DRAFT SPECIMEN MATERIAL

GCSE
BIOLOGY

Foundation Tier Paper 2F

F

Specimen 2018 Time allowed: 1 hour 45 minutes

Materials
For this paper you must have:
- a ruler
- a calculator.

Instructions
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 100 marks available on this paper.
- 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.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

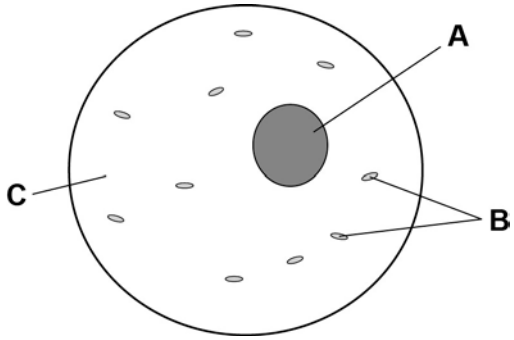
Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

0 1 **Figure 1** shows a human body cell.

Figure 1



0 1 . 1 Which part in **Figure 1** contains chromosomes?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

0 1 . 2 Humans have pairs of chromosomes in their body cells.

How many **pairs** of chromosomes are there in a human body cell?

[1 mark]

Tick **one** box.

10 ☐

23 ☐

46 ☐

92 ☐

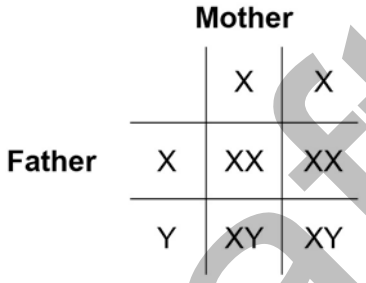
0 1 . 3 How many chromosomes are there in a human sperm cell?

[1 mark]

Humans have two different sex chromosomes, **X** and **Y**.

Figure 2 shows the inheritance of sex in humans.

Figure 2



0 1 . 4 **Circle** a part of **Figure 2** that shows an egg cell.

[1 mark]

0 1 . 5 Give the genotype of a male offspring.

[1 mark]

0 1 . 6 A man and a woman have two sons. The woman is pregnant with a third child.

What is the chance that this child will also be a boy?

[1 mark]

Tick **one** box.

0% ☐

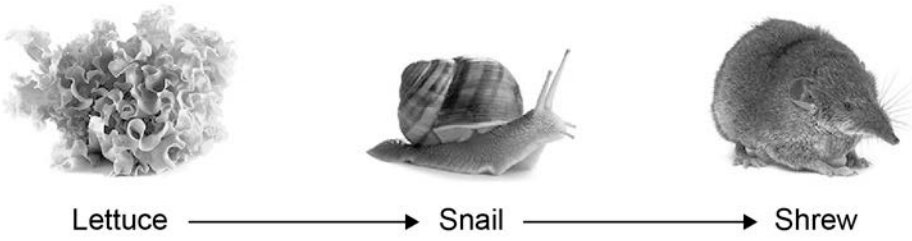
25% ☐

50% ☐

100% ☐

0 2 **Figure 3** shows a food chain.

Figure 3



0 2 . 1 Lettuce makes glucose by photosynthesis.

What is the source of energy transferred for photosynthesis?

[1 mark]

0 2 . 2 Name **one consumer** shown in **Figure 3**.

[1 mark]

0 2 . 3 Name **one carnivore** shown in **Figure 3**.

[1 mark]

0 2 . 4 A disease kills most of the shrews.

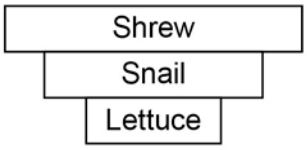
Suggest why the number of snails may increase.

[1 mark]

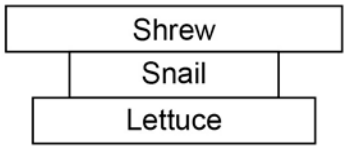
0 2 . 5 Which pyramid of biomass is correct for the food chain shown in **Figure 3**?

[1 mark]

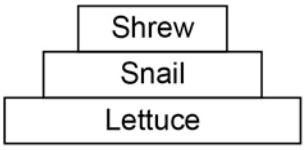
Tick **one** box.



