated by haemoglobin?

A Relationship **1**

B Relationship **2**

C Relationship **3**

D No relationship

9.3 How many chromosomes, (**X**), does a gorilla have?

A 23

B 46

C 48

D 50

9.4 What is the most likely appearance of chromosomes 5 and 12 in the chimpanzee (**Y**)?

A Identical with human

B Identical with gorilla

C Different from human

D Different from gorilla

END OF TEST

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1b - FOUNDATION TIER

Question No.	KEY
One	1 – B 2 – A 3 – D 4 – C
Two	1 – D 2 – B 3 – A 4 – C
Three	1 – D 2 – A 3 – C 4 – B
Four	1 – B 2 – C 3 – D 4 – A
Five	1 – D 2 – B 3 – C 4 – A
Six	1 – B 2 – D 3 – C 4 – A
Seven	7.1 – A, 7.2 – C, 7.3 – C, 7.4 – A
Eight	8.1 – D, 8.2 – D, 8.3 – D, 8.4 – B
Nine	9.1 – D, 9.2 – A, 9.3 – D, 9.4 – A
	Overall marks = 36

GCSE SCIENCE A

OBJECTIVE TEST ANSWER KEY

UNIT BIOLOGY 1b - HIGHER TIER

Question No.	KEY
One	1 – B 2 – D 3 – C 4 – A
Two	1 – A 2 – C 3 – B 4 – D
Three	3.1 – D, 3.2 – D, 3.3 – D, 3.4 – B
Four	4.1 – D, 4.2 – A, 4.3 – D, 4.4 – A
Five	5.1 – C, 5.2 – D, 5.3 – C, 5.4 – C
Six	6.1 – B, 6.2 – A, 6.3 – C, 6.4 – B
Seven	7.1 – D, 7.2 – C, 7.3 – A, 7.4 – C
Eight	8.1 – B, 8.2 – D, 8.3 – D, 8.4 – D
Nine	9.1 – C, 9.2 – B, 9.3 – C, 9.4 – B
	Overall marks = 36

Surname		Other Names	
Centre Number			Candidate Number									
Candidate signature												

Leave blank

General Certificate of Secondary Education
Specimen Paper

SCIENCE B
Unit Biology 1

BIOLOGY
Unit Biology 1

Foundation Tier

F

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

Date and Time

For this paper you must have:
- a ruler

You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use			
Number	Mark	Number	Mark
1		9	
2		10	
3			
4			
5			
6			
7			
8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

1 The drawing shows a cape fox.

The cape fox has receptors which are sensitive to changes in the environment.

(a) Write down **one** part of the cape fox's body where there are:

(i) receptors that are sensitive to light .....

(ii) receptors which help it to keep its balance .....

(iii) receptors which are sensitive to chemicals. .....

(3 marks)

(b) The cape fox lives in a hot desert.

Write down **one** way in which the cape fox is adapted for losing heat.

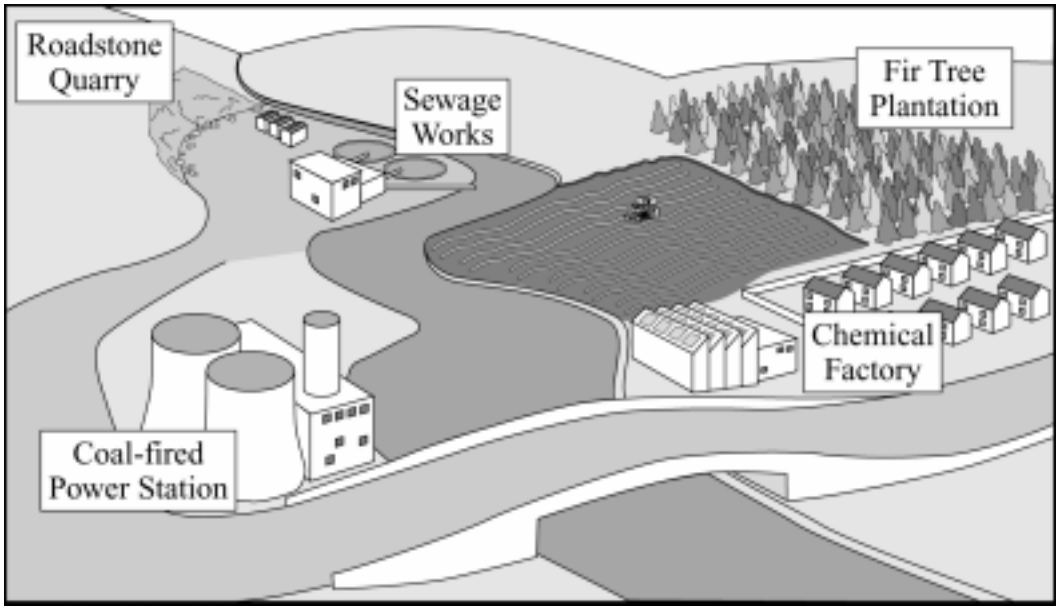
.....

.....

(1 mark)

4

2 The drawing shows some of the ways in which humans affect the environment.



Use information from the drawing to help you to answer these questions.

(a) Write down **three** ways in which humans have reduced the amount of land available to other animals and plants.

1 .....

2 .....

3 .....

(3 marks)

(b) Smoke from the power station contains several gases that pollute the atmosphere.

Name **one** of these gases.

.....

(1 mark)

(c) Write down **one** way in which the water in the river might become polluted.

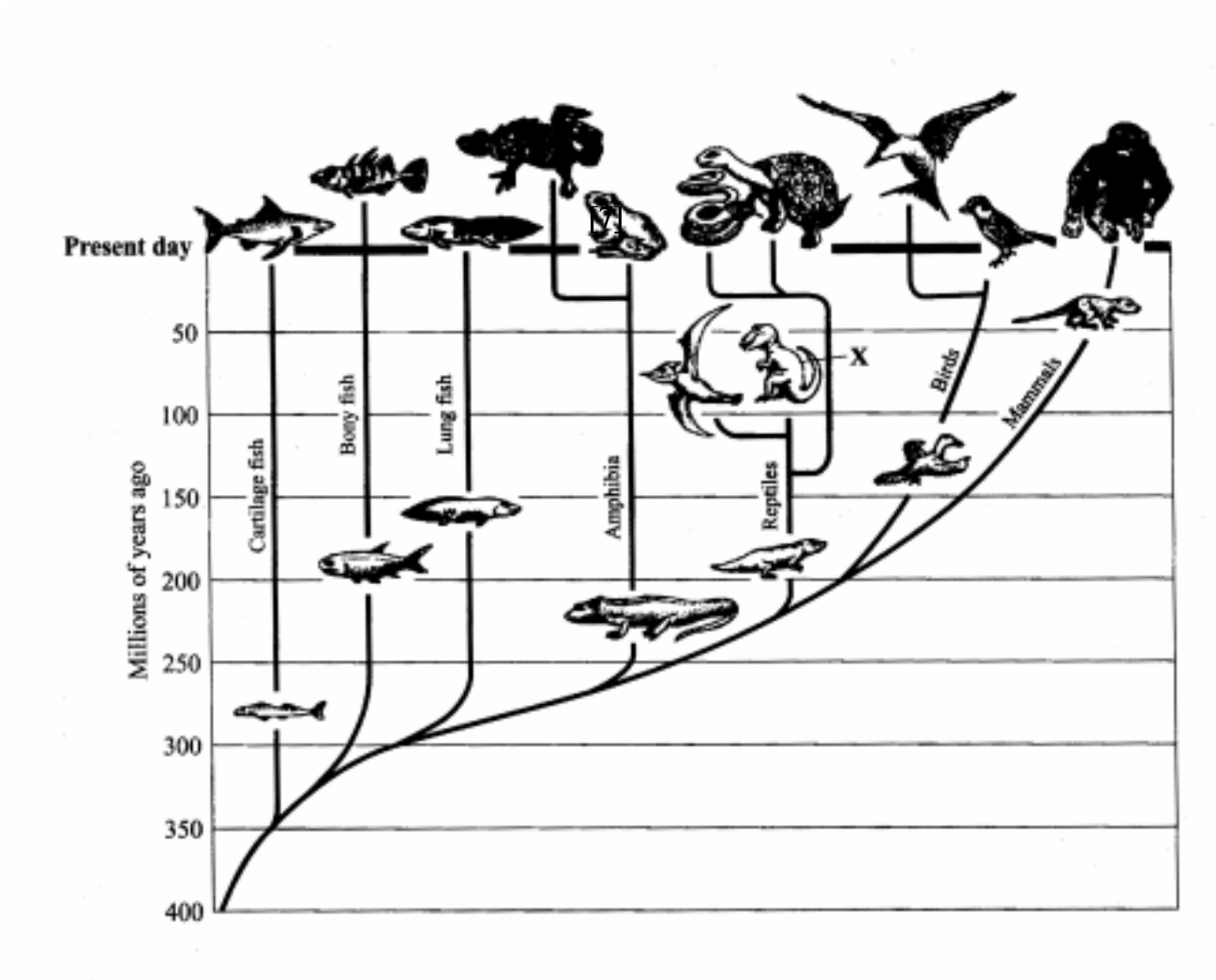
.....

(1 mark)

5

3 The diagram shows a timeline for the evolution of some groups of animals.

All the groups shown below the line for **Present day** are extinct.



Use information from the diagram to answer these questions.

(a) Name the **four** groups of animals which developed legs.

1 .....

2 .....

3 .....

4 .....

(1 mark)

LEAVE MARGIN BLANK

(b) Which group of animals shown in the diagram evolved first?

.....

(1 mark)

(c) The animal labelled **X** has been extinct for over 50 million years.

How do scientists know that it once lived?

.....

(1 mark)

(d) Complete the sentence by using the correct words from the box.

diseases	**enzymes**	**hormones**	**plants**	**predators**	**rocks**

Animals may become extinct because of new ..... and new ..... .

(2 marks)

5

Turn over for the next question

4 Obesity is a condition in which people are overweight.

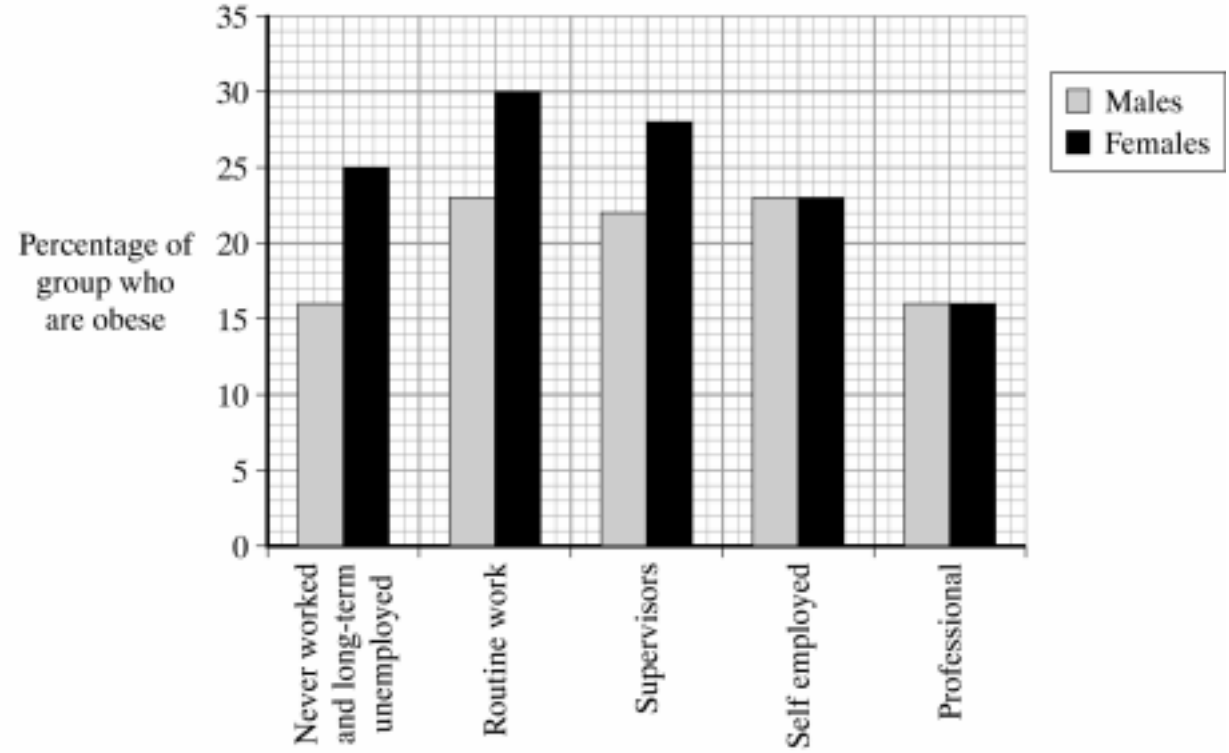
(a) Write down **two** health problems caused by obesity.

1 .....

2 .....

(2 marks)

(b) The graph shows the percentage of people in different occupations who are obese.



(i) Which group has the highest percentage of obese people?

.....

(1 mark)

(ii) Suggest an explanation for this.

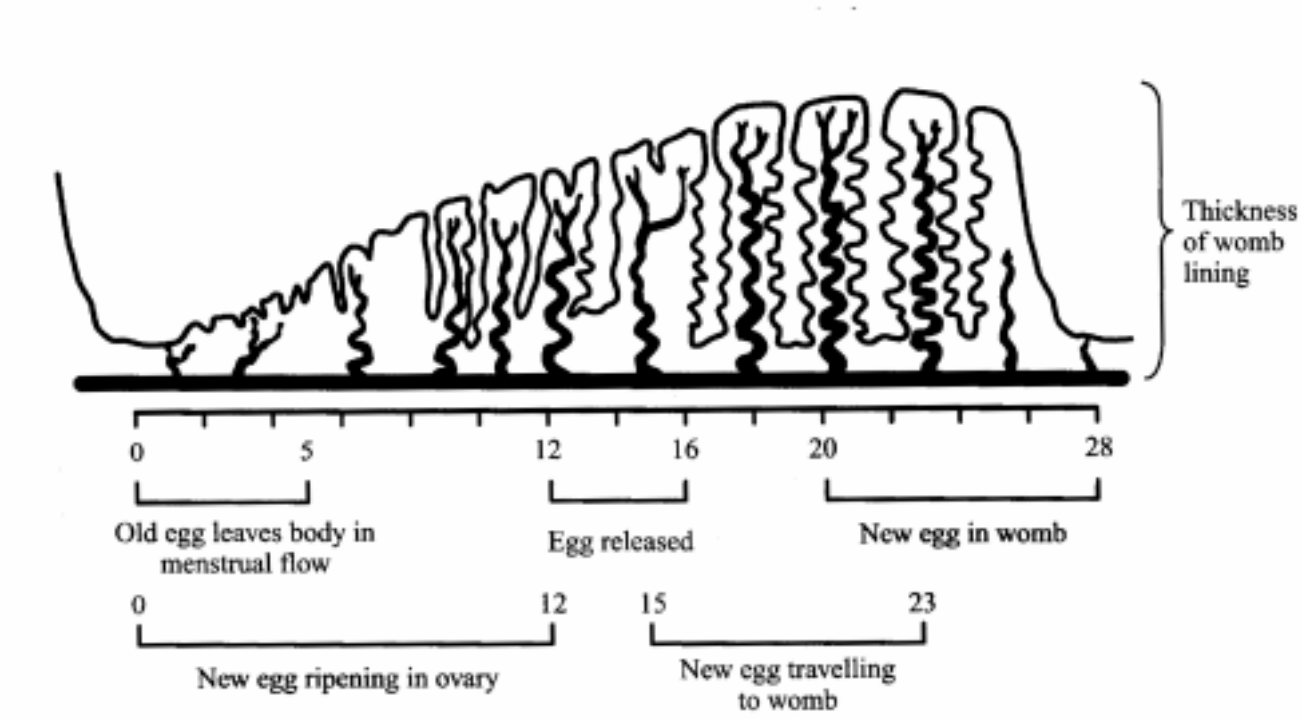
.....

.....

(1 mark)

4

5 The diagram shows some of the events in a woman's monthly cycle.



(a) On which day of the cycle is the lining of the womb thickest?

.....

(1 mark)

(b) On how many days in a month might an egg be released?

.....

(1 mark)

(c) Birth control pills (oral contraceptives) contain hormones.

Which event in the diagram is prevented by these hormones?

.....

(1 mark)

Question 5 continues on the next page

(d) 'The Shot' is a method of contraception, in which a hormone is injected into a woman once every three months.

These are some facts about 'the Shot':

- effective for twelve weeks
- must receive 'the Shot' every three months
- helps prevent cancer of the lining of the uterus
- no pill to take daily
- takes about 10 months to get pregnant after getting the last shot
- nothing to put in place before vaginal intercourse
- some women will have longer, heavier periods
- may not be used continuously for more than two years.

Use the above information to write down **two** disadvantages of 'the Shot' as a method of contraception.

1 .....

2 .....

(2 marks)

5

6 These young rabbits look like their parents.

This is because information about characteristics such as fur colour is passed from parents to their young.

Complete the sentence by using the correct words from the box.

body	**chromosomes**	**clones**	**cytoplasm**	**genes**	**nucleus**	**sex**

Information is passed from parents to their young in..... cells.

Each characteristic, eg fur colour, is controlled by ..... .

The structures which carry information for a large number of characteristics are called

..... .

The part of the cell which contains these structures is called the ..... .

(4 marks)

4

Turn over for the next question

7 Each January, the RSPB (Royal Society for the Protection of Birds) organises the **Big Garden Birdwatch**. About 400 000 volunteers take part.

This is to find the most commonly seen garden birds. These are the instructions given to volunteers.

- Choose one hour over the weekend of 29–30 January to watch birds in your garden, local park or school.
- Then tell us the highest number that you see at any one time (not the total number that you see in one hour).
- You only need to record the birds that actually land (not the ones flying over).

The table shows what one volunteer recorded.

Bird	Most seen at one time
Blackbird	2
Blue tit	2
Chaffinch	0
Coal tit	0
Collared dove	2
Goldfinch	0
Great tit	0
Greenfinch	0
House sparrow	6
Long-tailed tit	1
Magpie	2
Robin	1
Starling	8

[13]

(a) The volunteers were all asked to do the survey on the weekend of 29–30 January.

Explain why.

.....

.....

(1 mark)

(b) The volunteers were told **not** to count the total number of birds seen in one hour.

Explain why.

.....

.....

(1 mark)

(c) The volunteer said "My results show that starlings are the most common garden bird."

Was she correct?
Give the reason for your answer.

.....

.....

(1 mark)

(d) The RSPB have collected questionnaires from 400 000 people

Suggest the best method of storing this data so that it could be analysed quickly.

.....

.....

.....

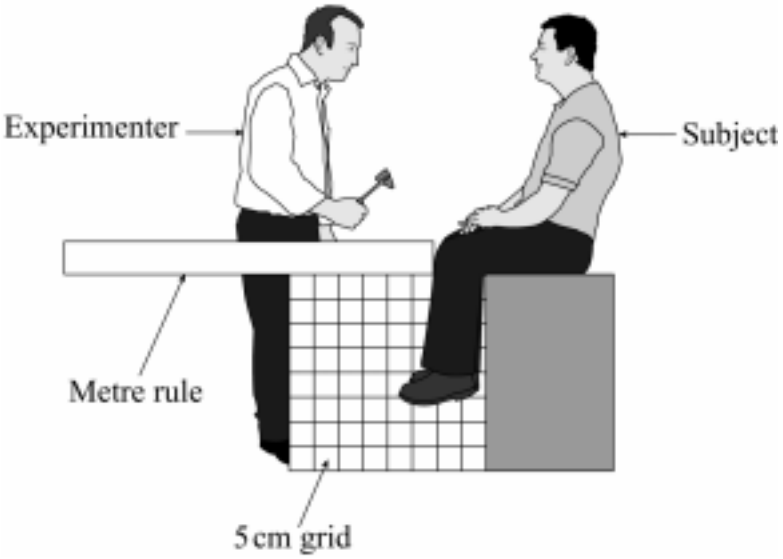
.....

(2 marks)

5

8 When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action. A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

The diagram shows how the experiment was set up.



Each trial was recorded on a video. A frame was taken every 33 milliseconds. The video was then played using single-frame advance. The number of frames for the hammer to move to the knee was found. The faster the speed, the smaller was the number of frames. The video was also used to find the distance moved by the toe.

In each trial, the experimenter held the hammer 20 cm from the subject's knee and then hit the subject's tendon. For each trial the experimenter used the hammer at a different speed.

The table shows some of the results.

Trial number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Distance hammer moved to knee (in cm)	20	20	20	20	20	20	20	20	20	20
Number of frames it took the hammer to move to the knee	15	16	12	10	9	8	7	6	2	2
Distance moved by toe in cm	0	0	5	5	10	10	10	10	15	15

(a) What was the control variable in this experiment?

.....

(1 mark)

(b) Give **two** advantages of using a video to measure the time it took for the hammer to move to hit the tendon.

1 .....

.....

2 .....

.....

(2 marks)

(c) Give **one** conclusion from the results of the experiment.

.....

.....

(1 mark)

(d) Give **one** way in which the precision of the experiment could have been improved.

.....

.....

(1 mark)

5

Turn over for the next question

LEAVE MARGIN BLANK

9 The picture shows a child being vaccinated with the MMR vaccine.

(a) Measles is caused by a virus.

Why does a virus infection makes us feel ill?

.....