A ☐



B ☐



C ☐

0 2 . 6 Some snails ate some lettuces.

The lettuces contained 11 000 kJ of energy.

Only 10% of this energy was transferred to the snails.

Calculate the energy in the lettuces transferred to the snails.

[1 mark]

Energy = _____ kJ

0 2 . 7 Give **one** reason why only 10% of the energy in the lettuce is transferred on to the snails.

[1 mark]

Tick **one** box.

The lettuce carries out photosynthesis ☐

The snail does not eat the roots of the lettuce ☐

Not all parts of the snail can be eaten ☐

0 2 . 8 **Abiotic** factors can affect the food chain.

Wind direction is one abiotic factor.

Name **two other** abiotic factors.

[2 marks]

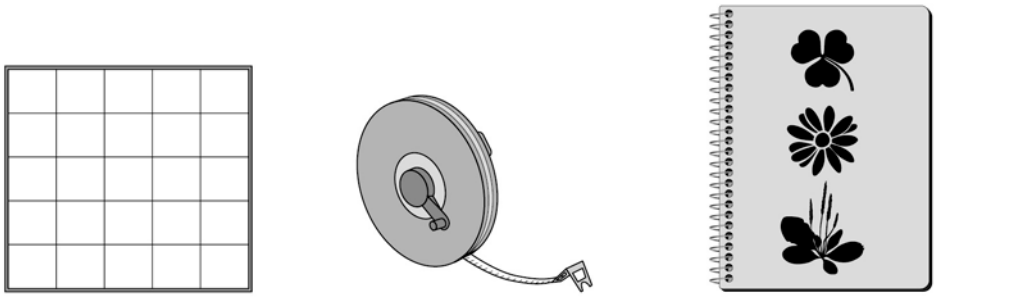
1 _____

2 _____

0 3 A student was asked to estimate how many clover plants there are in the school field.

Figure 4 shows the equipment used.

Figure 4



Not drawn to scale

This is the method used.

1. Throw a quadrat over your shoulder.
2. Count the number of clover plants inside the quadrat.
3. Repeat step **1** and step **2** four more times.
4. Estimate the number of clover plants in the whole field.

0 3 . 1 The teacher told the student that throwing the quadrat over his shoulder was **not** random.

The method could be improved to make sure the quadrats were placed randomly.

Suggest **one** change the student could make.

[1 mark]

0 3 . 2 How could the student improve the investigation so that a reliable estimate can be made?

[2 marks]

Tick **two** boxes.

- Weigh the clover plants ☐
- Compare their results with another student's results ☐
- Count the leaves of the clover plants ☐
- Place more quadrats ☐
- Place the quadrats in a line across the field ☐

Question 3 continues on the next page

Table 1 shows the student's results.

Table 1

Quadrat number	Number of clover plants counted
1	22
2	15
3	22
4	19
5	2
Total	**X**

0 3 . 3 Calculate the value of **X** in **Table 1**.

[1 mark]

Total number of clover plants = _____

0 3 . 4 The area of the school field was 500 m^2.

The five quadrats in **Table 1** had a total area of 5 m^2.

Calculate the estimated number of clover plants in the school field.

[1 mark]

Number of clover plants = _____

0 3 . 5 What was the mode for the results in **Table 1**?

[1 mark]

Tick **one** box.

2 ☐

16 ☐

22 ☐

40 ☐

0 3 . 6 Suggest which quadrat was placed under the shade of a large tree.

Give **one** reason for your answer.

[1 mark]

Quadrat number _____

Reason _____

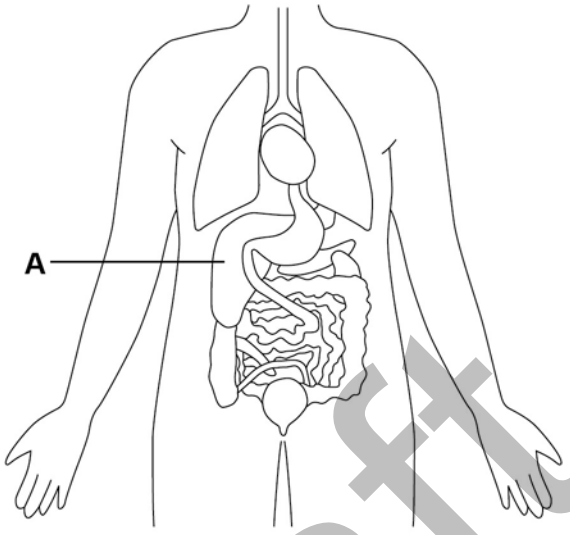
_____

Turn over for the next question

0 4 Humans control their internal environment in many ways.

Look at **Figure 5**.

Figure 5



0 4 . 1 Name organ **A**.

[1 mark]

0 4 . 2 Organ **A** stores glucose.

People with Type 1 diabetes cannot effectively control their blood glucose level.

Name the **hormone** people with **Type 1 diabetes** inject to decrease their blood glucose level.

[1 mark]

0 4 . 3 What organ helps to control body temperature?

[1 mark]

Tick **one** box.

- Lungs ☐
- Ovary ☐
- Pancreas ☐
- Skin ☐

0 4 . 4 What organ produces urine?

[1 mark]

Tick **one** box.

- Brain ☐
- Lungs ☐
- Kidney ☐
- Thyroid ☐

0 4 . 5 The production of urine removes excess water from the body.

Give **two other** ways water leaves the body.

[2 marks]

1 _____

_____

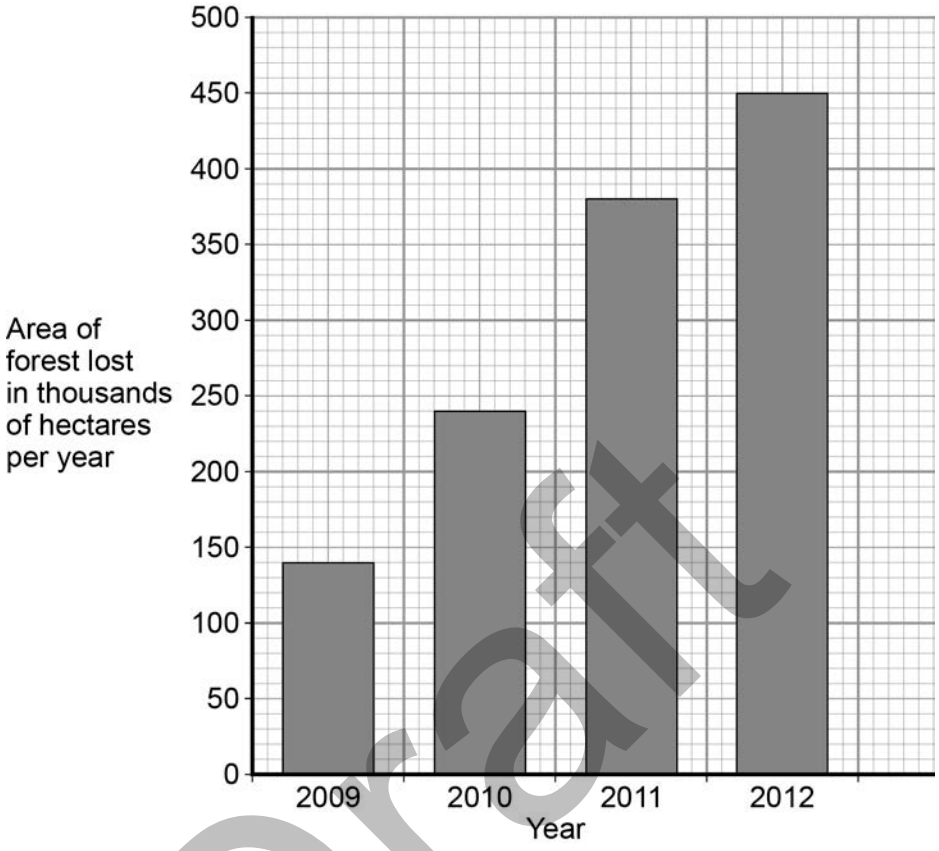
2 _____

_____

Turn over for the next question

0 5 **Figure 6** shows the area of forest lost in Madagascar from 2009 to 2012.

Figure 6



0 5 . 1 The area of forest lost each year in Madagascar has increased from 2009 to 2012.

Determine the total area of forest lost from the start of 2009 to the end of 2012.

[1 mark]

Total area of forest lost = _____ thousand hectares

0 5 . 2 What are the possible reasons for the change in the area of forest lost per year between 2009 and 2012?