.....

(1 mark)

(b) Explain, as fully as you can, how vaccination prevents disease.

.....

.....

.....

.....

.....

.....

(3 marks)

4

Turn over for the next question

10 Professor John Lawton researches into the problem of controlling the spread of bracken. He is waiting for government permission to release the *Conservular* caterpillar which feeds on the bracken. The Secretary of State has to decide whether the *Conservular* caterpillar can be released.

The article printed below describes some of the problems faced by the Secretary of State.

David the caterpillar to bracken's Goliath

Bracken is one of the most widespread and dangerous weeds known to man. Professor Lawton is researching a new method of controlling bracken with *Conservular* caterpillars which could have done the job for nothing.

His research has shown that bracken is the caterpillar's only food. However, can scientists predict what will happen when insects are released into the wild?

Bracken is poisonous – more than 20 000 sheep and 1000 cattle are poisoned by it each year. Its spores can cause hill walkers to develop cancer. Bracken cost £4 m a year to control. It destroys grazing land worth £5 m each year.

The National Farmers Union is concerned about the caterpillar getting out of control. What if it started eating potatoes? However, the caterpillar might help to preserve important habitats for rare animals and plants.

World-wide, scientists are trying to control 94 species of weeds by using insects. Professor Lawson says that there is good control in approximately one-third of these cases.

Use information from the passage to help you to answer these questions.

(a) Why might the Secretary of State decide to allow the caterpillar to be released?

Explain the reasons for your answer.

.....

.....

.....

.....

.....

.....

(2 marks)

LEAVE MARGIN BLANK

(b) Why might the Secretary of State decide **not** to allow the caterpillar to be released.

Explain the reasons for your answer.

.....

.....

.....

.....

.....

.....

(2 marks)

4

END OF QUESTIONS

Biology 1F Mark Scheme

Question 1

	answers	extra information	mark
(a)(i)	eyes		1
(ii)	ears		1
(iii)	nose / mouth / tongue		1
(b)	large ears		1
Total			**4**

Question 2

	answers	extra information	mark
(a)	any **three** from: • roads • buildings • farmland • quarries • tips • forests • reservoirs • canals • sewage farms		3
(b)	sulfur dioxide / nitrogen oxides (or named) / carbon monoxide / carbon dioxide		1
(c)	sewage / fertiliser / pesticide / herbicide / nitrate / phosphate		1
Total			**5**

Question 3

	answers	extra information	mark
(a)	amphibia, reptile, birds, mammals		1
(b)	cartilage fish		1
(c)	from fossils		1
(d)	diseases predators		1 1
Total			**5**

Question 4

	answers	extra information	mark
(a)	any **two** from: • arthritis • diabetes • high blood pressure • heart disease		2
(b)(i)	females in routine work		1
(ii)	eg poor diet / lack of exercise		1
Total			**4**

Question 5

	answers	extra information	mark
(a)	21 / 22		1
(b)	5 (days)		1
(c)	egg release / new egg ripening		1
(d)	any **two** from: • takes 10 months to get pregnant after last shot • some women have longer / heavy periods • may not be used continuously for more than 2 years		2
Total			**5**

Question 6

	answers	extra information	mark
	sex genes chromosomes nucleus		1 1 1 1
Total			**4**

Question 7

	answers	extra information	mark
(a)	eg conditions same for all observers / some birds migrate		1
(b)	some might be counted twice		1
(c)	(no) sample too small / sample could be biased		1
(d)	computer database		1 1
Total			**5**

Question 8

	answers	extra information	mark
(a)	distance moved by hammer		1
(b)	permanent record of result very short time (for hammer to move) can be measured accurately		1 1
(c)	the faster the hammer moves, the further the lower leg jerks		1
(d)	use 1 cm grid		1
Total			**5**

Question 9

	answers	extra information	mark
(a)	produce toxins / damage cells in which they live		1
(b)	any **three** from: • antigens / pathogens / bacteria / virus • stimulate white blood cells • to produce antibodies • body can respond by rapidly making the correct antibody on re-infection		3
Total			**4**

Question 10

	answers	extra information	mark
(a)	any **two** from: • reduce poisoning of cattle / sheep • reduce risk of cancer to walkers • reduce destruction of grazing land • 5 years of experiment indicate safe to release		2
(b)	any **two** from: • cannot predict what will happen on release • possibility of danger to crops • only 30% success in similar cases		2
Total			**4**
		Overall marks	**45**

Surname		Other Names	
Centre Number						Candidate Number				
Candidate signature										

Leave blank

General Certificate of Secondary Education
Specimen Paper

SCIENCE B
Unit Biology 1

H

BIOLOGY
Unit Biology 1

Higher Tier

Date and Time

For this paper you must have:
- a ruler

You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

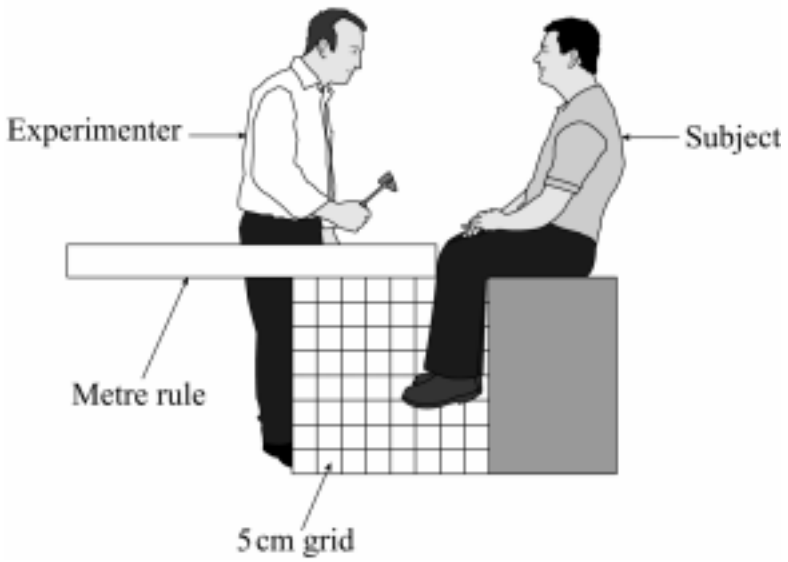
Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use			
Number	Mark	Number	Mark
1		9	
2			
3			
4			
5			
6			
7			
8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

1 When the tendon below the knee is tapped with a hammer, the lower leg jerks upwards in a reflex action. A group of students wanted to find out how the speed of the hammer affected the distance the lower leg moved.

The diagram shows how the experiment was set up.



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Distance moved by toe in cm	0	0	5	5	10	10	10	10	15	15

(a) What was the control variable in this experiment?

.....

(1 mark)

(b) Give **two** advantages of using a video to measure the time it took for the hammer to move to hit the tendon.

1 .....

.....

2 .....

.....

(2 marks)

(c) Give **one** conclusion from the results of the experiment.

.....

.....

(1 mark)

(d) Give **one** way in which the precision of the experiment could have been improved.

.....

.....

(1 mark)

5

Turn over for the next question

LEAVE MARGIN BLANK

2 The picture shows a child being vaccinated with the MMR vaccine.

(a) Measles is caused by a virus.

Why does a virus infection make us feel ill?

.....

.....

(1 mark)

(b) Explain, as fully as you can, how vaccination prevents disease.

.....

.....

.....

.....

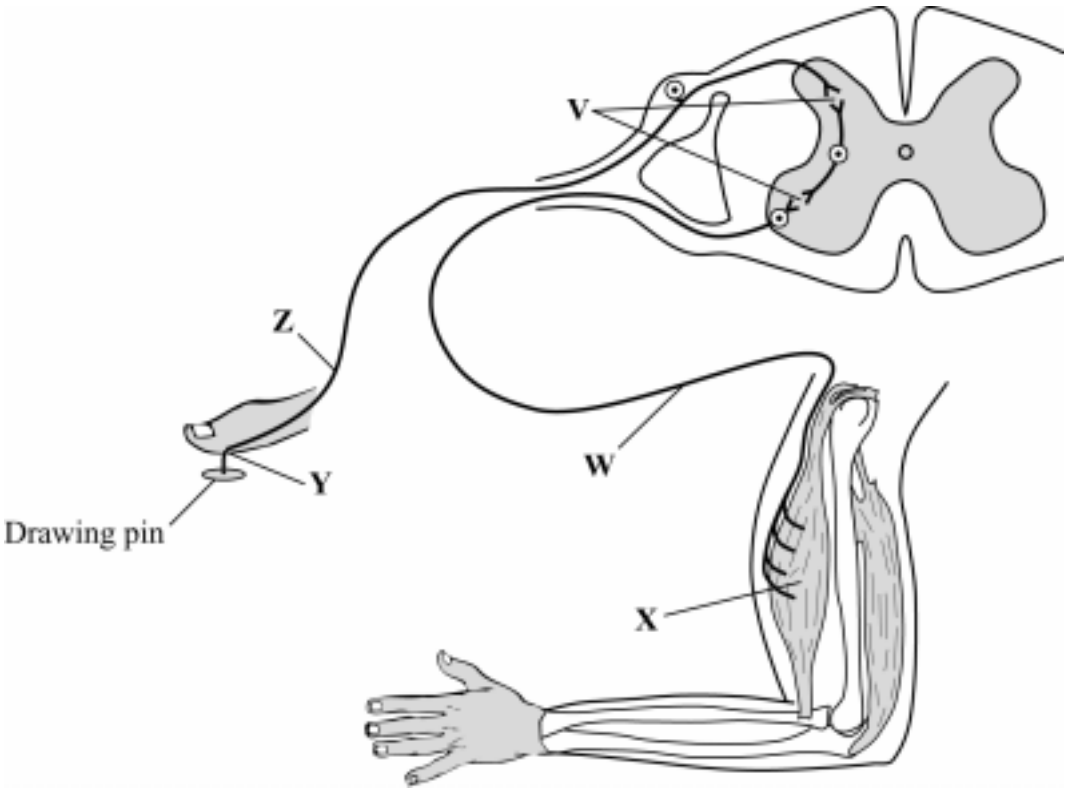
.....

.....

(3 marks)

4

3 A student accidentally touches a drawing pin. Her hand is automatically moved away from the pin.



The drawing shows the parts involved in this reflex action.

(a) In this reflex action:

(i) the receptor is found at .....

(ii) the effector is found at .....

(2 marks)

(b) How does an impulse cross the synapse labelled **V**?

.....

.....

(1 mark)

(c) Why is this type of reflex action important to the body?

.....

.....

(1 mark)

4

4 Professor John Lawton researches into the problem of controlling the spread of bracken. He is waiting for government permission to release the *Conservular* caterpillar which feeds on the bracken. The Secretary of State has to decide whether the *Conservular* caterpillar can be released.

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The National Farmers Union is concerned about the caterpillar getting out of control. What if it started eating potatoes? However, the caterpillar might help to preserve important habitats for rare animals and plants.

World-wide, scientists are trying to control 94 species of weeds by using insects. Professor Lawson says that there is good control in approximately one-third of these cases.

Use information from the passage to help you to answer these questions.

(a) Why might the Secretary of State decide **not** to allow the caterpillar to be released?

Explain the reason for your answer.

.....

.....

.....

.....

.....

(2 marks)

(b) What will be the effect on hill farms if the Secretary of State decides that the caterpillar should not be released?

Explain the reasons for your answer.

.....

.....

.....

.....

.....

.....

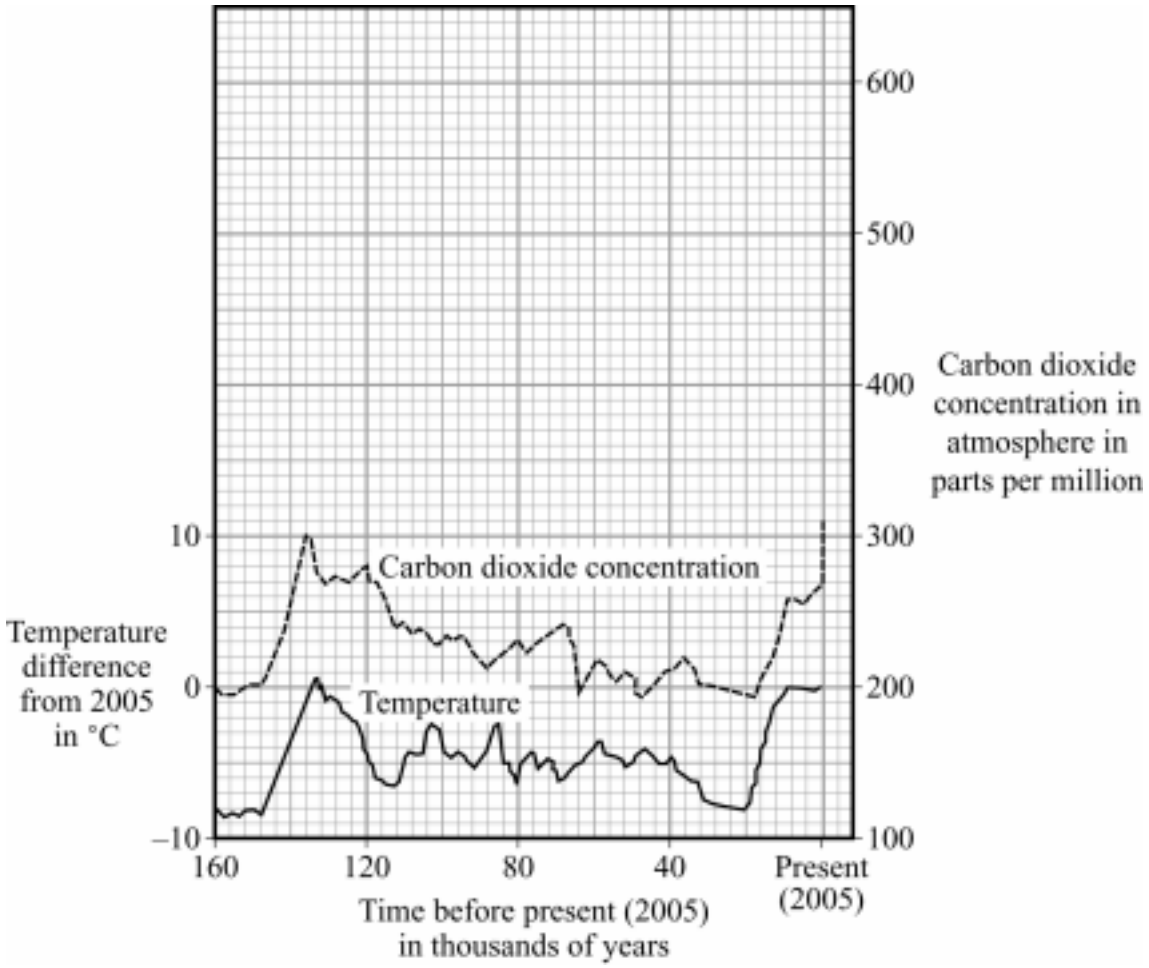
(2 marks)

4

Turn over for the next question

5 Scientists have analysed air bubbles trapped in ice in Antarctica.

The graph shows some data they have collected.



[100]

(a) Describe how the carbon dioxide concentration of the atmosphere changed between 160 000 years ago and 2005.

.....

.....

.....

.....

.....

.....

(3 marks)

(b) Why do many scientists think that these data show that carbon dioxide is a greenhouse gas?

.....

.....

(1 mark)

(c) These data do not prove that carbon dioxide is responsible for global warming.

Using data from the graph, give **one** reason why.

.....

.....

(1 mark)

5

Turn over for the next question

LEAVE MARGIN BLANK

6 Read the information about contraceptive implants.

> Contraceptive implants work in a similar way to contraceptive pills. They contain one of the hormones in contraceptive pills. This hormone prevents pregnancy. Instead of being in a pill, this hormone is in a small, thin flexible rod. It is 4 cm long and made of plastic. It is inserted just under the skin on the inside of the woman's arm. This must be done by a doctor who is familiar with the technique. The implant steadily releases a small amount of hormone. This prevents pregnancy for three years.

(a) Explain how hormones can prevent pregnancy.

.....

.....

.....

.....

(2 marks)

(b) Suggest **one** disadvantage of contraceptive implants over contraceptive pills.

.....

.....

(1 mark)

(c) Contraceptive implants rather than contraceptive pills are being used increasingly in birth control programmes in developing countries.

Suggest **one** explanation for this increase in the use of contraceptive implants.

.....

.....

.....

.....

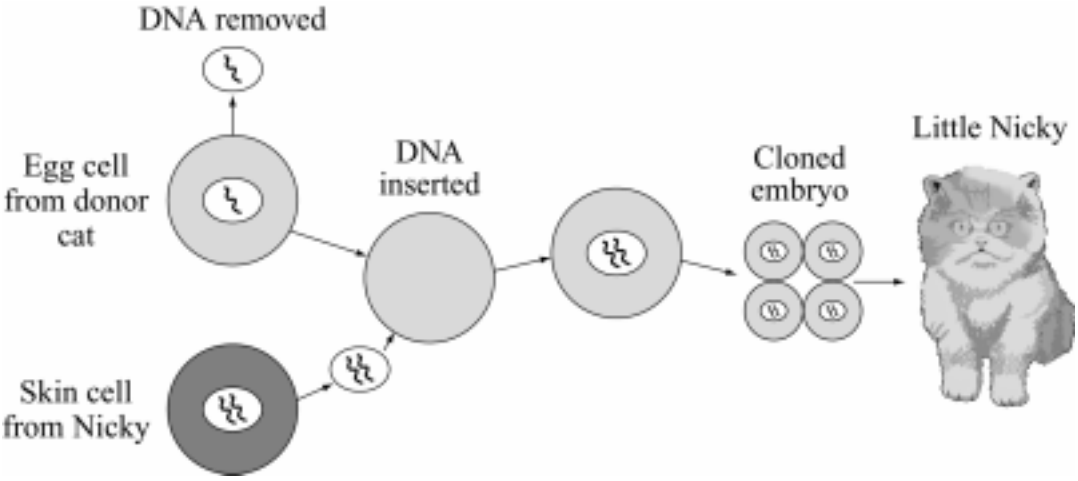
(2 marks)

5

7 Read the following passage.

> The first cloned-to-order pet sold in the United States is named Little Nicky, a 9 week old kitten delivered to a Texas woman saddened by the loss of a cat she owned for 17 years. The kitten cost its owners $50 000 and was created from DNA from her beloved cat, named Nicky, who died last year. "He is identical. His personality is he same," the owner, Julie, told The Associated Press in a telephone interview. She asked that her last name and home town not be disclosed, because she said she fears being targeted by groups opposed to cloning.

The diagram shows how Nicky was cloned.



(a) Explain, as fully as you can, why Little Nicky is identical with Nicky.

.....

.....

.....

.....

.....

.....

(3 marks)

Question 7 continues on the next page

(b) Julie fears being targeted by groups who disagree with cloning.

(i) Suggest **one** group of people who might disagree with the cloning of pet cats.

.....

(1 mark)

(ii) Explain why the group might disagree.

.....

.....

.....

.....

(1 mark)

5

8 (a) Describe the theory of evolution.

.....

.....

.....

.....

(2 marks)

(b) A scientist called Lamarck proposed a mechanism for evolution. The passage gives Lamarck's explanation of the evolution of the long legs of wading birds.

> Change occurs, because an animal passes on to its offspring changes it acquires during its lifetime. The long legs of wading birds arose when those animals' ancestors responded to a need to feed on fish. In their attempt to get into deeper water, but still keep their bodies dry, they would stretch their legs to the full extent, making them slightly longer in the process. This trait would be passed on to the next generation, who would in turn stretch their legs. Over many generations, the wading birds' legs became much longer.

Darwin's proposal of natural selection would give a different explanation for the evolution of the long legs of wading birds.

Describe the differences between Lamarck's and Darwin's explanations of the evolution of the long legs of wading birds.

.....

.....

.....

.....

.....

.....

(3 marks)

5

9 The level of cholesterol in the blood is influenced by the amount and type of fat in the diet.

(a) How does each of the following types of fat in the diet affect the concentration of cholesterol in the blood:

(i) saturated fat

.....

(ii) mono-unsaturated fat

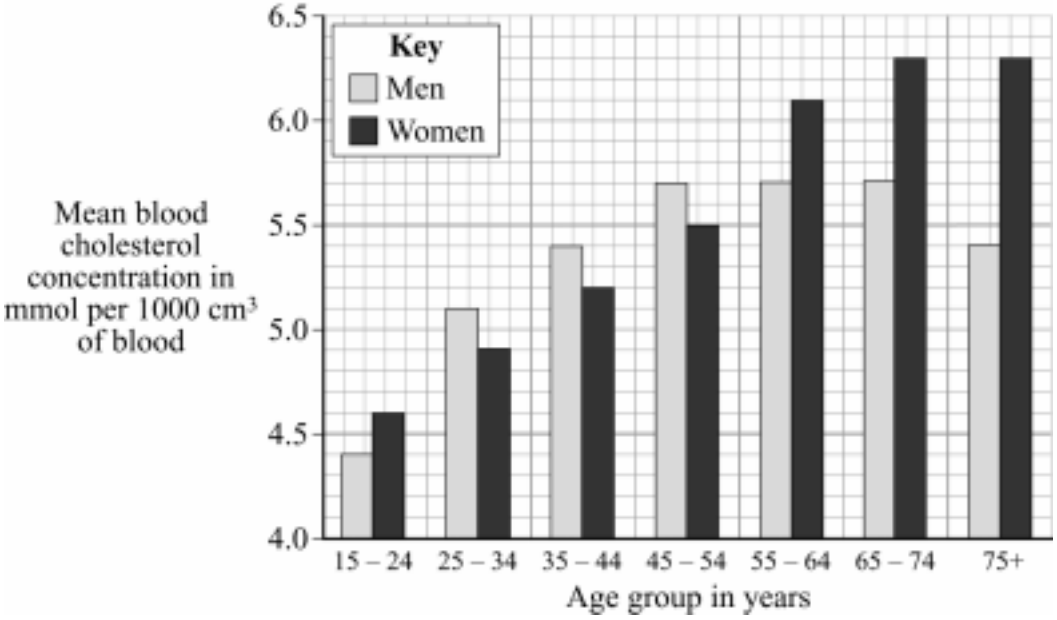
.....