[2 marks]

Tick **two** boxes.

The local people stop growing rice	☐
Less new housing is needed for the population	☐
The local people decided to farm cattle	☐
More trees have been planted	☐
A company starts growing plants for biofuels	☐

0 5 . 3 More forest was lost in 2012 than in 2009.

Use words from the box to complete the sentences.

[2 marks]

carbon dioxide	**excretion**	**nitrogen**
oxygen	**photosynthesis**	**respiration**

The increase in the area of forest lost has caused an increase in the gas _____ .

The increase of this gas has been caused because less of the gas is being absorbed by plants for the process of _____ .

Question 5 continues on the next page

0 5 . 4 Deforestation can have negative effects on our ecosystems.

What are the negative effects of deforestation?

[2 marks]

Tick **two** boxes.

Animals and birds migrate because there is less food	☐
More habitats are formed	☐
There is less acid rain	☐
There is less biodiversity	☐
The temperature of our world is decreasing	☐

0 5 . 5 Scientists try to reduce the negative effects of human activity on our ecosystems.

One way is to protect rare habitats.

Give **one other** way of reducing the negative effects of human activity on our ecosystems.

[1 mark]

Turn over for the next question

0 6 Hormones called auxins control plant growth.

A student investigated plant growth responses in roots.

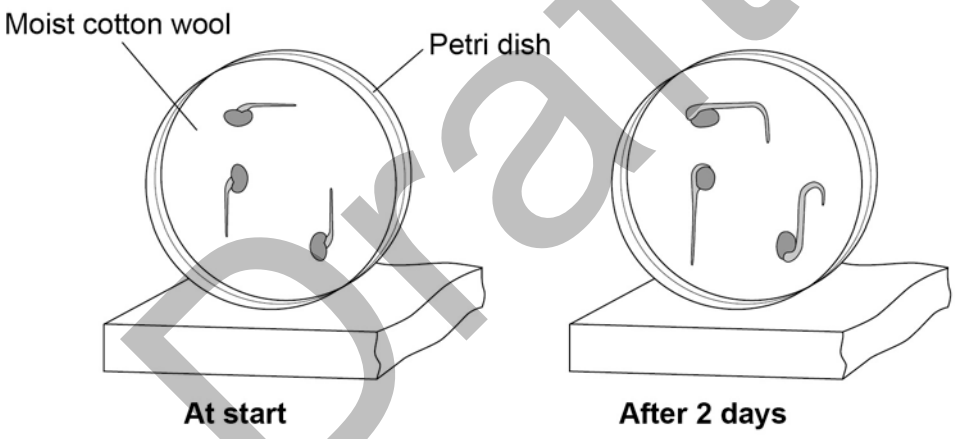
This is the method used.

1. Grow three bean seeds till their roots are 1 cm long.
2. Attach the three bean seeds to moist cotton wool in a Petri dish.

   Each bean seed root should point in a different direction.
3. Fix the Petri dish vertically for 2 days in the dark.

Figure 7 shows the results.

Figure 7



0 6 . 1 Describe the direction of growth of the bean **roots** after 2 days.

Give **one** reason for this growth response.

[2 marks]

Direction of growth _____

Reason _____

_____

0 6 . 2 The student then noticed the shoots growing from the seeds.

He then:

1. puts a light above the Petri dish but does not move the seeds
2. allows the seeds grow for 2 **more** days.

Predict the direction of growth of the bean **shoots** after 2 days.

Give **one** reason for your prediction.

[2 marks]