(iii) poly-unsaturated fat?

.....

(3 marks)

(b) The graph shows the mean blood cholesterol concentrations of men and women in different age groups.



(i) These data were obtained by measuring the blood cholesterol concentrations of large numbers of people. Why were a large number of people used?

.....

.....

(1 mark)

(ii) From these data, which group has the highest risk of developing heart disease?

.....

(1 mark)

(iii) Apart from diet, suggest **one** other explanation for the blood cholesterol concentration of the group in (b)(ii).

.....

(1 mark)

(c) An ancient Indian natural medicine called Gum Guggal is said by its manufacturer to reduce blood cholesterol concentration. The manufacturer wants to market Gum Guggal in the UK.

Describe what must happen before Gum Guggal is allowed to be advertised for sale as a cholesterol-reducing drug.

.....

.....

.....

.....

.....

(2 marks)

8

END OF QUESTIONS

Biology 1H Mark Scheme

Question 1

	answers	extra information	mark
(a)	distance moved by hammer		1
(b)	permanent record of result very short time (for hammer to move) can be measured accurately		1 1
(c)	the faster the hammer moves, the further the lower leg jerks		1
(d)	use 1 cm grid		1
Total			**5**

Question 2

	answers	extra information	mark
(a)	produce toxins / damage cells in which they live		1
(b)	any **three** from: • antigens / pathogens / bacteria / virus • stimulate white blood cells • to produce antibodies • body can respond by rapidly making the correct antibody on re-infection		3
Total			**4**

Question 3

	answers	extra information	mark
(a)(i)	**Y**		1
(ii)	**X**		1
(b)	via chemicals		1
(c)	protection against damage		1
Total			**4**

Question 4

	answers	extra information	mark
(a)	any **two** from: • cannot predict what will happen on release • possibility of danger to crops • only 30% success in similar cases		2
(b)	lose income / less likely to survive because less grazing land / more animals poisoned		1 1
Total			**4**

Question 5

	answers	extra information	mark
(a)	rose until 130 million years ago fell until 20 million years ago rising since 20 million years ago		1 1 1
(b)	changes in carbon dioxide concentration and temperature show similar pattern		1
(c)	eg in some parts carbon dioxide concentration is falling whilst temperature is rising		1
Total			**5**

Question 6

	answers	extra information	mark
(a)	inhibits formation of FSH so egg does not mature		1 1
(b)	eg pain when inserted / need for doctor		1
(c)	eg more reliable since women can forget to take pill / pills not easily available over long period **or** less expensive since treatment only once every three years		1 1
Total			**5**

Question 7

	answers	extra information	mark
(a)	DNA carries genetic information		1
	DNA from skin cell of Nicky inserted into egg		1
	DNA replicated by cell division / mitosis as egg / embryo cells divide		1
(b)(i)	eg religious groups		1
(ii)	believe procedure violates natural laws **or** animal rights groups against experimenting with animals		1
Total			**5**

Question 8

	answers	extra information	mark
(a)	all species of living things have evolved from simple life-forms		1
	over millions / billions of years		1
(b)	Darwin – natural variation in leg length / Lamarck – legs stretch		1
	Darwin – selection of fittest ie long-legged survive		1
	Lamarck – inheritance of acquired characteristics		1
Total			**5**

Question 9

	answers	extra information	mark
(a)(i)	increase		1
(ii)	little effect		1
(iii)	decrease		1
(b)(i)	individuals within age group show large variation		1
(ii)	women 65 +		1
(iii)	eg genetic / exercise least		1
(c)	trials for efficacy and side effects		1 1
Total			**8**
		Overall marks	**45**

Surname		Other Names	
Centre Number			Candidate Number									
Candidate signature												

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General Certificate of Secondary Education
Specimen Paper

ADDITIONAL SCIENCE
Unit Biology 2

BIOLOGY
Unit Biology 2

Foundation Tier

F

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

Date and Time

For this paper you must have:
- a ruler

You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

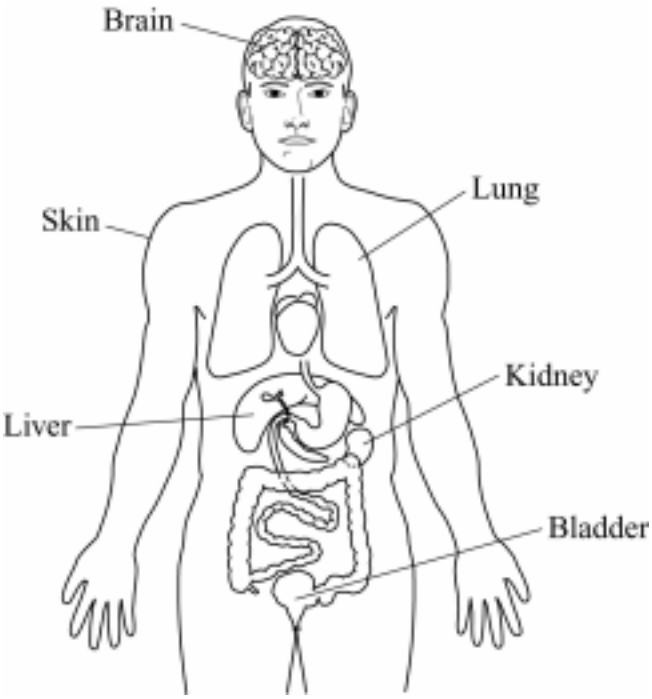
Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use			
Number	Mark	Number	Mark
1		5	
2		6	
3		7	
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

1 The diagram shows some of the organs which help to keep conditions constant inside our bodies.



(a) Which of the organs on the diagram:

(i) produces sweat .....

(ii) produces urea .....

(iii) produces urine .....

(iv) stores urine? .....

(4 marks)

(b) Explain why we should drink more water on a hot day than on a cold day.

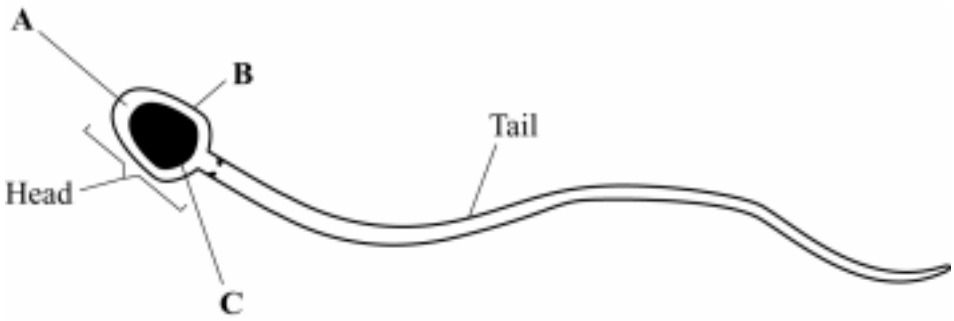
.....

.....

(2 marks)

6

2 The diagram shows a sperm cell.



(a) Use words from the box to name parts **A**, **B** and **C**.

cell membrane	**chloroplast**	**cytoplasm**	**nucleus**	**vacuole**

A .....

B .....

C .....

(3 marks)

(b) The sperm is a male gamete. It swims towards the female gamete.

Write down **two** ways in which the structure of the sperm helps it to swim.

1 .....

2 .....

(2 marks)

(c) (i) What happens when a male gamete meets a female gamete?

.....

.....

(1 mark)

(ii) What type of reproduction is this?

.....

(1 mark)

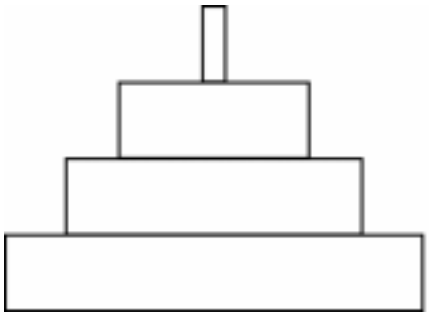
7

3 Read the paragraph below about organisms in a garden.

> A gardener pulled up weeds and used them to start a compost heap. The compost heap soon became colonised by large numbers of earthworms and slugs. The gardener then noticed a hedgehog rooting through the compost heap, eating the earthworms and slugs. Every so often, the hedgehog stopped to scratch itself. This was because it had large numbers of fleas which fed by sucking the hedgehog's blood.

(a) The diagram shows a pyramid of biomass for the organisms.

Write the names of the organisms in the garden on the correct lines next to the pyramid of biomass.



.....

.....

.....

.....

(3 marks)

(b) (i) Gardeners put weeds onto compost heaps so that they will decay.

Describe how the weeds are decayed.

.....

.....

.....

.....

(2 marks)

(ii) Gardeners then put the decayed compost onto soil in the garden.

Explain why gardeners do this.

.....

.....

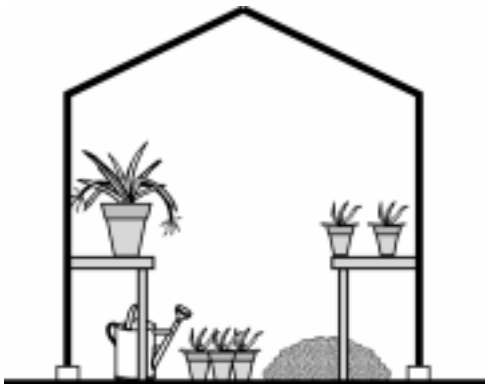
.....

.....

(2 marks)

7

4 The diagram shows plants growing in a greenhouse. It is noon on a hot, sunny day.



(a) In the sentences below, cross out the **two** words which are wrong in each box.

(i) The plant leaves will be taking in

carbon dioxide nitrogen oxygen

.

(ii) The plant leaves will be making

magnesium nitrate sugar

.

(iii) The energy needed for this process comes from

electricity fossil fuels light

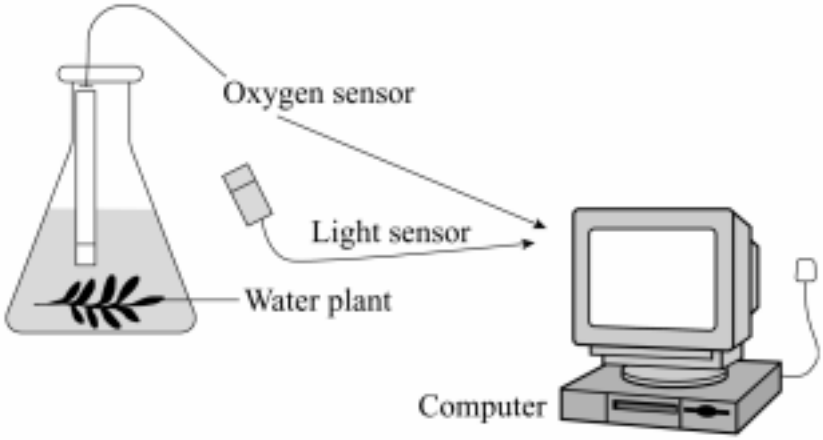
.

(3 marks)

Question 4 continues on the next page

(b) The diagram shows a computer being used as a data-logger in a photosynthesis experiment.

The experiment is to find how the oxygen output of the water plant varies over a 24 hour period.



Give **two** advantages of using a data logger in this experiment.

1 .....

.....

2 .....

.....

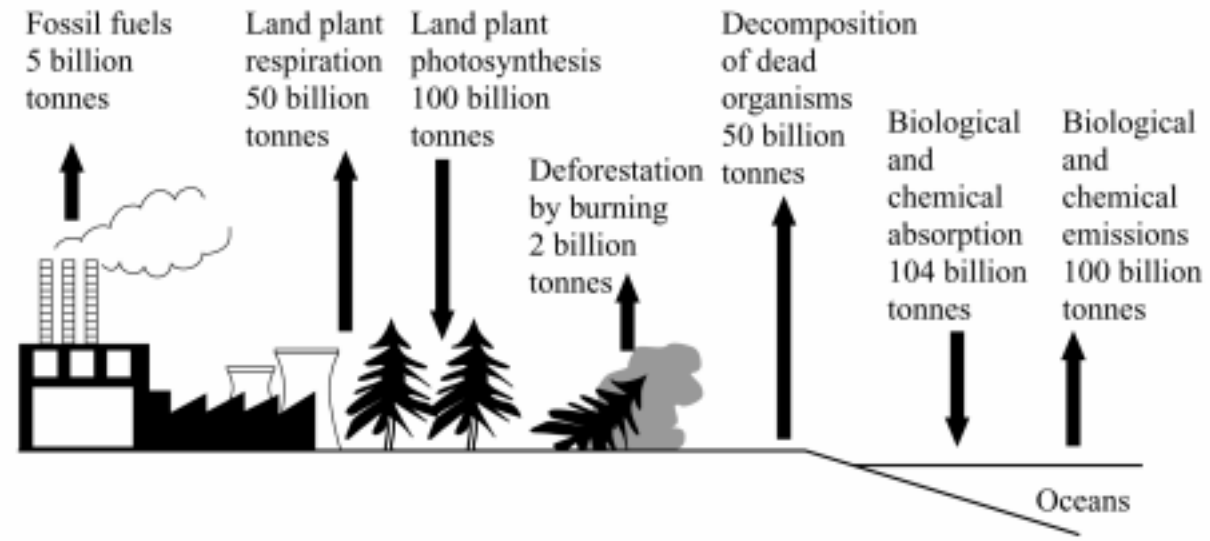
(2 marks)

5

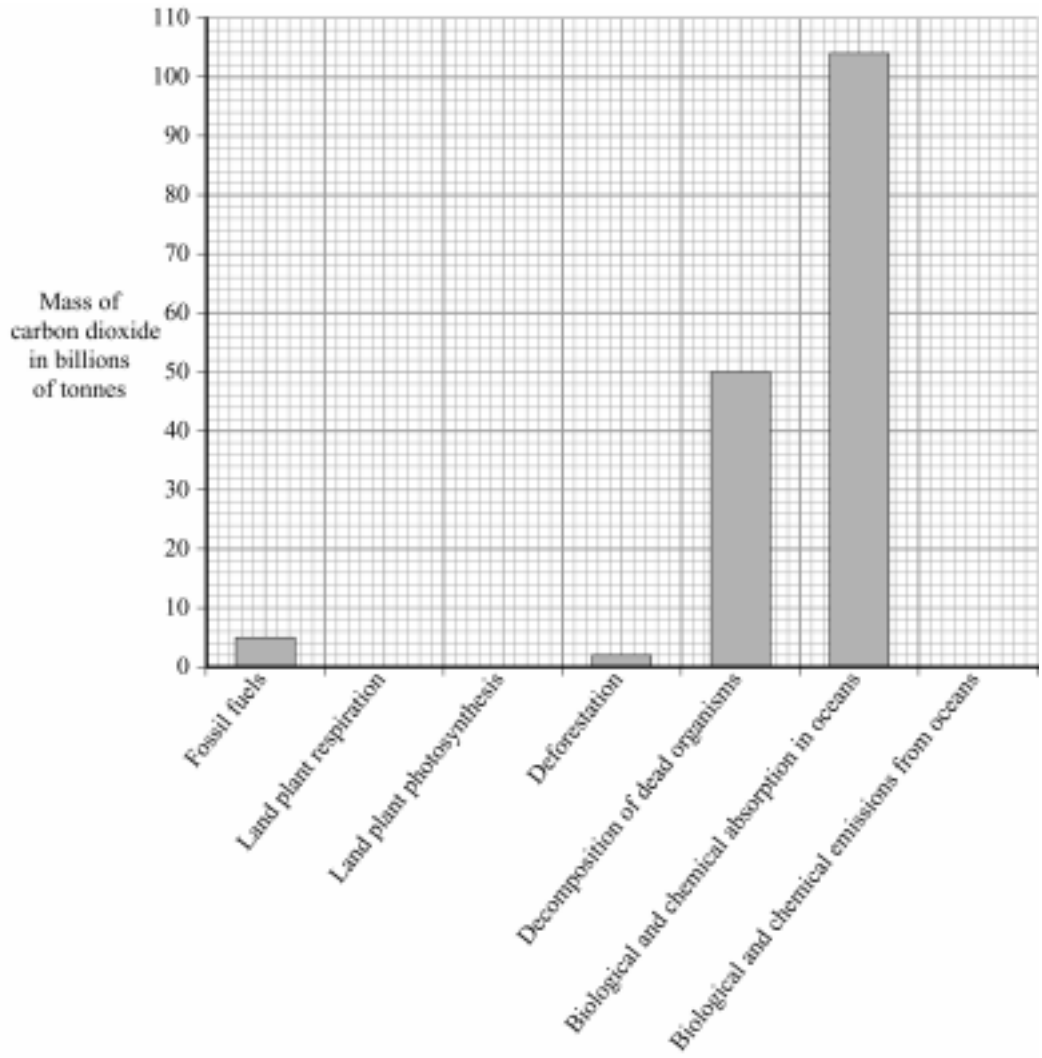
Turn over for the next question

LEAVE MARGIN BLANK

5 The diagram below shows the mass of carbon involved each year in some of the processes in the carbon cycle.



(a) Complete the bar chart using data from the diagram above.



(3 marks)

[120]

(b) (i) Calculate the total mass of carbon dioxide emitted into the atmosphere each year. Show your working.

.....

.....

.....

Mass = ……billion tonnes
(1 mark)

(ii) How much greater is this mass than the total mass of carbon dioxide removed from the atmosphere?

.....

Mass = ……billion tonnes
(1 mark)

(c) Describe what happens to sugars during respiration.

.....

.....

.....

.....
(2 marks)

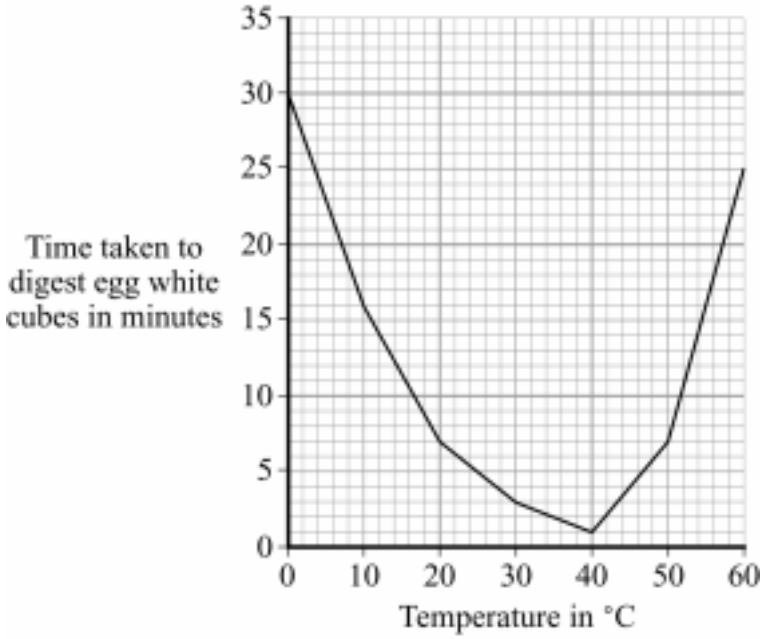
7

Turn over for the next question

6 (a) Egg white is a protein. Protease enzymes will digest cubes of boiled egg white.

A student investigated the effect of temperature on the digestion of egg white by protease enzyme solution.

The graph shows the student's results.



(i) Estimate the time it would take to digest the egg white cubes at 8 °C.

Time = ... minutes
(1 mark)

(ii) At what temperature does this enzyme work best?

Temperature = ... °C
(1 mark)

(iii) Why is the time taken to digest the egg white cubes greater at 60 °C than at 30 °C?

.....

.....
(1 mark)

(b) In 1822, Alexis St. Martin was accidentally shot in the stomach. A doctor called William Beaumont looked after Alexis as the wound healed. However, the wound did not heal completely. It left a small hole through his side into his stomach. William realised that he could use the hole to study what happened to food in the human stomach.

He did many experiments with Alexis' permission. Here are two of them.

Experiment 1

William tied a piece of boiled beef to a silk thread. He then gently pushed the beef into Alexis' stomach. The piece of beef was completely digested in two hours.

Experiment 2

William removed some of Alexis' stomach juices and placed them in a test tube. The test tube was kept at 37 °C. He placed a piece of raw beef in the test tube. The piece of beef was completely digested in two hours.

(i) Why did William keep the test tube at 37 °C?

.....

.....

(1 mark)

(ii) What was the dependent variable in both experiments?

.....

(1 mark)

(iii) What control should William have done in **Experiment 2**?

.....

.....

(1 mark)

(iv) What evidence about digestion did William's two experiments provide?

.....

.....

(1 mark)

7

7 Read the passage below about pig factories in Poland.

New pig factories like this one are multiplying around Poland as the country tries to bring cheap food to Europe's hypermarkets.

The village of Wieckowice has a community which is deeply divided by about pig factories. Some locals have got new jobs, earning higher incomes, and are driving smarter cars. Others are feeling angry. They say Polish pig factories are polluting their earth, air and water, as well as putting their small farms out of business.

Keeping hundreds of pigs inside one building is cost-effective. However, it produces large amounts of waste. Pig faeces and urine form slurry which can be a dangerous pollutant. Studies have shown that slurry ponds emit toxic gases such as ammonia and hydrogen sulfide. These gases can cause headaches, eye irritations, mood alterations and fatigue.

(a) Explain why '*Keeping hundreds of pigs inside one building is cost-effective'*.

.....

.....

.....

.....

(2 marks)

LEAVE MARGIN BLANK

(b) Explain why some villagers are in favour of '*pig factories*'.

.....

.....

.....

.....

(2 marks)

(c) Explain why some villagers are against '*pig factories*'.

.....

.....

.....

.....

(2 marks)

6

END OF QUESTIONS

Biology 2F Mark Scheme

Question 1

	answers	extra information	mark
(a)(i)	skin		1
(ii)	liver		1
(iii)	kidney		1
(iv)	bladder		1
(b)	to replace water lost via sweating		1 1
Total			**6**

Question 2

	answers	extra information	mark
(a)	**A** cytoplasm **B** cell membrane **C** nucleus		1 1 1
(b)	long tail streamlined head		1 1
(c)(i)	fuse / join / fertilisation		1
(ii)	sexual		1
Total			**7**

Question 3

	answers	extra information	mark
(a)	fleas hedgehog earthworms and slugs compost / leaves / plants	all 4 levels correct –gains **3** marks 3 **or** 2 levels correct gains **2** marks 1 level correct gains **1** mark	3
(b)(i)	broken down / digested by microbes / bacteria		1 1
(ii)	compost contains nutrients / named which make plants grow better		1 1
Total			**7**

Question 4

	answers	extra information	mark
(a)(i)	carbon dioxide		1
(ii)	sugar		1
(iii)	light		1
(b)	eg many more readings / much more data records throughout 24 hours / does not require manual readings during night		1 1
Total			**5**

Question 5

	answers	extra information	mark
(a)	all bars correctly plotted	3 bars correctly plotted gains **2** marks 2 or 1 bars correctly plotted gains **1** mark	3
(b)(i)	207 (billion tonnes)		1
(ii)	3 (billion tonnes)		1
(c)	react with oxygen / oxidised to release energy		1 1
Total			**7**

Question 6

	answers	extra information	mark
(a)(i)	19 (minutes)		1
(ii)	40 (°C)		1
(iii)	enzyme shape destroyed at higher temperature		1
(b)(i)	same temperature as stomach		1
(ii)	time for meat to digest		1
(iii)	test tube with water and beef at 37 °C		1
(iv)	showed that chemical produced by stomach digested meat		1
Total			**7**

Question 7

	answers	extra information	mark
(a)	any **two** from: • pigs grow faster • because less movement / temperature controlled • labour costs lower • bulk buying of food cheaper		2
(b)	cheaper food new jobs / higher income / new cars		1 1
(c)	large amounts of waste / toxic gases one effect of waste : headaches /eye irritations / mood alterations / fatigue		1 1
Total			**6**
		Overall marks	**45**

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Surname		Other Names	
Centre Number			Candidate Number									
Candidate signature												

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General Certificate of Secondary Education
Specimen Paper

ADDITIONAL SCIENCE
Unit Biology 2

H

AQA
ASSESSMENT and QUALIFICATIONS ALLIANCE

BIOLOGY
Unit Biology 2

Higher Tier

Date and Time

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1		5	
2		6	
3		7	
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

1 (a) Egg white is a protein. Protease enzymes will digest cubes of boiled egg white.

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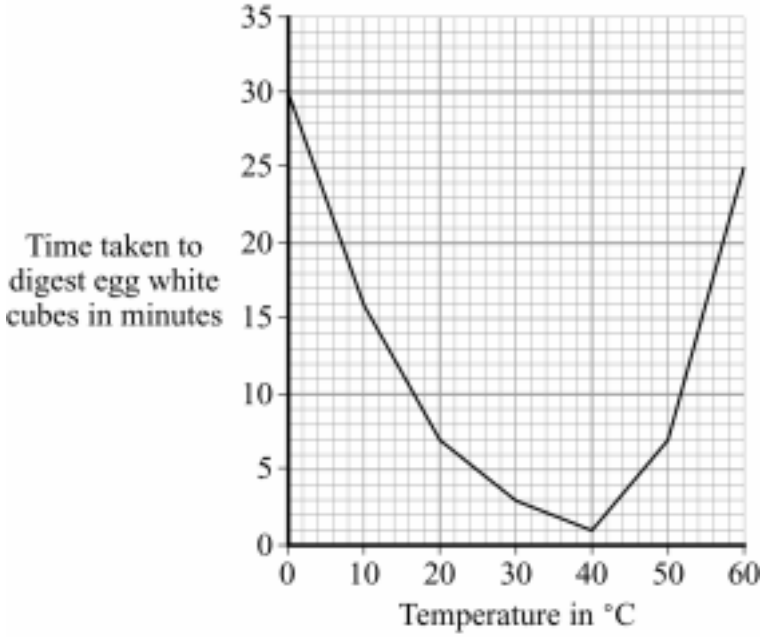

(i) Estimate the time it would take to digest the egg white cubes at 8 °C.

Time = ... minutes
(1 mark)

(ii) At what temperature does this enzyme work best?

Temperature = ... °C
(1 mark)

(iii) Why is the time taken to digest the egg white cubes greater at 60 °C than at 30 °C?

.....

.....
(1 mark)

(b) In 1822, Alexis St. Martin was accidentally shot in the stomach. A doctor called William Beaumont looked after Alexis as the wound healed. However, the wound did not heal completely. It left a small hole through his side into his stomach. William realised that he could use the hole to study what happened to food in the human stomach.

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(i) Why did William keep the test tube at 37 °C?

.....

.....

(1 mark)

(ii) What was the dependent variable in both experiments?

.....

(1 mark)

(iii) What control should William have done in **Experiment 2**?

.....

.....

(1 mark)

(iv) What evidence about digestion did William's two experiments provide?

.....

.....

(1 mark)

7

2 Read the passage below about pig factories in Poland.

New pig factories like this one are multiplying around Poland as the country tries to bring cheap food to Europe's hypermarkets.

The village of Wieckowice has a community which is deeply divided by pig factories. Some locals have got new jobs, earning higher incomes, and are driving smarter cars. Others are feeling angry. They say Polish pig factories are polluting their earth, air and water, as well as putting their small farms out of business.

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(a) Explain why '*Keeping hundreds of pigs inside one building is cost-effective'.*

.....

.....

.....

.....

(2 marks)

(b) Explain why some villagers are in favour of '*pig factories*'.

.....

.....

.....

.....

(2 marks)

(c) Explain why some villagers are against '*pig factories*'.

.....

.....

.....

.....

(2 marks)

6

Turn over for the next question

3 (a) Complete the sentence.

Cystic fibrosis is a disorder of .....

(1 mark)

(b) Explain, as fully as you can, how a person usually inherits cystic fibrosis.

.....

.....

.....

.....

.....

(3 marks)

(c) One effect of cystic fibrosis in some patients is that enzymes from the pancreas do not reach food in the intestine. Doctors now give capsules containing enzymes to these patients.

(i) Name **three** digestive enzymes produced by the pancreas.

1 .....

2 .....

3 .....

(3 marks)

(ii) The first attempts at giving pancreatic enzymes involved giving a pill consisting of powdered pancreatic enzymes to the patient. The treatment failed. When scientists investigated why this happened, they found the enzymes from the pill in the stomach of the patient, but not in the intestine.

Suggest **two** possible reasons why the enzymes in the pill did not reach the small intestine.

1 .....

.....

2 .....

.....

(2 marks)

9

4 (a) Which organ in the body monitors blood sugar concentration?

.....

(1 mark)

(b) How is diabetes detected by doctors?

.....

.....

(1 mark)

(c) Describe, in as much detail as you can, how the body responds to an increase in blood sugar concentration.

.....

.....

.....

.....

.....

.....

(3 marks)

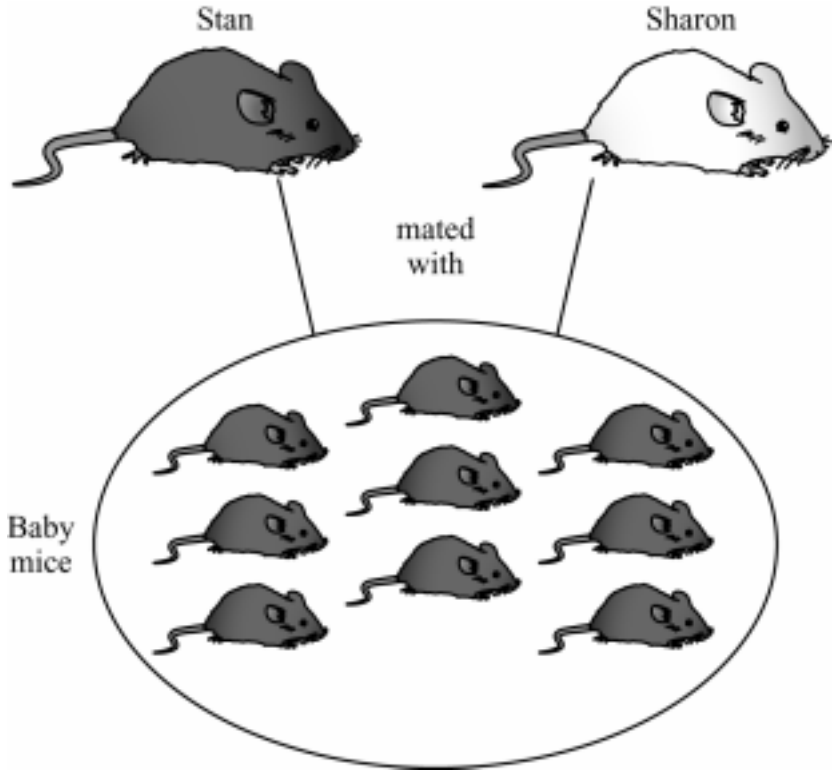
5

Turn over for the next question

5 A student's hobby was breeding pet mice.
Three of the pet mice were called Stan, Tom and Sharon.
Stan and Tom had black fur. Sharon had white fur.
The colour of the fur is controlled by a single gene which has two alleles, **B** and **b**.

(a) The student first crossed Stan with Sharon.

The results are shown on the diagram.



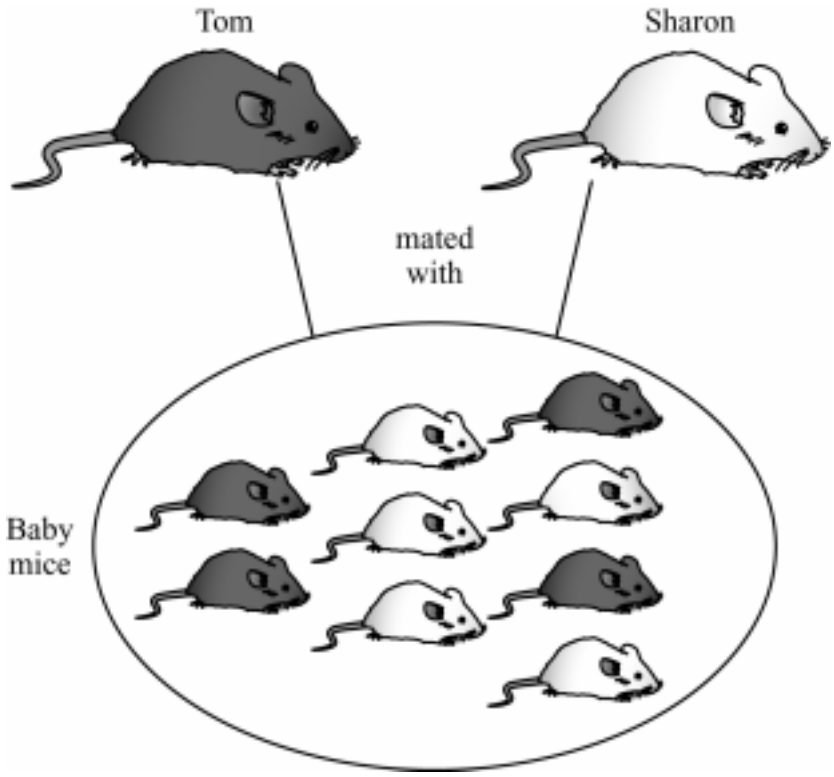
Give the alleles present in the body cells of:

(i) Stan .....

(ii) Sharon. .....

(1 mark)

(b) The student then crossed Tom with Sharon. The results are shown on the diagram.



Use a genetic diagram to explain why some of the baby mice had white fur.

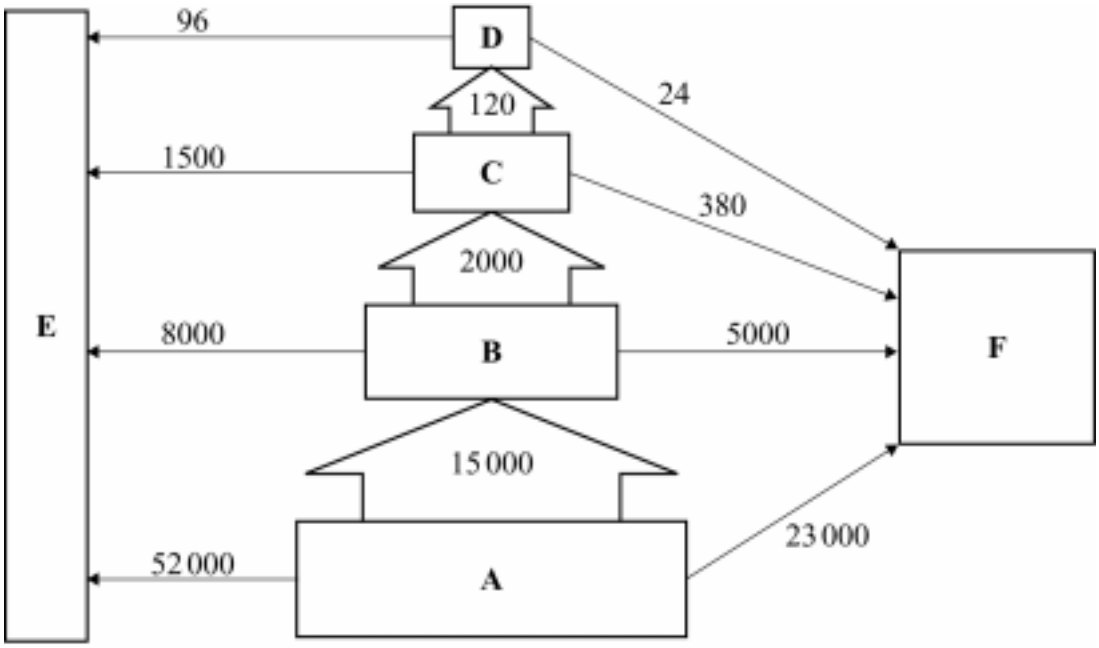
(3 marks)

4

Turn over for the next question

6 The diagram shows the flow of energy through 1 m^2 of an ecosystem.

The unit in each case is kJ per m^2 per year.



Key	
A Plants	**D** Mammals and birds
B Animals	**E** Heat transfer to environment
C Animals	**F** Detritus feeders and microorganisms

(a) (i) Name the process in which green plants transfer solar energy into chemical compounds.

.....

(1 mark)

(ii) Name the process in living organisms which eventually results in the transfer of heat to the environment.

.....

(1 mark)

(b) Give **two** ways in which energy is transferred from animals to detritus feeders.

1 .....

.....

2 .....

.....

(2 marks)

(c) (i) Calculate the percentage of the energy intake of mammals and birds which is transferred to the environment.

.....

.....

Percentage = ...

(2 marks)

(ii) Explain why mammals and birds lose a greater percentage of their energy intake to the environment as heat, than other groups of animals.

.....

.....

.....

.....

(2 marks)

8

Turn over for the next question

7 (a) (i) What is meant by a stem cell?

.....

.....

(1 mark)

(ii) Stem cells divide by mitosis.

Explain why cells produced by mitosis have identical genetic information.

.....

.....

.....

.....

(2 marks)

(b) Read the passage below about stem cells and genetic screening.

A boy has been born to a British couple who want to use stem cells from his umbilical cord to treat an older brother with a life threatening blood disorder. The disorder can only be cured by a transplant of stem cells from a sibling with a perfect tissue match.

Michelle and Jason Whitaker's baby, Jamie, was genetically selected while he was still an embryo to be a near perfect match to four year old Charlie. The couple went to an American clinic for test tube baby treatment because the selection procedure is not allowed in the UK.

Mr Whitaker told the newspaper: "All we did was change the odds from a one-in-four chance of a tissue match to almost 100%. There was no selection on the basis of colour of eyes, hair or sex."

The Human Fertilisation and Embryology Authority said it was acceptable to test and select embryos to prevent the birth of a baby with a genetic disease, but not to select them in order to help another child.

But John Smeaton, national director of the Society for the Protection of Unborn Children, said: "Human beings who were not the perfect match were simply discarded and a child has been created with the primary purpose of benefiting his elder brother."

LEAVE MARGIN BLANK

Use information from the passage to evaluate whether genetic screening should be allowed in cases similar to that of Jamie and Charlie. Explain the reasons for your answer.

.....

.....

.....

.....

.....

.....

(3 marks)

6

END OF QUESTIONS

Biology 2H Mark Scheme

Question 1

	answers	extra information	mark
(a)(i)	19 (minutes)		1
(ii)	40 (°C)		1
(iii)	enzyme shape destroyed at higher temperature		1
(b)(i)	same temperature as stomach		1
(ii)	time for meat to digest		1
(iii)	test tube with water and beef at 37 °C		1
(iv)	showed that chemical produced by stomach digested meat		1
Total			**7**

Question 2

	answers	extra information	mark
(a)	any **two** from: • pigs grow faster • because less movement / temperature controlled • labour costs lower • bulk buying of food cheaper		2
(b)	cheaper food new jobs / higher income / new cars		1 1
(c)	large amounts of waste / toxic gases one effect of waste : headaches /eye irritations / mood alterations / fatigue		1 1
Total			**6**

Question 3

	answers	extra information	mark
(a)	cell membranes		1
(b)	caused by recessive allele		1
	both parents carriers / do not have condition		1
	receives one recessive allele from each		1
(c)(i)	amylase		1
	protease		1
	lipase		1
(ii)	acid destroys enzymes		1
	enzymes digested by stomach enzymes		1
Total			**9**

Question 4

	answers	extra information	mark
(a)	pancreas		1
(b)	blood sugar test / urine sugar test		1
(c)	any **three** from: • pancreas • secretes insulin • glucose/sugar converted to glycogen • in liver		3
Total			**5**

Question 5

	answers	extra information	mark
(a)(i) (ii)	BB bb	**both** required for mark	1
(b)	Tom Bb Sharon bb gamete B or b, b offspring Bb or bb		1 1 1
Total			**4**

Question 6

	answers	extra information	mark
(a)(i)	photosynthesis		1
(ii)	respiration		1
(b)	any **two** from: • death • urine • faeces		2
(c)(i)	20 (%) gains **2** marks	else evidence of (24 ÷ 120) x 100 gains **1** mark	2
(ii)	keep bodies at constant temperature higher than that of surroundings		1 1
Total			**8**

Question 7

	answers	extra information	mark
(a)(i)	cell that can be made to differentiate into other types of cell		1
(ii)	chromosomes copied before cell division		1 1
(b)	(yes because) almost 100% certain to provide cure even though some embryos killed **or** (no because) embryos killed if not correct tissue type even though provides cure		3
Total			**6**
		Overall marks	**45**

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Surname		Other Names	
Centre Number			Candidate Number									
Candidate signature												

Leave blank

General Certificate of Secondary Education
Specimen Paper

BIOLOGY
Unit Biology 3

F

Foundation Tier

Date and Time

For this paper you must have:
- a ruler

You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1		5	
2		6	
3		7	
4		8	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Time allowed: 45 minutes

Instructions
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Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 The pictures show some products that are made by microorganisms.

Use words from the box to label each picture with the microorganism that made it.

bacteria	**fusarium**	**penicillium**	**yeast**

Antibiotic pills
Made by .....

Wine
Made by .....

Cheese
Made by .....

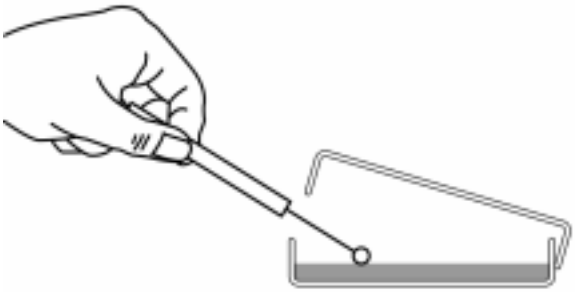
Vegi-burger (mycoprotein)
Made by .....