Direction of growth _____

Reason _____

Question 6 continues on the next page

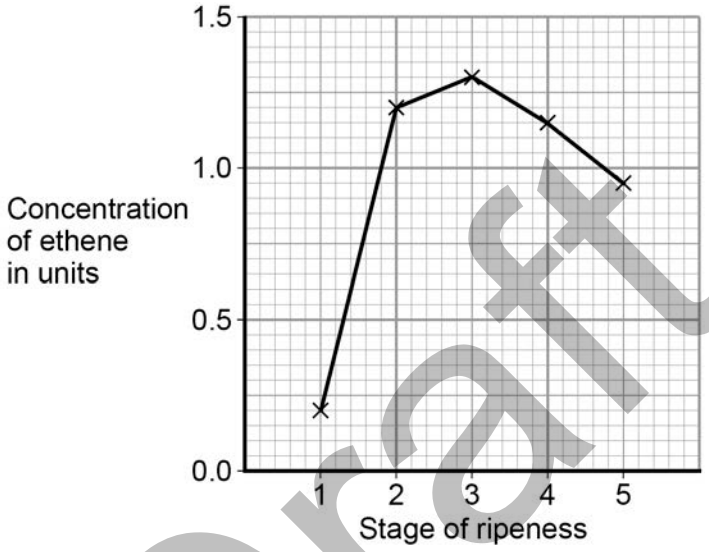
Ethene is a plant hormone.

Ethene causes fruit to ripen.

Scientists investigated the effect of ethene concentration on the ripeness of fruit.

Figure 8 shows the results.

Figure 8



0 6 . 3 At which stage of ripeness is there most ethene?

[1 mark]

Tick **one** box.

Stage **1** ☐

Stage **2** ☐

Stage **3** ☐

Stage **4** ☐

Stage **5** ☐

0 6 . 4 The scientists were not sure if the result for Stage **1** was an anomaly.

Suggest how they can find out if the result for Stage **1** was an anomaly.

[1 mark]

0 6 . 5 Giberrellins are a different type of plant hormone.

Farmers growing cotton plants in cold climates sometimes soak their seeds in a solution of gibberellins before planting the seeds.

Suggest why.

[1 mark]

Turn over for the next question

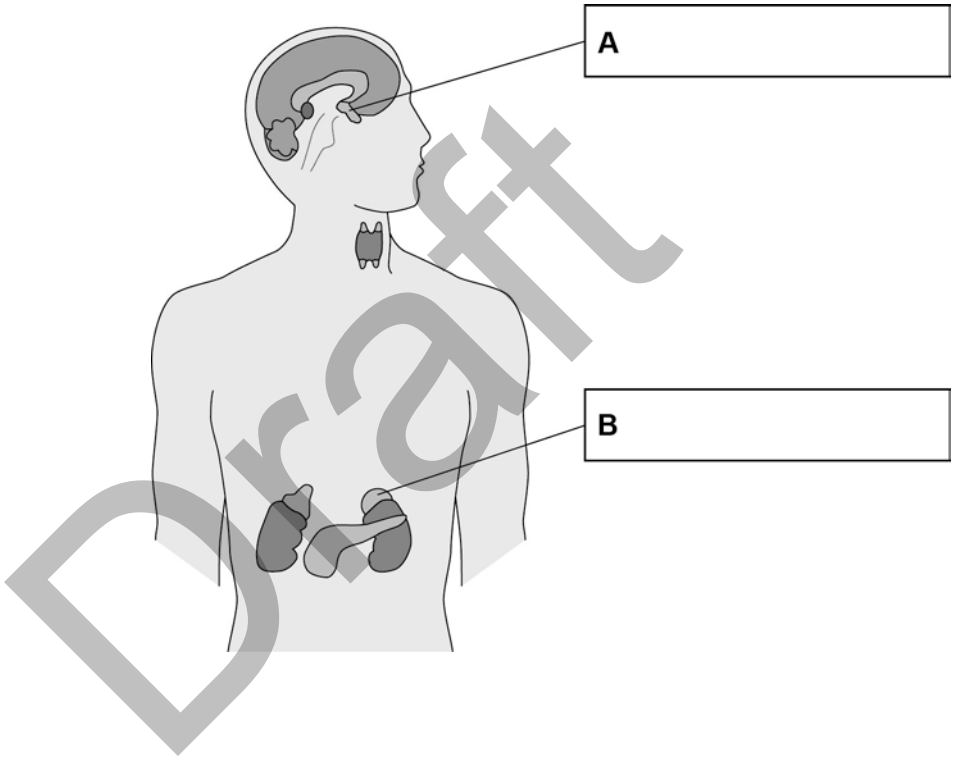
0 7 Glands in the body produce hormones.

0 7 . 1 Use words from the box to label gland **A** and gland **B** on **Figure 9**.

[2 marks]

Adrenal	**Pancreas**	**Pituitary**	**Testis**	**Thyroid**

Figure 9



0 7 . 2 Which gland produces oestrogen?