(4 marks)

4

2 The diagram shows stages in the inoculation of an agar plate.

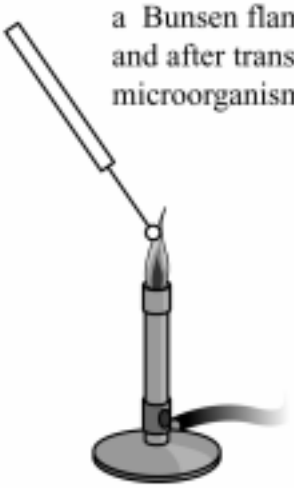
A The lid of the petri dish is raised just sufficiently to allow microorganisms to be transferred from the inoculating loop to the nutrient agar



B The petri dish with nutrient agar is sterilised by heating to 120 °C

C The lid of the petri dish is sealed with adhesive tape to prevent contamination by microorganisms from the air

D An inoculating loop is sterilised by heating in a Bunsen flame before and after transferring microorganisms



E The cooled inoculating loop is used to collect microorganisms from a culture

Write the letters that label the stages in the correct order.

One has been done for you.

Stage	1	2	3	4	5
Letter			**E**		

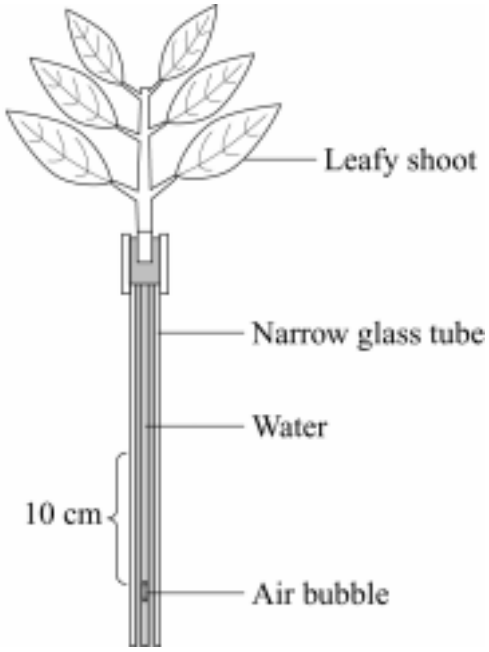
(3 marks)

3

3 A student set up five sets of the apparatus shown in the diagram. He used these to measure the effects of:

- temperature
- wind
- light

on the rate of water loss from a plant shoot.



The student's results are shown in the table.

Condition	25 °C windy light	5 °C windy light	25 °C calm light	5 °C calm light	25 °C calm dark
Time taken for bubble to move 10 cm in minutes	5	7	8	12	29

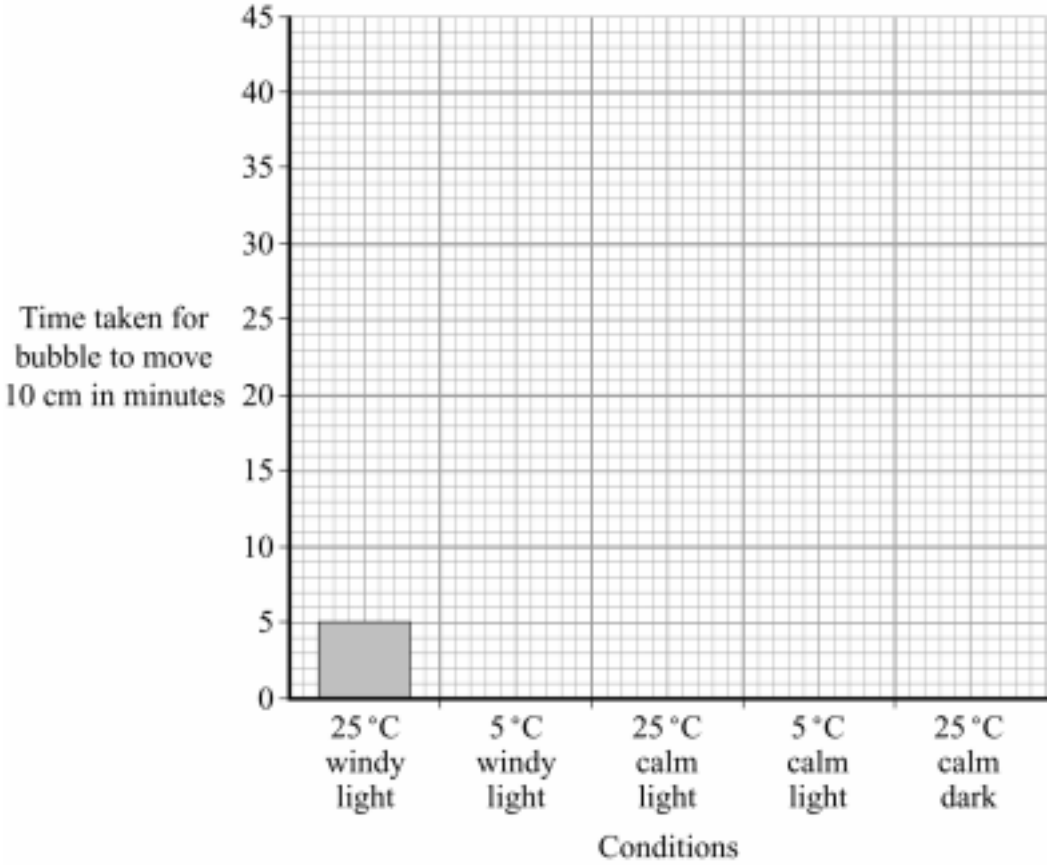
(a) Write down **two** ways in which the student could have made his experiment more reliable.

1 .....

2 .....

(2 marks)

(b) Plot the student's results on the graph below. One has been done for you.



(2 marks)

(c) Which change in condition had the most effect on the rate of water loss?

Tick (√) the correct answer.

Decreasing the temperature from 25 °C to 5 °C	
Changing from windy to calm	
Changing from light to dark	

(1 mark)

(d) (i) Write down the name for the process by which plant leaves lose water vapour.

.....

(1 mark)

(ii) The water vapour is lost through tiny pores on the leaf.

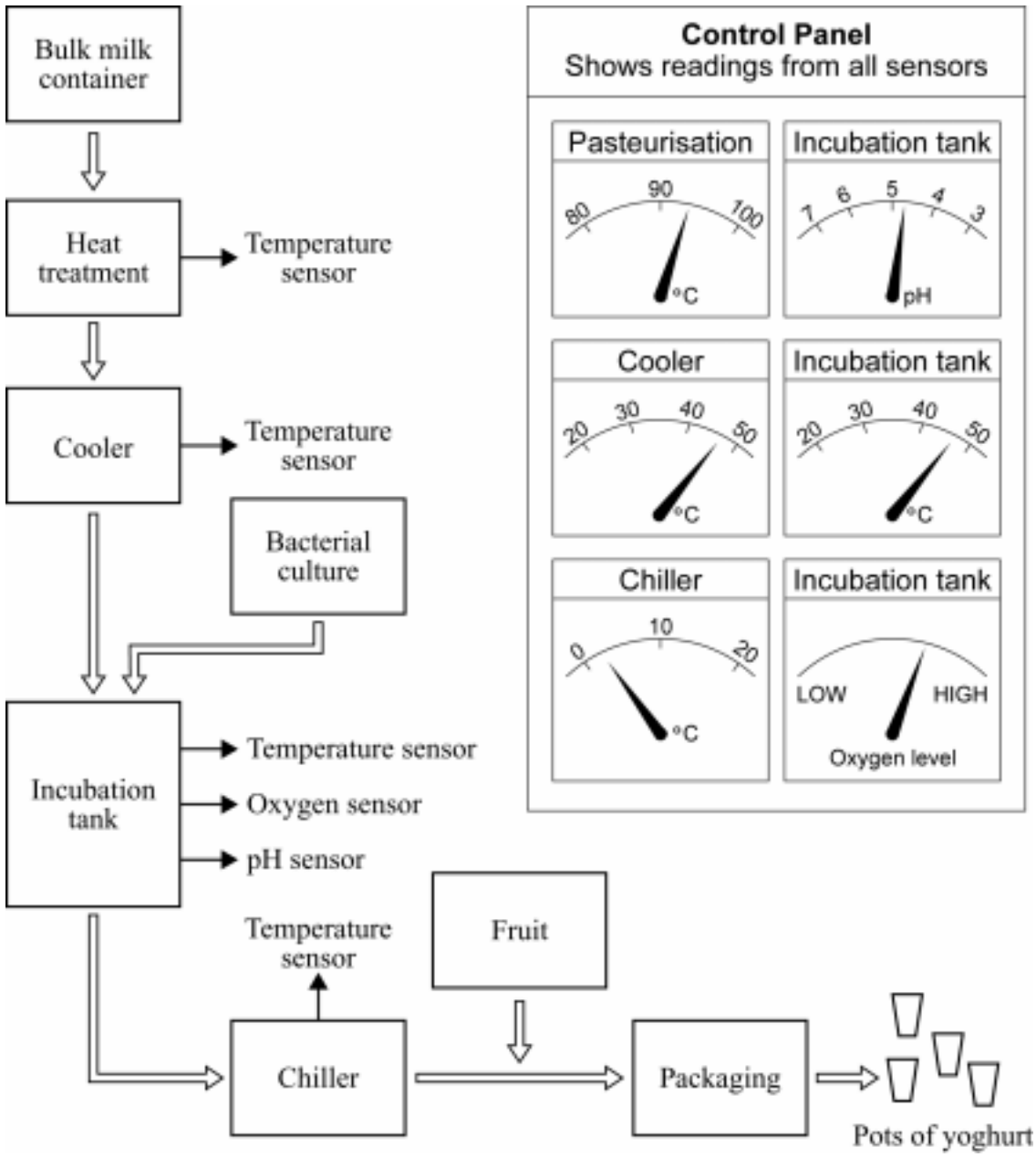
Write down the name of these pores.

.....

(1 mark)

7

4 The flow chart shows how yoghurt is made.



(a) (i) Which temperature sensor shows the highest reading?

.....

(1 mark)

(ii) What will happen to bacteria in this part of the process?

.....

(1 mark)

(b) (i) What is the pH in the incubator tank? .....

(1 mark)

(ii) In the sentence below, cross out the **two** words which are wrong in the box.

The contents of the incubator tank are

acid alkaline neutral

.

(1 mark)

(iii) The pH inside the incubator tank is caused mainly by one substance.

Write down the name of this substance.

.....

(1 mark)

(iv) Apart from changing pH, what effect does this substance have on milk?

.....

(1 mark)

(c) The chiller cools down the yoghurt.

What effect will this have on the bacteria in the yoghurt?

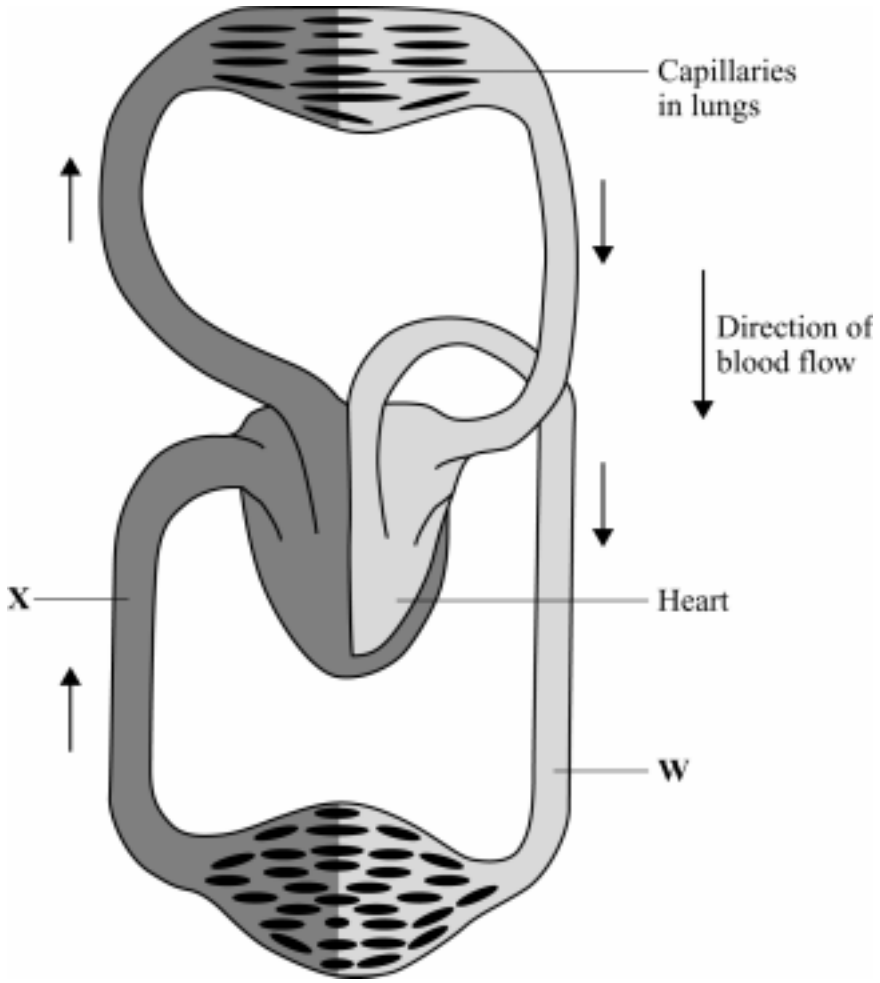
.....

(1 mark)

7

Turn over for the next question

5 The diagram shows the human circulatory system.



(a) Name:

(i) the type of blood vessel labelled **W** .....
(1 mark)

(ii) the type of blood vessel labelled **X**. .....
(1 mark)

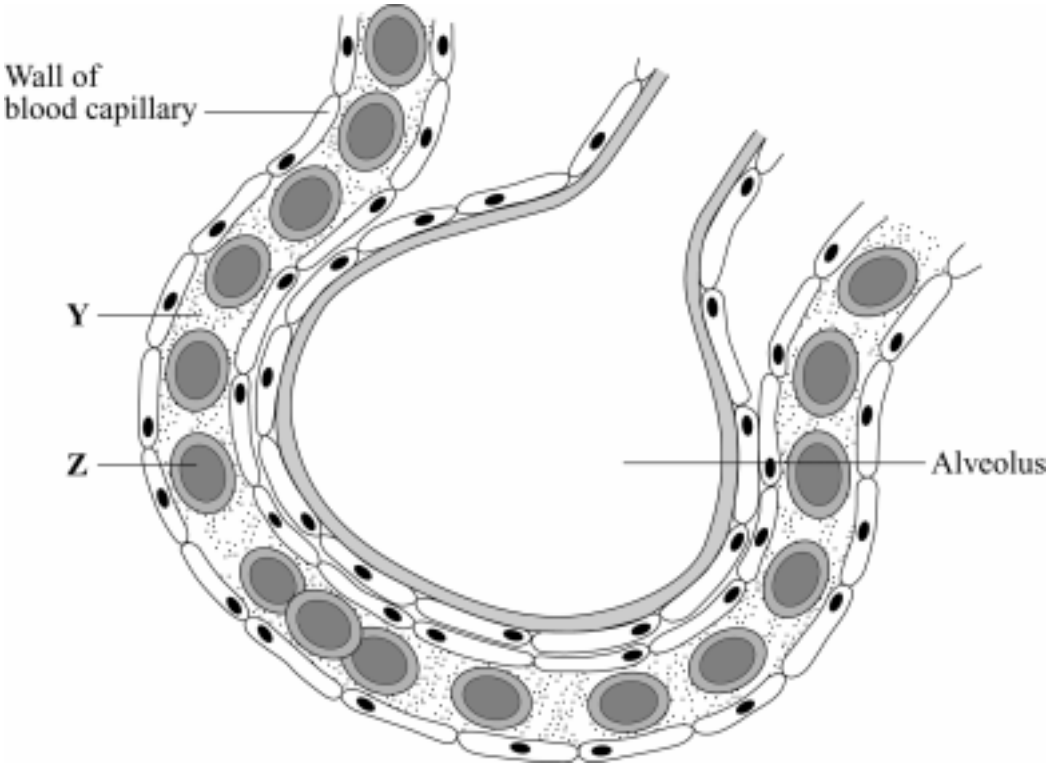
(b) Explain why this is called a double circulatory system.

.....

.....

.....
(2 marks)

(c) The diagram shows an alveolus and a blood capillary in the lung.



(i) Name:

1. liquid **Y** .....

(1 mark)

2. cell **Z**. .....

(1 mark)

(ii) During gaseous exchange, oxygen and carbon dioxide are exchanged across the wall of the alveolus.

On the diagram, carefully draw:

- **one** arrow to show the path taken by oxygen
- **one** arrow to show the path taken by carbon dioxide.

Label each arrow.

(4 marks)

10

6 The table shows the water intake and the water output for a student on four different days.

Each value is in cm^3 per day.

		Day 1 Normal day	**Day 2** Outside on a cold day	**Day 3** Went on a fun run	**Day 4** Spent the evening at a disco
Water input	In drinks	1500	1500		3500
	In food	800	800	1000	800
	From respiration	300	300	500	300
	Total		**2600**	**4900**	**4600**
Water output	In urine	1100	1500	1200	2500
	In sweat	1000	600	3000	1500
	In breath	400	400	600	500
	In faeces	100	100	100	100
	Total	**2600**	**2600**	**4900**	**4600**

(a) (i) Calculate the total water input on **Day 1**.

.....

(1 mark)

(ii) Calculate the amount of water taken in drinks on **Day 3**.

.....

(1 mark)

(b) (i) On which day did the student produce most urine?

.....

(1 mark)

(ii) Suggest the reason for this.

.....

.....

(1 mark)

(c) (i) Which computer application package would be best for storing the data shown in the table?

.....

(1 mark)

(ii) Give the reason for your answer.

.....

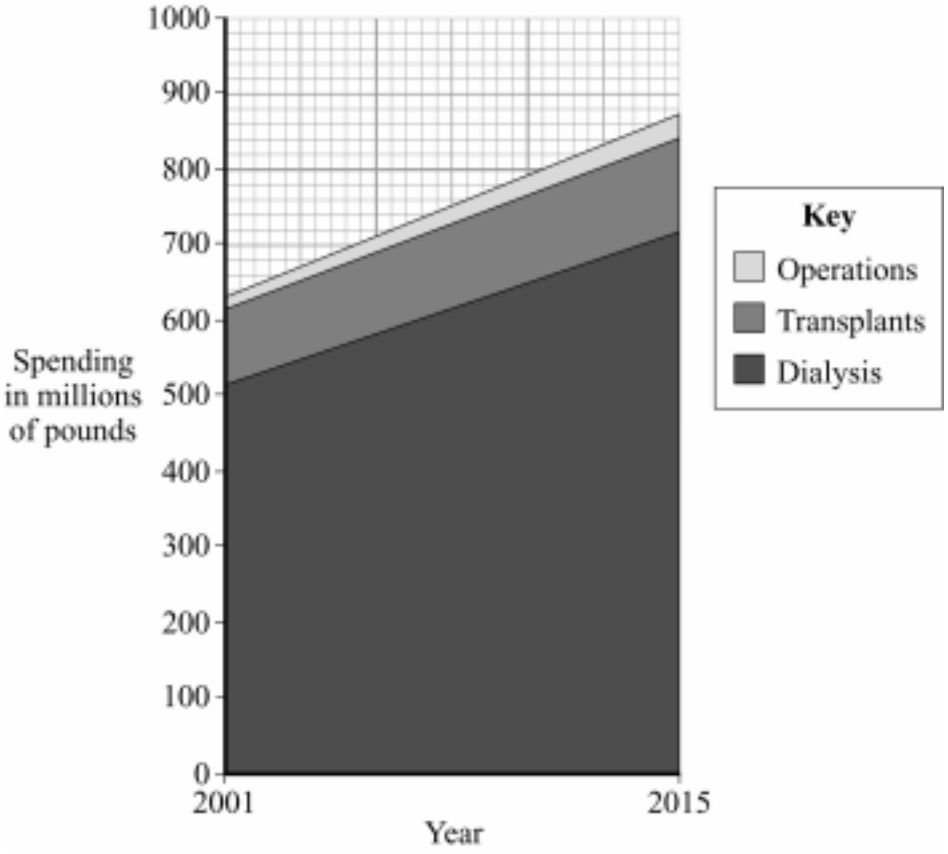
.....

(1 mark)

6

Turn over for the next question

7 The graph shows the projected spending on treatment of kidney failure until 2015.
It does **not** include changes due to inflation.



(a) Suggest **one** explanation for the increase in spending on treatment of kidney failure between 2001 and 2015.

.....

.....

(1 mark)

(b) (i) The cost of treating one patient by dialysis is much greater than treating the same patient by transplant between 2001 and 2015.

Explain why.

.....

.....

.....

.....

(2 marks)

(ii) The spending on transplants is not expected to change very much between 2001 and 2015.

Suggest **one** explanation for this.

.....

.....

.....

(1 mark)

4

8 Read the passage below about Gasohol.

> Brazil is now 'growing' its own fuel for cars. It is growing sugar cane to produce ethanol. This is mixed with petrol to make a fuel called Gasohol. In Brazil, Gasohol contains 25% ethanol. Burning Gasohol releases carbon dioxide into the atmosphere, but it releases much less nitrogen oxide. To grow sugar cane for fuel, Brazil has cleared large areas of rainforest.

Is using Gasohol better or worse for the environment than using petrol?

Use information from the passage and your own knowledge and understanding to explain the reasons for your answer.

.....

.....

.....

.....

.....

.....

.....

(4 marks)

4

END OF QUESTIONS

Biology 3F Mark Scheme

Question 1

	answers	extra information	mark
	penicillium		1
	yeast		1
	bacteria		1
	fusarium		1
Total			**4**

Question 2

	answers	extra information	mark
	B **D** (**E**) **A** **C**	all 4 correct gains **3** marks 3 **or** 2 correct gains **2** marks 1 correct gains **1** mark	3
Total			**3**

Question 3

	answers	extra information	mark
(a)	eg use same shoot in each set of conditions do several readings in each set of conditions		1 1
(b)	4 correct plots gains **2** marks 3 **or** 2 correct plots gains **1** mark		2
(c)	changing from light to dark		1
(d)(i)	transpiration		1
(ii)	stomata		1
Total			**7**

Question 4

	answers	extra information	mark
(a)(i)	pasteurisation		1
(ii)	killed		1
(b)(i)	4.7 / 4.8		1
(ii)	acid		1
(iii)	lactic acid		1
(iv)	clots milk		1
(c)	slows activity / reactions / growth		1
Total			**7**

Question 5

	answers	extra information	mark
(a)(i)	artery		1
(ii)	vein		1
(b)	one circulation to lungs		1
	other to body		1
(c)(i)	plasma		1
	red blood cell		1
(ii)	arrow labelled oxygen from alveolus		1
	to red blood cell		1
	arrow labelled carbon dioxide from plasma		1
	to alveolus		1
Total			**10**

Question 6

	answers	extra information	mark
(a)(i)	2600		1
(ii)	3400		1
(b)(i)	day 2		1
(ii)	cold day so less water lost via sweat		1
(c)(i)	spreadsheet		1
(ii)	totals calculated by program		1
Total			**6**

Question 7

	answers	extra information	mark
(a)	population living longer, so higher incidence of kidney disease		1
(b)(i)	transplant is permanent cure dialysis needed regularly for rest of life		1 1
(ii)	shortage of donors		1
Total			**4**

Question 8

	answers	extra information	mark
	(better) less nitrogen oxides released less use of petrol / non-renewable resource can grow energy source carbon dioxide released is equivalent to that taken in by plants		 1 1 1 1
Total			**4**
		Overall marks	**45**

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Surname		Other Names	
Centre Number			Candidate Number				
Candidate signature									

Leave blank

General Certificate of Secondary Education
Specimen Paper

BIOLOGY
Unit Biology 3

H

Higher Tier

Date and Time

For this paper you must have:
- a ruler

You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1		5	
2		6	
3		7	
4		8	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Time allowed: 45 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 The table shows the water intake and the water output for a student on four different days.

Each value is in cm^3 per day.

		Day 1 Normal day	**Day 2** Outside on a cold day	**Day 3** Went on a fun run	**Day 4** Spent the evening at a disco
Water input	In drinks	1500	1500		3500
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	Total		**2600**	**4900**	**4600**
Water output	In urine	1100	1500	1200	2500
	In sweat	1000	600	3000	1500
	In breath	400	400	600	500
	In faeces	100	100	100	100
	Total	**2600**	**2600**	**4900**	**4600**

(a) (i) Calculate the total water input on **Day 1**.

.....

(1 mark)

(ii) Calculate the amount of water taken in drinks on **Day 3**.

.....

(1 mark)

(b) (i) On which day did the student produce most urine?

.....

(1 mark)

(ii) Suggest the reason for this.

.....

.....

(1 mark)

(c) (i) Which computer application package would be best for storing the data shown in the table?

.....

(1 mark)

(ii) Give the reason for your answer.

.....

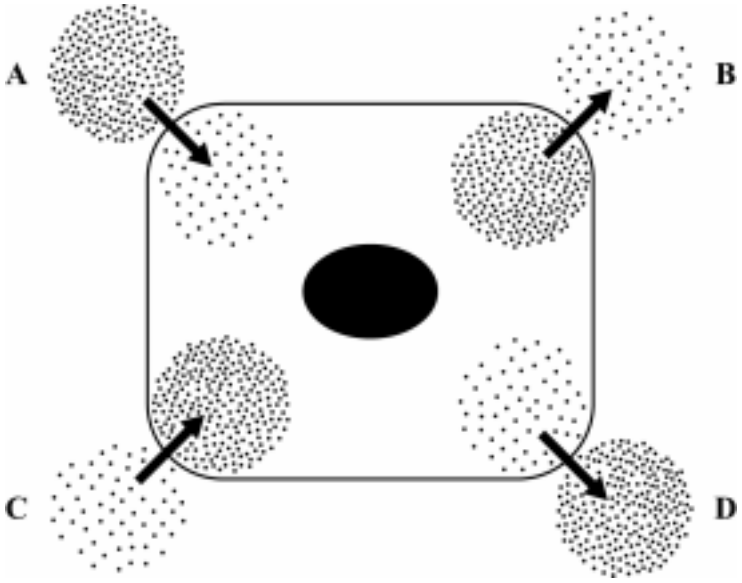
.....

(1 mark)

6

Turn over for the next question

2 (a) The diagram shows four ways in which molecules may move into and out of a cell.



The dots show the concentration of molecules.

The cell is respiring aerobically.

Which arrow, **A**, **B**, **C**, or **D**, represents:

(i) movement of oxygen molecules .....

(1 mark)

(ii) movement of carbon dioxide molecules? .....

(1 mark)

(b) Name the process by which these gases move into and out of the cell.

.....

(1 mark)

(c) (i) Which arrow, **A**, **B**, **C**, or **D**, represents the active uptake of sugar molecules by the cell?

.....

(1 mark)

(ii) Explain the reason for your answer.

.....

.....

.....

(1 mark)

5

3 The diagram shows a red blood cell.

(a) What is the function of red blood cells?

.....

.....

(1 mark)

(b) Explain, as fully as you can, how the structure of a red blood cell is related to its function.

.....

.....

.....

.....

.....

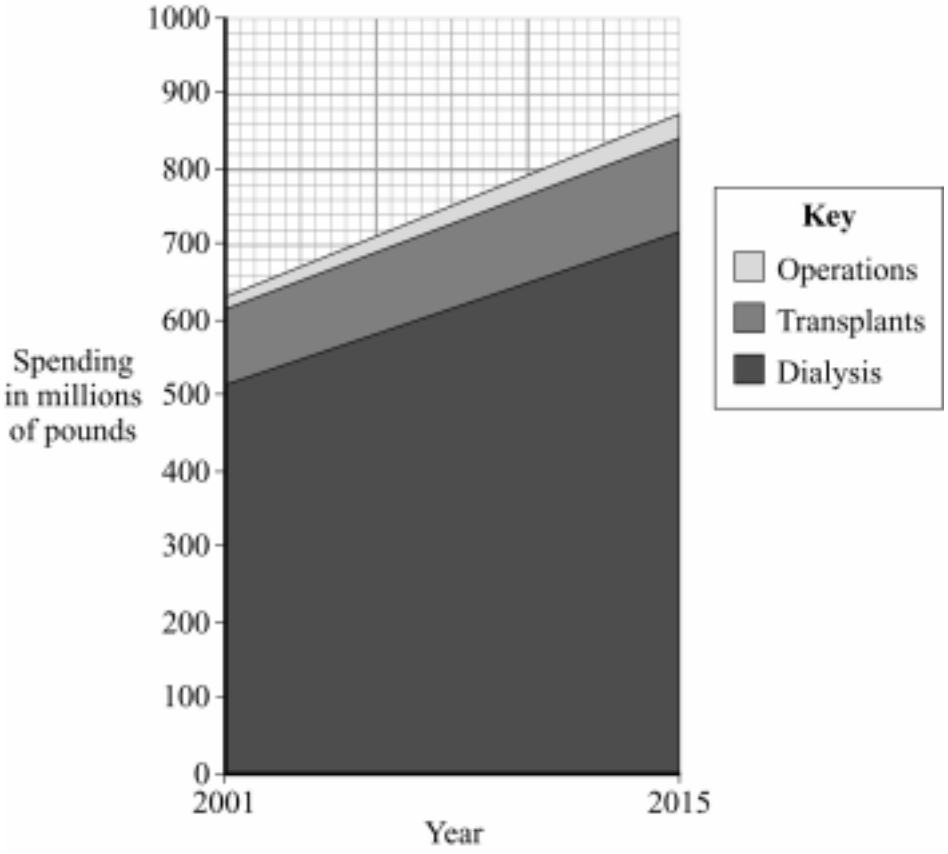
.....

(3 marks)

4

Turn over for the next question

4 The graph shows the projected spending on treatment of kidney failure until 2015. It does **not** include changes due to inflation.



(a) Suggest **one** explanation for the increase in spending on treatment of kidney failure between 2001 and 2015.

.....

.....

(1 mark)

(b) (i) The cost of treating one patient by dialysis is much greater than treating the same patient by transplant between 2001 and 2015.

Explain why.

.....

.....

.....

.....

(2 marks)

(ii) The spending on transplants is not expected to change very much between 2001 and 2015.

Suggest **one** explanation for this.

.....

.....

.....

(1 mark)

4

Turn over for the next question

LEAVE MARGIN BLANK

5 Read the passage below about Gasohol.

> Brazil is now 'growing' its own fuel for cars. It is growing sugar cane to produce ethanol. This is mixed with petrol to make a fuel called Gasohol. In Brazil, Gasohol contains 25 % ethanol. Burning Gasohol releases carbon dioxide into the atmosphere, but it releases much less nitrogen oxide. To grow sugar cane for fuel, Brazil has cleared large areas of rainforest.

Is using Gasohol better or worse for the environment than using petrol?

Use information from the passage and your own knowledge and understanding to explain the reasons for your answer.

…….

…….

…….

…….

……..

…….

…….

…….

(4 marks)

4

Turn over for the next question

6 (a) Complete the sentences about anaerobic respiration.

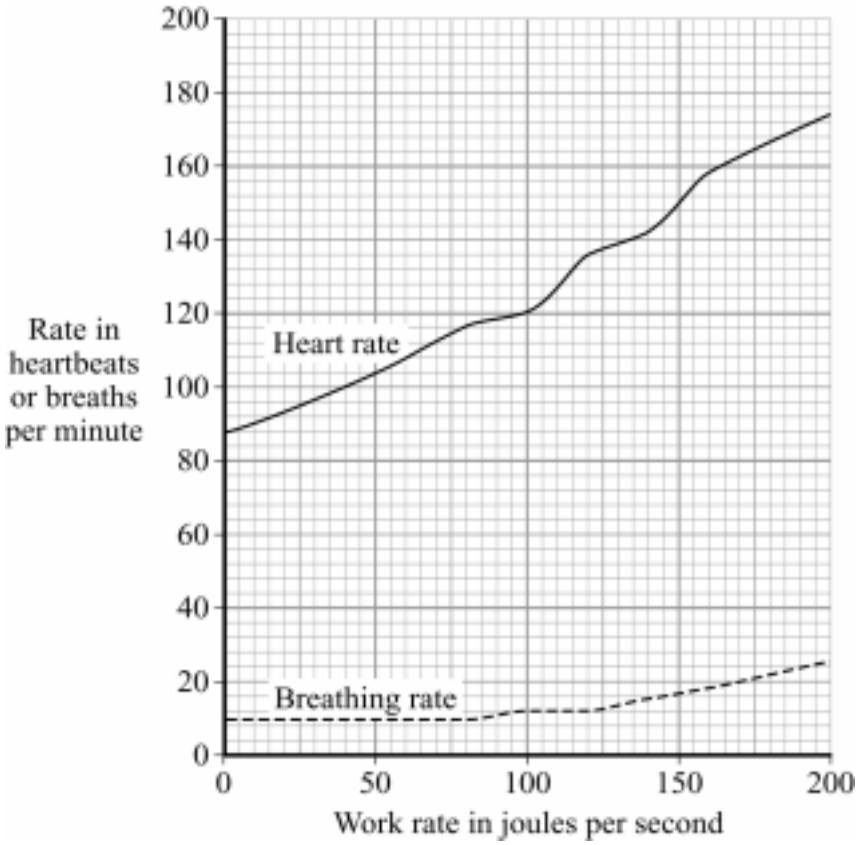
Anaerobic respiration is incomplete breakdown of …… into …… .

Anaerobic respiration results in an ……..…… .

(3 marks)

(b) The picture shows a student using an exercise machine.

The graph shows how the student's heart rate and breathing rate varied with his work rate.



(i) Describe the relationship between the variables breathing rate and heart rate.

.....

.....

.....

(2 marks)

(ii) Explain, as fully as you can, the advantages to the body in the change in breathing and heart rates.

.....

.....

.....

.....

.....

(4 marks)

9

Turn over for the next question

7 Read the information below about John Needham and Lazarro Spallanzani.

John Needham – 1748

Needham performed an experiment using mutton broth. He heated containers of mutton broth and then sealed some of the containers and left others open. He also left some of the broth uncooked, and put it into containers that were open and some that were closed. Needham saw that microorganisms grew in all of the containers, whether they were open or closed, or whether they had been heated or unheated. He saw this as strong evidence of spontaneous generation.

Lazzaro Spallanzani – 1767

Spallanzani also did experiments using meat broths. He boiled some broths for long periods of time, then melted the neck of some of the containers shut and left some open. Only the cultures that were left open had microorganisms in them. The sealed containers remained sterile. As controls, he boiled some broths for a short time. He then capped some of them loosely, left some open and totally sealed some of the others. Microorganisms grew in all of the control containers. Spallanzani saw this as strong evidence for the theory of biogenesis.

(a) Explain the difference between spontaneous generation and biogenesis.

.....

.....

.....

.....

(2 marks)

(b) Spallanzani and Needham did similar experiments but came to different conclusions.

Explain why.

.....

.....

.....

.....

.....

.....

(3 marks)

5

Turn over for the next question

8 India is a developing country.

The table shows the sources of some of the energy used in India between 1960 and 1970.

	Source of energy in millions of tonnes			
	Non-renewable fuels		**Renewable fuels**	
Year	**Coal**	**Oil**	**Cow dung**	**Vegetable waste**
1960	47	7	101	31
1965	64	10	112	34
1970	71	15	123	38
Percentage increase between 1960 and 1970	51.1	114.3	21.8	22.6

(a) (i) The use of all the fuels increased between 1960 and 1970.

Suggest **one** explanation for this.

.....

.....

(1 mark)

(ii) The percentage increase in the use of non-renewable fuels was much greater than that of the renewable fuels.

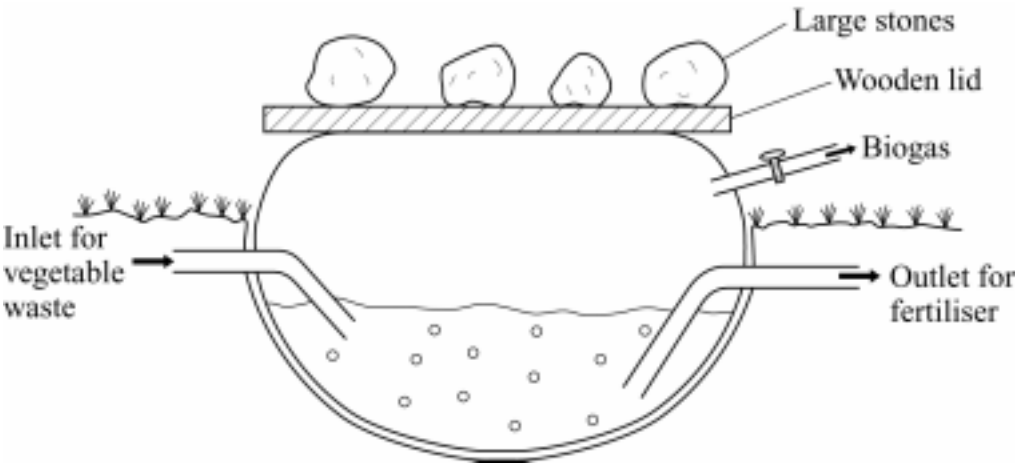
Suggest **one** explanation for this.

.....

.....

(1 mark)

(b) The Indian government suggested that villagers should make better use of renewable resources. They encouraged villagers to use biogas generators of the type shown in the diagram.



The table shows the mean monthly temperature in an Indian village which has built a biogas generator. The village is in the northern hemisphere.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean temperature in °C	13	17	20	29	33	33	31	29	29	25	20	14

Use information from the diagram and from the table to explain the advantages and disadvantages of this biogas generator.

Advantages:

.....

.....

.....

.....

.....

.....

Question 8 continues on the next page

Disadvantages:

.....

.....

.....

.....

.....

.....

(6 marks)

8

END OF QUESTIONS

Biology 3H Mark Scheme

Question 1

	answers	extra information	mark
(a)(i)	2600		1
(ii)	3400		1
(b)(i)	day 2		1
(ii)	cold day so less water lost via sweat		1
(c)(i)	spreadsheet		1
(ii)	totals calculated by program		1
Total			**6**

Question 2

	answers	extra information	mark
(a)(i)	**A**		1
(ii)	**B**		1
(b)	diffusion		1
(c)(i)	**C**		1
(ii)	movement against concentration gradient		1
Total			**5**

Question 3

	answers	extra information	mark
(a)	oxygen transport		1
(b)	contains haemoglobin		1
	which has high affinity for oxygen / can carry much oxygen		1
	no nucleus, so can carry much more oxygen / space for more haemoglobin		1
Total			**4**

Question 4

	answers	extra information	mark
(a)	population living longer, so higher incidence of kidney disease		1
(b)(i)	transplant is permanent cure		1
	dialysis needed regularly for rest of life		1
(ii)	shortage of donors		1
Total			**4**

Question 5

	answers	extra information	mark
	(better) less nitrogen oxides released less use of petrol / non-renewable resource can grow energy source carbon dioxide released is equivalent to that taken in by plants		 1 1 1 1
Total			**4**

Question 6

	answers	extra information	mark
(a)	glucose		1
	lactic acid		1
	oxygen debt		1
(b)(i)	association		1
	both affected by work rate		1
(ii)	any **four** from: • higher breathing rate – higher rate diffusion of oxygen into blood • higher breathing rate – higher rate diffusion of carbon dioxide out of blood • higher heart rate – faster delivery of oxygen to muscles • higher heart rate – faster delivery of glucose to muscles • for respiration / energy release		4
Total			**9**

Question 7

	answers	extra information	mark
(a)	biogenesis – life can come only from existing life		1
	spontaneous – life can come from non-living materials		1
(b)	Needham did not appreciate that boiling for some time was necessary to kill all the organisms in the broth		1
	Spallanzani did control experiments		1
	his data more valid		1
Total			**4**

Question 8

	answers	extra information	mark
(a)(i)	increased population / standard of living		1
(ii)	increased use of motor vehicles		1
(b)	any **six** from: (advantages) • uses waste material • cheap to construct • cheap to maintain • produces fertiliser as waste product (disadvantages) • loss of gas via leaks • will produce little gas in cold months • difficult to control production		6
Total			**8**
		Overall marks	**45**

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Teachers' Notes
ISA – Biology 1 – Acid Rain
Specimen Material

This ISA relates to: Biology 1

How do humans affect the environment?

Candidates should be given the opportunity to carry out an investigation concerning the effect of a change of pH on the growth of seedlings.

The investigation could involve any method for altering the pH of the soil in which seedlings are growing. Candidates should have a clear prediction and have some involvement in the choice of the range for the independent variable. They need to produce a table and a graphical representation of their results.

Suggested outline methods:

Use petri dishes and cotton wool or filter paper to germinate (eg cress) seedlings and then add different concentrations of (e.g. HCl) daily. Candidates should think about controls and how many seedlings to harvest and what measurements to take.

It would be appropriate to give to the students a detailed method for setting up the independent variable and give them any guidance and support that they need to produce useful results.

Note that if this practical is being used to assess the skills associated with the carrying out of practical work then the method should be sufficiently sophisticated to allow access to the marks expected for those candidates. Note that any help given could reduce the marks available.

Candidates can work individually or in groups and can pool results if it is thought to be appropriate.

Each candidate should draw up his or her own table of results and should process the data in an appropriate way, eg bar chart or line graph. This part of the activity must be carried out individually and under direct supervision (ie controlled conditions). The table of data and graphs should then be kept by the teacher and provided to the candidate for the subsequent ISA.

Candidates should have a copy of **their** results, any pooled results and a suitable graphical representation of those results at the assessment.

GCSE Science – Investigative Skills Assignment
Biology 1 – Acid Rain
Specimen Material

Centre number						Candidate number					Today's date	. . . /. . . / . . .
Candidate name (please print)							Are your own results submitted with this ISA?					YES/NO (delete one)

Instructions

- Maximum time allowed: 45 minutes.
- Use blue or black ink or ball-point pen.
- Fill in the boxes above.
- Answer **all** questions.
- Answer the questions in the spaces provided.

Code	Title of own investigation	Mark (to be filled in by teacher)	
		Section 1	
		Section 2	
		Total (max 34)	

Signature of candidate ..... Date .....

Signature of teacher marking this ISA ..... Date .....

Section 1

These questions refer to **your own investigation** into the growth of plants. You should use your own results, your graph/s and what you remember about doing your investigation to answer these questions. All answers should be in the spaces provided.

1 What were you trying to find out in your investigation?
Complete the blank spaces in the sentence below.

I was trying to find out if the.....

.....depends on the

.....

(2 marks)

2 Name **one** variable that you kept the same.

.....

(1 mark)

3 Describe how this variable was controlled.

.....

.....

(1 mark)

4 Why did you need to record several seedlings for each pH in your investigation?
Write down at least **two** measurements that show why this was needed.

.....

.....

(2 marks)

5 (a) Write down what you measured about your seedlings.

.....

(1 mark)

(b) Write down **one** other difference that you noticed about your seedlings.

.....

(1 mark)

6 Will your investigation **prove** that changing the pH of soil **directly** affects the growth of seedlings? Explain your answer.

.....

(1 mark)

7 Put a circle around any data that did not seem to fit your pattern.
You can do this on your table or your graph.
If you did not find any anomalous results, then say so here.

.....

(1 mark)

8 Were there any random errors in your results?
Answer yes or no and use an example to support your answer.
Explain why you think this happened.

.....

.....

.....

(3 marks)

9 Is there a pattern in your results?
Answer yes or no and then explain how you know this.

.....

.....

.....

.....

(2 marks)

10 Do you think that you have enough data to make a conclusion?
Answer yes or no and explain your answer.

.....

.....

.....

(2 marks)

11 Your teacher carried out a trial to decide the best range of pHs for your investigation. Suggest how this was done.

.....

.....

(2 marks)

12 Describe **one** way in which your evidence could lead to society understanding more about pollution.

.....

.....

(1 mark)

Carry out a final check of your results and graph/s and hand them in with your paper.

20

Section 2

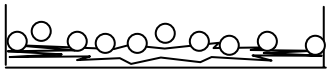
These questions are about **John's investigation** into the growth of cress seeds. You should use his results below, as well as your own understanding of how these investigations are carried out, to answer the questions.

John designed his investigation to test this prediction:

The lower the pH of the soil in which cress seeds are grown, the poorer the growth of those seeds.

John grew 100 cress seeds in each of six dishes**.** The dishes all contained cotton wool and 50 ml of pure water. The seeds were spread out onto the cotton wool and he then put a different number of drops of sulfuric acid into each of the dishes.

The dishes and seedlings were left for one week before 10 seeds were taken out and measured.



The 100 seeds are on cotton wool and 50 ml of water. Different numbers of drops of sulfuric acid are added to each of the six dishes.

John's results

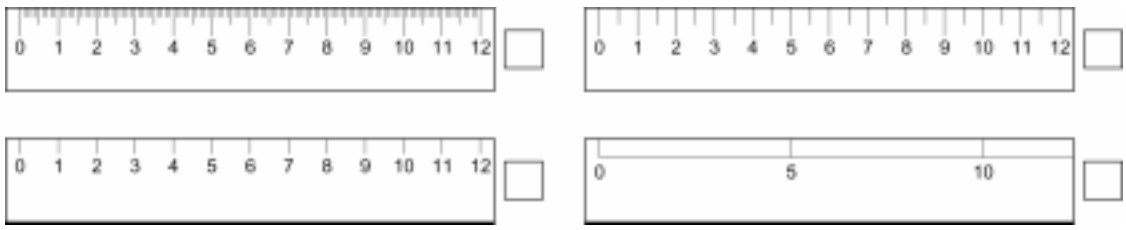
	Number of drops of sulfuric acid added					
	0	**1**	**2**	**3**	**4**	**5**
Cress seed height in mm	76	45	13	1	12	*
	38	61	25	7	3	*
	68	35	16	5	5	*
	67	62	24	17	4	*
	45	36	21	14	5	*
	53	43	11	12	4	*
	12	48	3	9	8	*
	56	11	22	5	4	*
	78	41	24	11	8	*
	50	37	17	7	2	*
Mean	49		16	9	5	

* these cress seeds did not grow

Answer the questions that follow.

13 Which of the following rulers should John have used for this investigation?

Tick the box beside the correct answer.



(1 mark)

14 John decided to change the pH by adding different numbers of drops of acid.
Do you think this was a good method?

Answer yes or no and give a reason for your answer. Suggest **one** way in which John could have improved the method of changing the pH.

Quality of written communication is important in this answer.

.....

.....

.....

.....

.....

(4 marks)

15 John chose to measure any 10 from the 100 seeds he put in.
Explain how John might have improved on this method of sampling.

.....

.....

.....

.....

(3 marks)

16 State the range for the seed height grown in one drop of the acid.

.....

(2 marks)

17 Would you consider John's results to be more reliable or less reliable than yours?
Answer by crossing out **one** of the words in the box below.

I think that John's results are | less / more | *reliable than mine.*

Give **one** reason for your decision.

.....

.....

(1 mark)

18 Calculate the mean for the seed height grown in one drop of the acid.
Put this figure into the table.

(2 marks)

19 John wanted to process his results to show how pH and the growth of the seedlings are related. How should he do this?

Tick the box beside the correct answer.

- Bar chart ☐
- Line graph ☐
- Pie chart ☐
- Scatter graph ☐

(1 mark)

14

END OF QUESTIONS

ISA – Biology 1 – Acid Rain

Marking Guidelines

Specimen Material

Please mark in red ink, and use one tick for one mark.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

One of the marks on this test is to be awarded for the Quality of Written Communication (QWC)

Section 1

1	Can state the purpose of the investigation in general terms	1 mark
	Goes on to define the purpose in terms of the independent and the dependent variables	1 mark
2	Identification of a control variable	1 mark
3	Description of how variable mentioned above was controlled	1 mark
4	Recognises the need for repeats for increased accuracy or precision or reproducibility. Correct counter argument acceptable	1 mark
	Gives correct example to illustrate lack of precision or accuracy or reproducibility. Correct counter argument acceptable	1 mark
5	(a) Correctly states measurement taken	1 mark
	(b) Gives a sensible description of a relevant difference eg another possible dependent variable	1 mark
6	Answer must be 'no' – explanation that it could be that pH affects something that affects growth	1 mark
7	Correct identification of a clear anomaly or correct statement that there are no anomalies	1 mark
8	No marks for 'yes'/'no' Identifies that there is variation Identifies a potential cause for that variation Identifies correctly whether that cause is random or systematic	 1 mark 1 mark 1 mark
9	Pattern correctly identified, or statement that there is no pattern	1 mark
	Above but using terms linear/non-linear or (not) directly proportional	1 mark
10	No marks for yes/no. Judgement needed here The explanation must match the answer and the data – Can suggest that extra evidence is (not) required Can identify the extra evidence needed	 1 mark 1 mark

11	Describes the likely method for a trial run	1 mark
	Includes details of likely range of pH's	1 mark
12	Can describe eg how the evidence goes with other evidence to support other findings on acid rain pollution	1 mark

Max 20 marks

Section 2

13	Correct ruler identified	1 mark
14	'Yes' or 'no' <u>with reason</u> eg no, because some seeds may have had more acid/been more acidic than others	(1 mark)
or	eg no because no direct reading of pH/no control of pH	2 marks
	eg make sure that the acid is mixed before the cress seeds are added	1 mark
	eg use pH meter/pH papers to measure pH	
	Quality of Written Communication for logical link between reason and suggested improvement	1 mark
	Underline each term correctly used, tick the icon	
15	Increase the size of the sample	
	or	
	Idea that sample taken must have been fair	1 mark
	Increase size of sample to at least 20	1 mark
	Reduction of bias technique eg take all from outside	1 mark
16	11 – 62	1 mark
	mm	1 mark
17	No mark for choosing less or more	
	Any correct statement that relates to the reliability of the evidence	1 mark
18	41.9 or 42	(1 mark)
	or	
	45.3 or 45 (ie omitting anomaly)	2 marks
19	Bar chart	1 mark

Max 14 marks

Teachers' Notes
ISA – Biology 1 – Fieldwork Investigation
Specimen Material

This ISA relates to: Biology 1

What determines where particular species live and how many of them are there?

Candidates should carry out a fieldwork investigation related to the distribution of a particular species. They may investigate any factor that may possibly influence the distribution.

For example, they might investigate the height of grasses at different distances from a footpath, or they might investigate the distribution of certain indicator plants and link this to the type or acidity of the soil.

It would be appropriate to give to the candidates an outline method and give them any guidance and support that they need to produce useful results. Thought will need to be given to:

- the number of measurements to be taken within each sample
- the number and location of samples to be taken.

It is important that, whatever the plan is, the candidates must be involved in taking some measurements.

Note that if this practical is being used to assess the skills associated with the carrying out of practical work then the method should be sufficiently sophisticated to allow access to the marks expected for those candidates. Note that any help given could reduce the marks available.

Candidates can work individually or in groups and can pool results if it is thought to be appropriate.

Each candidate should draw up his or her own table of results and should process the data in an appropriate way, eg bar chart or line graph. This part of the activity must be carried out individually and under direct supervision (ie controlled conditions). The table of data and graphs should then be kept by the teacher and provided to the candidate for the subsequent ISA.

Candidates should have a copy of **their** results, any pooled results and a suitable graphical representation of those results at the assessment.

GCSE Science – Investigative Skills Assignment
Biology 1 – Fieldwork Investigation
Specimen Material

Centre number						Candidate number					Today's date	. . . /. . . / . . .
Candidate name (please print)								Are your own results submitted with this ISA?				YES/NO (delete one)

Instructions

- Maximum time allowed: 45 minutes.
- Use blue or black ink or ball-point pen.
- Fill in the boxes above.
- Answer **all** questions.
- Answer the questions in the spaces provided.

Code	Title of own investigation	Mark (to be filled in by teacher)	
		Section 1	
		Section 2	
		Total (max 34)	

Signature of candidate ..... Date .....

Signature of teacher marking this ISA ..... Date .....

Section 1

These questions refer to **your own** fieldwork investigation. You should use your own results, your graph/s and what you remember about doing your investigation to answer these questions.
All answers should be in the spaces provided.

1 What were you trying to find out in your investigation? Complete the blank spaces in the sentence below.

I was trying to find out if the.....

.....depends on the

.....

(2 marks)

2 Write down **one** thing that you measured during your investigation.

One thing that I measured was the .....

How did you make this measurement?

.....

(1 mark)

3 Why was it necessary to take several measurements within each sample, rather than just one?

.....

(1 mark)

4 How did you decide where to take your samples?

.....

(1 mark)

5 Write down **one** other factor that may have affected the outcome of your investigation.

.....

(1 mark)

6 Explain what you did to control or take account of this other factor.

.....

.....

(1 mark)

7 Did the way in which you took your samples affect your measurements?

.....

(1 mark)

8 Put a circle around any data that did not seem to fit your pattern. You can do this on your table or your graph. If you did not find any anomalous results then say so here.

.....

.....

(1 mark)

9 Were there any random errors in your results? Answer yes or no and use an example to support your answer and suggest why it happened.

.....

.....

(1 mark)

10 Is there a pattern in your results? Answer yes or no and explain how you know this.

.....

(1 mark)

11 Do you think that you have enough data to make a conclusion?
Answer yes or no and explain your answer.

.....

.....

.....

(1 mark)

12 What conclusion can you come to?

.....

(1 mark)

13 Carry out a final check of your results and graph/s. You will be awarded up to 6 marks for these.

(6 marks)

19

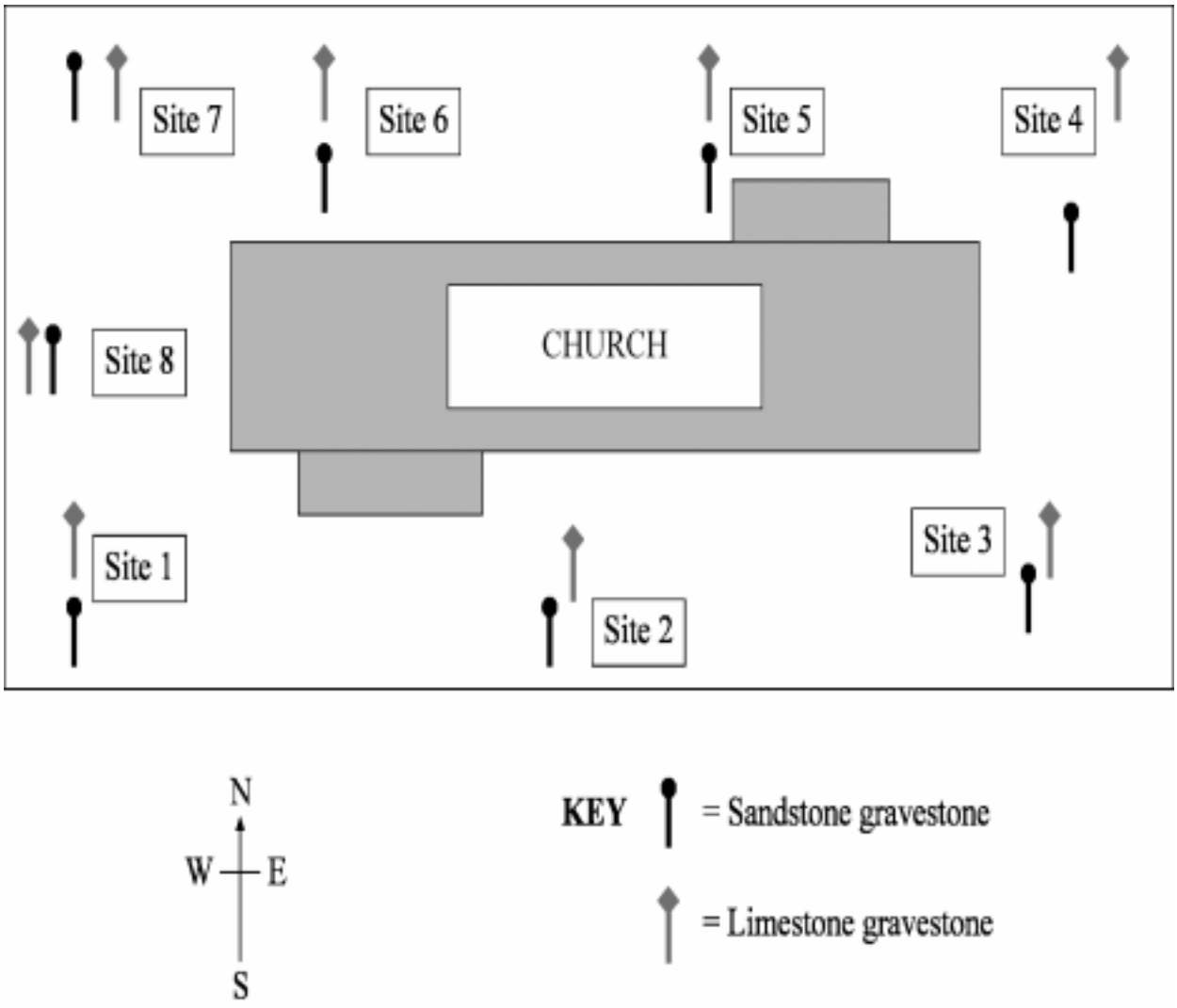
Section 2

These questions are about **Sally's investigation** into where snails are found in a churchyard.
You should use her results below as well as your own understanding of how these investigations are carried out, to answer the questions.

Read Sally's report, look at the tables of data and then answer the questions that follow.

'I wanted to find out whether snails in a churchyard are evenly distributed or not. In the churchyard there are two sorts of gravestone – limestone and sandstone. I predict that I shall find more snails around the limestone gravestone. This is because limestone is calcium carbonate and that is what snail shells are made of.'

'I picked 8 pairs of gravestones. I tried to find a limestone and a sandstone one as close together as I could. I chose 8 different positions around the church. Here is a plan to show where they were.'



At the time I collected my data, the sun was shining from the south west.

I counted the snails on each of the four sides of each gravestone and put the results into this table.

Limestone number	Number of snails counted on each side				Total number
	East	West	North	South	
1	9	2	0	2	13
2	2	0	0	2	4
3	0	3	6	0	9
4	7	15	1	1	24
5	4	8	4	4	20
6	2	2	1	0	5
7	0	4	1	1	6
8	1	6	1	1	9
Total	**25**	**40**	**14**	**11**	**90**

Average number of snails per gravestone = ☐

Sandstone number	Number of snails counted on each side				
	East	West	North	South	
1	5	3	0	0	8
2	2	1	0	3	6
3	0	4	6	0	10
4	6	1	4	1	12
5	4	2	0	1	7
6	1	2	1	1	4
7	0	4	6	0	10
8	4	3	0	0	7
Total	**22**	**20**	**17**	**6**	**64**

Average number of snails per gravestone = ☐

14 Sally chose to investigate whether the type of gravestone affected the distribution of snails.
What kind of variable is the 'type' of gravestone?
Tick the box beside the correct answer.

A categoric variable ☐

A control variable ☐

A dependent variable ☐

A discrete variable ☐

(1 mark)

15 Sally chose 8 pairs of gravestones.
Why was this better than just choosing one pair?

.....

(1 mark)

16 Sally tried to find a sandstone and a limestone gravestone that were as close together as possible.
Do you think that this was a good idea? Explain your answer.

.....

.....

(1 mark)

17 Work out the average number of snails per gravestone for each type, and put your answers in the boxes in the table.

(1 mark)

18 Describe one pattern that you can see in the results.

.....

.....

(2 marks)

19 It might have been easier to see any differences if Sally had presented her results in a graph. Describe one way of showing these results graphically. Say whether you would use a bar chart or a line graph, and say what you would plot on each axis.

Quality of written communication is important in this answer.

.....

.....

.....

.....

(4 marks)

20 Is there any evidence to suggest that Sally's hypothesis is correct and that snails do prefer limestone to sandstone? Explain your answer.

.....

.....

(1 mark)

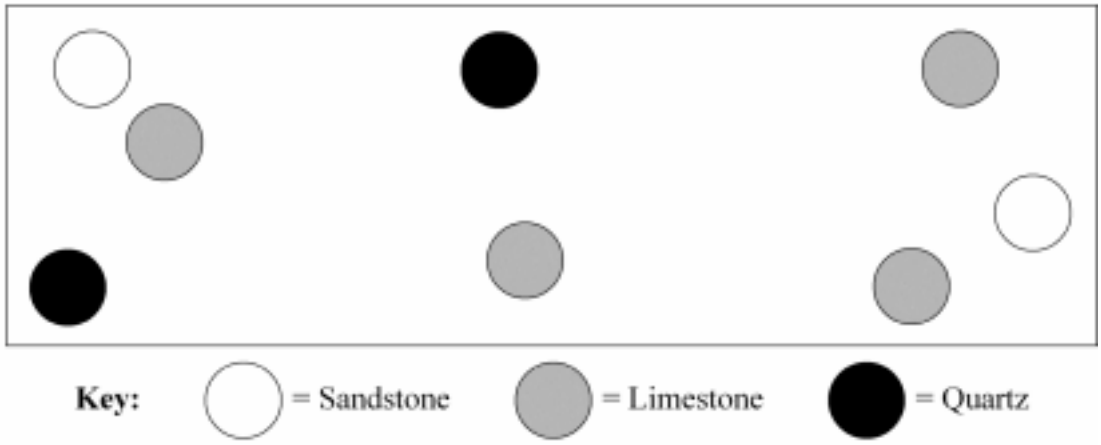
21 Suggest one other factor that could be influencing the distribution of snails.

.....

(1 mark)

After her field investigation, Sally carried out a test in the laboratory.
She put several pieces of rock into a large tray. She then put 15 snails into the tray and recorded which piece of rock they went to.

Plan of tray with rocks:



Results:

Type of rock	Number of snails
Sandstone	4
Limestone	10
Quartz	1

22 What is the advantage of carrying out this second investigation?

.....

(1 mark)

23 Why did Sally put some samples of quartz rock into the tray?
Tick the box beside the correct answer.

To act as a control investigation ☐

To provide extra shelter for the snails ☐

To separate the limestone from the sandstone ☐

To find out whether snails liked quartz ☐

(1 mark)

24 Did Sally carry out a fair test in this second investigation? Explain your answer.

.....

(1 mark)

15

END OF QUESTIONS

ISA – Biology 1 – Fieldwork Investigation

Marking Guidelines

Specimen Material

Please mark in red ink, and use one tick for one mark.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

One of the marks on this test is to be awarded for the Quality of Written Communication (QWC)

Section 1

1	Dependent variable correctly named	1 mark
	Independent variable correctly named	1 mark
2	Mark is for how they made the measurement	1 mark
3	Idea of random variation	1 mark
4	Reason given for choice of sample area	1 mark
5	One other factor given, eg shade/soil type/weather etc	1 mark
6	Suitable explanation	1 mark
7	Statement concerning nature of the sampling process	1 mark
8	Any anomalous results correctly identified or explanation given saying that there are none	1 mark
9	Yes or no, any reasonable suggestion with some results quoted in support	1 mark
10	Pattern quoted, with some results to support or no pattern reported, with reasons to support	1 mark
11	Correct statement of yes or no **with** justification	1 mark
12	Simple correct conclusion given	1 mark
13	Suitable table of results with all relevant data included	1 mark
	Columns and rows correctly labelled	1 mark
	Units present and correct	1 mark
	Correct choice of bar chart or graph	1 mark
	Suitable scales chosen and labelled	1 mark
	Correct plotting	1 mark

Max 19 marks

Section 2

14 A categoric variable — 1 mark

15 Idea of more reliability — 1 mark

16 Either Yes, with reason, eg so that other factors, (eg shade), would be the same

or

No, with reason e.g. if they were too close together, may be difficult to judge which one snails preferred — 1 mark

17 11.25 for limestone, 8 for sandstone (allow 11) — 1 mark

18 Any suitable pattern, eg snails seem to prefer west, east, north, south in that order — 2 marks

(If simply states more snails on limestone than on sandstone, award 1 mark. Cannot really have a pattern when only 2)

19 eg bar chart — 1 mark
number of snails on y axis — 1 mark
type of stone on x axis — 1 mark

Quality of written communication - correct use of any **three** technical terms, 1 mark

eg dependent variable/independent variable; continuous variable/categoric variable; axis

Underline each term correctly used. Once three have been underlined, tick the icon

20 Yes, more snails on limestone — 1 mark

21 eg sun/shade/moisture/type of vegetation/type of soil — 1 mark

22 Idea of checking with alternative data — 1 mark

23 To act as a control investigation — 1 mark

24 No – more limestone pieces than sandstone or quartz put in — 1 mark

Max 15 marks

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Teachers' Notes
ISA – Biology 2 – Photosynthesis
Specimen Material

This ISA relates to: Biology 2

How do plants obtain the food they need to live and grow?

This work should be carried out during the teaching of the section relating to the question of how plants obtain the food they need to live and grow.

The investigation could involve any independent variable affecting the production of oxygen in photosynthesis. Candidates should have a clear prediction and have some involvement in the choice of the range for the independent variable. They need to produce a table and a graphical representation of their results.

Suggested outline methods:

Place some pondweed (Elodea for example) in water in a syringe and collect the gas in a graduated tube. Vary the light intensity, temperature or carbon dioxide concentration. Simulations could provide the data required for access to this ISA, but might not provide a high level of insight into some of the issues involved.

It would be appropriate to give to the candidates a detailed method and give them any guidance and support that they need to produce useful results.

Note that if this practical is being used to assess the skills associated with the carrying out of practical work then the method should be sufficiently sophisticated to allow access to the marks expected for those candidates. Note that any help given could reduce the marks available.

Candidates can work individually or in groups and can pool results if it is thought to be appropriate.

Each candidate should draw up his or her own table of results and should process the data in an appropriate way, eg bar chart or line graph. This part of the activity must be carried out individually and under direct supervision (ie controlled conditions). The table of data and graphs should then be kept by the teacher and provided to the candidate for the subsequent ISA.

Candidates should have a copy of **their** results, any pooled results and a suitable graphical representation of those results at the assessment.

GCSE Science – Investigative Skills Assignment
Biology 2 – Photosynthesis
Specimen Material

Centre number						Candidate number					Today's date	. . . /. . . / . . .
Candidate name (please print)								Are your own results submitted with this ISA?				YES/NO (delete one)

Instructions

- Maximum time allowed: 45 minutes.
- Use blue or black ink or ball-point pen.
- Fill in the boxes above.
- Answer **all** questions.
- Answer the questions in the spaces provided.

Code	Title of own investigation	Mark (to be filled in by teacher)	
		Section 1	
		Section 2	
		Total (max 34)	

Signature of candidate ..... Date .....

Signature of teacher marking this ISA ..... Date .....

Section 1

These questions refer to **your own investigation** into photosynthesis. You should use your own results, your graph/s and what you remember about doing your investigation to answer these questions.
All answers should be in the spaces provided.

1 What were you trying to find out in your investigation? Complete the blank spaces in the sentence below.

I was trying to find out if the.....

.....depends on the

.....

(1 mark)

2 Describe briefly how you changed your independent variable.

.....

.....

(1 mark)

3 In your investigation, which was the dependent variable?

.....

.....

(1 mark)

4 State **one** variable that you controlled in your photosynthesis investigation.

.....

(1 mark)

5 Describe **one** variable that you were **not** able to control.

.....

.....

(1 mark)

6 How might you improve the accuracy of your results?
Tick the box beside the correct answer.

repeat them again ☐

change the dependent variable ☐

change the independent variable ☐

use different leaves ☐

(1 mark)

7 Were there any random errors in your results?
Answer yes or no and use an example to support your answer and suggest why it happened.

.....

.....

(3 marks)

8 What was the range of your dependent variable?

.....

(1marks)

9 Which, if any, of your results would you wish to repeat?

.....

(1 mark)

10 (a) What is the link between the readings you have made and the process of photosynthesis in your plant?

.....

.....

(1 mark)

(b) Suggest why your measurements might not be an accurate reading of the rate of photosynthesis.

.....

.....

(1 mark)

LEAVE MARGIN BLANK

11 Look back to Question 1 where you wrote down what you were trying to find out.
Now write down what you **did** find out from this investigation.

.....

.....

(1 mark)

12 Carry out a final check of your results and graph/s. You will be awarded up to 6 marks for these.

(6 marks)

20

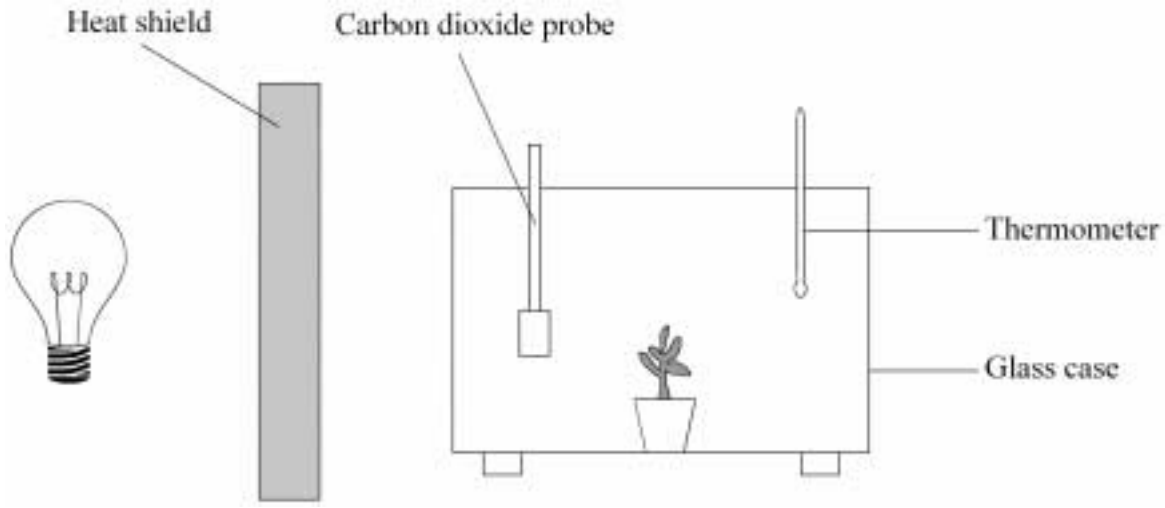
Section 2

These questions are about an investigation that is similar to yours. You should use the results below, as well as your own understanding of how these investigations are carried out, to answer the questions.

Mikael was interested in finding out the cheapest way of growing tomatoes in the winter. His argument was that light provides the energy for tomatoes to grow, but what level of light was needed? Giving too much light during the winter would cost him money.

He carried out a small-scale investigation to find out the relationship between light intensity and the rate of photosynthesis.

He took several tomato plants that had all grown to 5 leaves. He placed them separately into sealed glass cases. He measured the carbon dioxide concentration at the beginning and then 12 hours later, for each of seven different light intensities. The heat shield lets light but not heat through.



The results he obtained are in the table below.

Temperature °C	Light intensity (% of normal sunlight)	Carbon dioxide concentration at the start (%)	Carbon dioxide concentration after 12 hours (%)	Number of leaves
25	0	0.35	0.368	5
25	10	0.35	0.342	5
25	20	0.35	0.306	5
25	40	0.35	0.289	5
25	60	0.35	0.282	5
25	80	0.35	0.280	5
25	95	0.35	0.279	5

Answer the questions that follow.

13 What was the independent variable in Mikael's investigation?

.....

(1 mark)

14 What kind of measurements has Mikael has taken?
Tick the box beside the correct answer.

Continuous measurements ☐

Ordered measurements ☐

Discreet measurements ☐

Categoric measurements ☐

(1 mark)

15 State **one** control variable used by Mikael.

.....

(1 mark)

16 Mikael designed the investigation with one plant for each light intensity.
Was this a good idea? Explain your answer.

.....

.....

(1 mark)

17 One plant had been kept in the dark.
Explain why *in this investigation* it was important to have one plant kept in the dark.

.....

.....

.....

(1 mark)

18 Mikael was disappointed with his results.
He said 'I still do not know the exact light intensity it would be best to use'.
Suggest the range of light intensities he should use if he carries out a further investigation.

.....

(1 mark)

19 Mikael wants to plot a graph of his results.
Which of the following would be the best graph to draw?
Tick the box beside the correct answer.

A bar graph with final concentration plotted against light intensity ☐

A bar graph with initial concentration plotted against light intensity ☐

A line graph with final concentration plotted against light intensity ☐

A line graph with initial concentration plotted against light intensity ☐

(1 mark)

20 Describe the data which suggests that the carbon dioxide probe was very sensitive.

.....

.....

(1 mark)

21 Describe *fully* the relationship between light intensity and carbon dioxide concentration, as shown by these results. Then write a conclusion, based on the evidence from this investigation.

Quality of written communication is important in this answer.

.....

.....

.....

.....

.....

.....

(4 marks)

22 How could Mikael's work be of use to the wider public?
Tick the **2** boxes beside the **2** correct answers.

It could cut the cost of tomatoes in the shops ☐

It could reduce carbon dioxide emissions from glasshouses ☐

It could reduce the cost of electricity ☐

It could reduce emissions from power stations ☐

(1 mark)

END OF QUESTIONS

ISA – Biology 2 – Photosynthesis

Marking Guidelines

Specimen Material

Please mark in red ink, and use one tick for one mark.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

One of the marks on this test is to be awarded for the Quality of Written Communication (QWC)

Section 1

1	Purpose of investigation clearly stated	1 mark
2	Description to include eg changing the distance changed the light intensity	1 mark
3	Dependent variable correctly stated	1 mark
4	Identification of a control variable used eg heat filter to keep temperature constant	1 mark
5	Describes a variable that was not controlled eg external light source, CO_2 concentration, temperature	1 mark
6	Repeat them again	1 mark
7	Correctly identifies data that shows variation Suggests any possible cause Cause is random and not systematic	1 mark 1 mark 1 mark
8	Correct range stated	1 mark
9	Identifies an individual result or a set of results that do not fit the overall pattern	
	or Correctly states that none need to be repeated	1 mark
10	(a) eg 'the more photosynthesis the more oxygen produced and the further the bubble moves'	1 mark
	(b) Suggests how the bubble 'might not be just oxygen' or 'the oxygen bubble might expand due to the heat' or other equivalent suggestion	1 mark
11	Correct conclusion that relates to the prediction and fits the data	1 mark
12	Suitable table of results with all relevant data included	1 mark
	Columns, spaces and rows correctly labelled	1 mark
	Units present and correct	1 mark
	Correct choice of bar chart or graph	1 mark
	Suitable scales chosen and labelled	1 mark
	Correct plotting	1 mark

Max 20 marks

Section 2

13	Light intensity	1 mark
14	Continuous measurements	1 mark
15	Number of leaves, temperature or carbon dioxide concentration at the start	1 mark
16	'No' – eg there could have been variation (something wrong) with any of the plants **or** have different leaf areas	1 mark
17	To act as a control (group) **or** so that the rate of respiration can be taken into account	1 mark
18	40% – 60%	1 mark
19	Line graph with final concentration against intensity	1 mark
20	Reads to three decimal places	1 mark
21	As the light intensity increases the level of carbon dioxide falls	1 mark
	Up to about 40%/50%/60% of light intensity when the decrease in carbon dioxide is only very slight/the graph levels off/there is a limiting factor	1 mark
	Conclusion relates to photosynthesis eg states that increasing the light intensity increases the rate of photosynthesis/there is an optimum/most economic light intensity for photosynthesis	1 mark
	Recognises a limitation in the investigational procedure eg it is not clear what that light intensity is/there were no repeats/leaf area not controlled/ only with young plants	1 mark
	Quality of written communication - correct use of two scientific terms eg photosynthesis, limiting factor; light intensity; controls, rate.	1 mark
	Underline each term correctly used.	
	Once three have been underlined, tick the icon.	
22	It could cut the cost of tomatoes in the shops	
	and	
	It could reduce emissions from power stations	1 mark

Max 14 marks

Teachers' Notes
ISA – Biology 3 – Respiration in Yeast
Specimen Material

This ISA relates to: Biology 3

How are microorganisms used to make food and drink?

Preparation sheet for an investigation into the respiration of yeast.

This work should be carried out during the teaching of the section relating to how microorganisms are used to make food and drink.

The investigation could involve any independent variable affecting the production of carbon dioxide by yeast. Candidates should have a clear prediction that relates the chosen independent variable to yeast respiration. They should have some involvement in the choice of the range for the independent variable. They need to produce a table and a graphical representation of their results.

Suggested outline methods:

Yeast respiring in a container and collect carbon dioxide in a graduated tube. Vary either, aerobic/anaerobic conditions, or amounts/concentrations of glucose or varying temperatures or varying lengths of time.
Simulations could provide the data required for access to this ISA, but might not provide a high level of insight into some of the issues involved.

It would be appropriate to give to the candidates a detailed method and give them any guidance and support that they need to produce useful results.

Note that if this practical is being used to assess the skills associated with the carrying out of practical work then the method should be sufficiently sophisticated to allow access to the marks expected for those candidates. Note that any help given could reduce the marks available.

Candidates can work individually or in groups and can pool results if it is thought to be appropriate.

Each candidate should draw up his or her own table of results and should process the data in an appropriate way, eg bar chart or line graph. This part of the activity must be carried out individually and under direct supervision (ie controlled conditions). The table of data and graphs should then be kept by the teacher and provided to the candidate for the subsequent ISA.

Candidates should have a copy of **their** results, any pooled results and a suitable graphical representation of those results at the assessment.

GCSE Science – Investigative Skills Assignment
Biology 3 – Respiration in Yeast
Specimen Material

Centre number						Candidate number					Today's date	. . . /. . . / . . .
Candidate name (please print)								Are your own results submitted with this ISA?				YES/NO (delete one)

Instructions

- Maximum time allowed: 45 minutes.
- Use blue or black ink or ball-point pen.
- Fill in the boxes above.
- Answer **all** questions.
- Answer the questions in the spaces provided.

Code	Title of own investigation	Mark (to be filled in by teacher)	
		Section 1	
		Section 2	
		Total (max 34)	

Signature of candidate ..... Date .....

Signature of teacher marking this ISA ..... Date .....

LEAVE MARGIN BLANK

Section 1

These questions refer to **your own yeast respiration investigation.** You should use your own results, your graph/s and what you remember about doing your investigation to answer these questions.
All answers should be in the spaces provided.

1 What were you trying to find out in your investigation?
Complete the blank spaces in the sentence below.

I was trying to find out if the.....

..... depends on the

.....

(2 marks)

2 What was the range of the variable you changed (your independent variable)?

.....

(1 mark)

3 Name **one** variable that you kept the same.

.....

(1 mark)

4 Describe how this variable was controlled.

.....

.....

(1 mark)

5 Which of the following terms would you use to describe your dependent variable?
Tick the box beside the correct answer.

Categoric ☐

Ordered ☐

Discreet ☐

Continuous ☐

(1 mark)

6 In another school Karen carried out a similar investigation to yours. She counted the number of bubbles that the yeast produced.
Why do you think your method for measuring the amount of carbon dioxide produced was better than Karen's?

.....

.....

(1 mark)

7 State **one** variable that you were **not** able to control.

.....

.....

(1 mark)

8 A friend looks at your investigation and suggests that it was not the yeast that was making the carbon dioxide.
What other investigation could you carry out to prove that it was the yeast that was producing the carbon dioxide?

.....

.....

(1 mark)

9 If you wanted to find out if your results were reliable you could:
Tick the box beside the correct answer.

leave them for longer ☐

get somebody else to repeat them ☐

check out the theory in a textbook ☐

use more yeast ☐

(1 mark)

10 Describe the pattern in your results between your independent and dependent variable.

.....

.....

(1 mark)

11 Write a conclusion for your investigation.

.....

.....

.....

(1 mark)

12 How confident are you that this is a sound conclusion? Explain your answer.

.....

.....

(1 mark)

13 You could be asked to continue your investigation, to find out more about the same variables you have just used.
State the range and the values you would use to get more detailed information about your prediction. Remember, you must investigate changing the same variable.

.....

.....

(1 mark)

14 Carry out a final check of your results and graph/s. You will be awarded up to 6 marks for these.

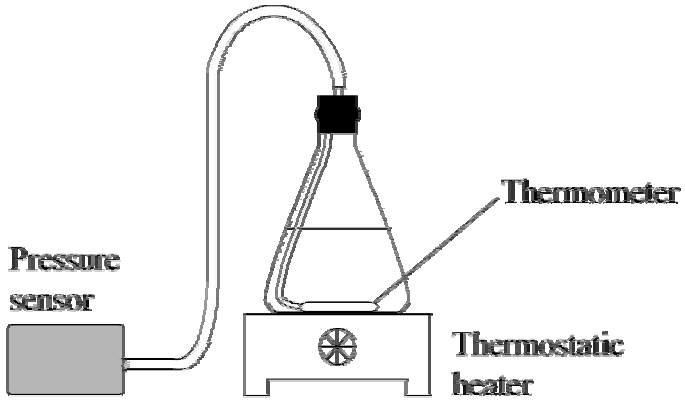
(6 marks)

20

Section 2

These questions relate to an investigation similar to the one that you carried out into the respiration of yeast. You should use the results below, as well as your own understanding of how these investigations are carried out, to answer the questions.

Paula decided to investigate how changing the concentration of sugar might affect the rate of carbon dioxide production by yeast. She put the yeast into water in six different flasks and added six different amounts of sugar. She attached the flask to a pressure sensor that measured the changes in pressure as the yeast made carbon dioxide.



Concentration of sugar (%)	Pressure at start (kPa)	Pressure after 1 hour(kPa)			Average pressure (kPa)
		a	b	c	
0	0	5	7	9	7
1	0	350	343	364	352
2	0	443	421	433	432
3	0	510	498	505	504
4	0	593	564	558	572
5	0	604	592	598	

Answer the questions that follow.

15 Complete the table of results by filling in the missing average.

(1 mark)

16 Describe any variation in the results for the 1 % sugar concentration.

.....

.....

(1 mark)

17 Do you consider that the pressure sensor is *sensitive* enough for this investigation?
Give evidence to support your answer.

.....

.....

(1 mark)

18 Describe *fully* the relationship between the rate of respiration of the yeast and the reading on the pressure sensor.

.....

.....

(2 marks)

19 What would be the best way of presenting these results?
Tick the box beside the correct answer.

Bar chart ☐

Line graph ☐

Pie chart ☐

Histogram ☐

(1 mark)

20 There is one anomalous result shown in the results. Draw a ring around this result.
Explain what Paula should have done about this anomaly.

Quality of written communication is important in this answer.

.....

.....

.....

.....

(4 marks)

21 The pressure sensor was calibrated to 600 kPa.
What effect does this have on the results that Paula obtained?

.....

.....

(1 mark)

22 The temperature of the liquid was kept constant, but the temperature of the gas above the liquid was not.
Explain how this might cast some doubt on the results obtained.

.....

.....

(1 mark)

23 Suggest **one** change you might make to improve the accuracy of the results in this investigation.

.....

.....

(1 mark)

24 How might the knowledge gained from this investigation be used by industry?

.....

.....

(1 mark)

14

END OF QUESTIONS

ISA – Biology 3 – Respiration in Yeast

Marking Guidelines

Specimen Material

Please mark in red ink, and use one tick for one mark.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

One of the marks on this test is to be awarded for the Quality of Written Communication (QWC)

Section 1

1	Purpose of investigation stated in general terms.	1 mark
	Goes on to define the purpose in terms of the dependent and independent variable	1 mark
2	Correct range given for independent variable	1 mark
3	Control variable named	1 mark
4	Method to control this variable correctly described	1 mark
5	Continuous	1 mark
6	Recognises the importance of interval or continuous measurements being more informative than Categoric measurements. Note these terms need not be used, but the idea conveyed.	1 mark
7	States a variable that was not controlled eg O_2 concentration, temperature	1 mark
8	Set up another test with no yeast or dead yeast (control group)	1 mark
9	Get somebody else to do them again	1 mark
10	Recognises the general pattern between independent and dependent variables	1 mark
11	Correct conclusion that relates to the prediction about yeast respiration and fits the data	1 mark
12	Correct response explained in terms of whether or not extra evidence is required for a confident conclusion	1 mark
13	Reasonable range (either interpolated or extrapolated from original range) with at least five sets of data	1 mark
14	Suitable table of results with all relevant data included	1 mark
	Columns and rows correctly labelled	1 mark
	Units present and correct	1 mark
	Correct choice of bar chart or graph	1 mark
	Suitable scales chosen and labelled	1 mark
	Correct plotting	1 mark
		Max 20 marks

Section 2

15	598 entered into table	1 mark
16	Identifies that there is some variation, or illustrates idea	1 mark
17	Yes – examples given or description made of the readings being sufficiently different between the concentrations of glucose	1 mark
18	Higher the rate of respiration the higher the reading on the pressure sensor	1 mark
	Any 3 of the following in the correct order: more respiration, more carbon dioxide, higher pressure, higher reading **or** reverse argument	1 mark
19	Line graph	1 mark
20	593 encircled	1 mark
	Recording should have been repeated	1 mark
	Mark should not have been included in the calculation of the mean.	1 mark
	Quality of written communication mark for the linking of any 'anomaly' to the correct action. Underline each term correctly used, tick the icon.	1 mark
21	Identification of the result obtained outside of the calibrated range as being eg untrustworthy	1 mark
22	eg an increase in temperature would increase the pressure, without an increase in carbon dioxide production	1 mark
23	eg use a water bath; use a stirrer; collect a volume of the gas	1 mark
24	eg the optimum rate for yeast respiration could be found out; industry could save on the cost of sugar	1 mark

Max 14 marks