[1 mark]

Tick **one** box.

Ovary ☐

Pancreas ☐

Testis ☐

Thyroid ☐

Table 2 shows some methods of contraception.

Table 2

Type of contraception	Percentage (%) of pregnancies prevented
Oral pill	>99
Implant	99
Condom	98
Diaphragm	<96

0 7 . 3 Which method of contraception in **Table 2** is **least** effective at preventing pregnancy?

[1 mark]

0 7 . 4 Which method of contraception in **Table 2** will protect against sexually transmitted diseases like HIV?

[1 mark]

Question 7 continues on the next page

Another method of contraception is called the intrauterine device (IUD).

There are two main types of IUD:

- copper
- plastic.

Both types of IUD are more than 99% effective.

Look at **Table 3**.

Table 3

	Copper IUD	**Plastic IUD**
How the IUD works	• releases copper • copper changes the fluids in the uterus to kill sperm	• releases a hormone • hormone thickens mucus from the cervix so the sperm have more difficulty swimming to the egg
Benefits	• prevents pregnancy for up to 10 years • can be removed at any time • can be used as emergency contraception	• prevents pregnancy for up to 5 years • can be removed at any time
Possible side effects	• very painful periods • heavy periods or periods which last for a long time • feeling sick, back pain	• painful periods • light periods or no periods • feeling sick, headaches, breast pain, acne • hormones may affect mood • ovarian cysts

Use the information in **Table 3** to answer the following questions.

0 7 . 5 Give **one** difference between the way the two IUDs work.

[1 mark]

0 7 . 6 Give **two** advantages of the copper IUD compared with the plastic IUD.

Do **not** include side effects in your answer.

[2 marks]

1

2

0 7 . 7 Compare the possible side effects of the copper IUD with the possible side effects of the plastic IUD.

[3 marks]

Turn over for the next question

0 8 Two students investigated reflex action times.

This is the method used.

1. Student **A** sits with his elbow resting on the edge of a table.
2. Student **B** holds a ruler with the bottom of the ruler level with the thumb of Student **A**.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler and records the distance.
5. Repeat steps **1** to **4**.

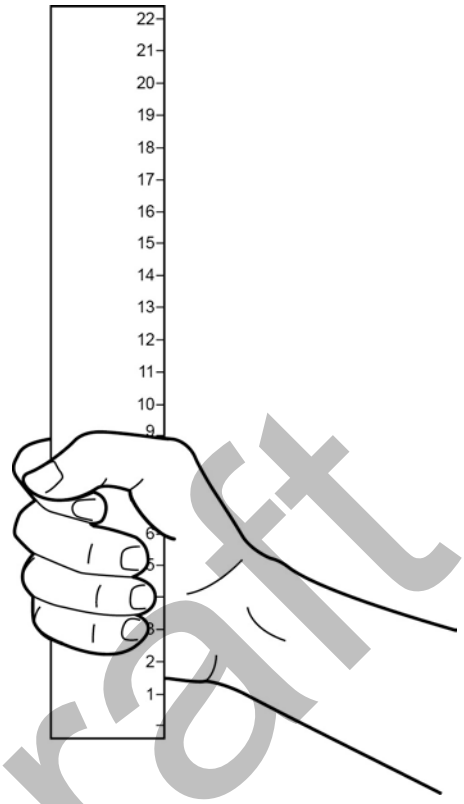
The same method was also used with Student **A** dropping the ruler and Student **B** catching the ruler.

0 8 . 1 Give **one** variable the students controlled in their investigation.

[1 mark]

Figure 10 shows one of the results for the Student **A**.

Figure 10



0 8 . 2 What is the reading shown in **Figure 10**?

[1 mark]

Reading on ruler = _____ cm

Question 8 continues on the next page

Table 4 shows the students' results.

Table 4

Test number	Distance ruler dropped in cm	
	Student A	**Student B**
1	9	12
2	7	13
3	9	13
4	6	8
5	10	13
6	2	8
7	7	10
Mean	**8**	**X**

0 8 . 3 **Circle** the anomalous result in **Table 4** for Student **A**.

[1 mark]

0 8 . 4 What is the median result for Student **B**?

[1 mark]

Tick **one** box.

8 ☐

10 ☐

12 ☐

13 ☐

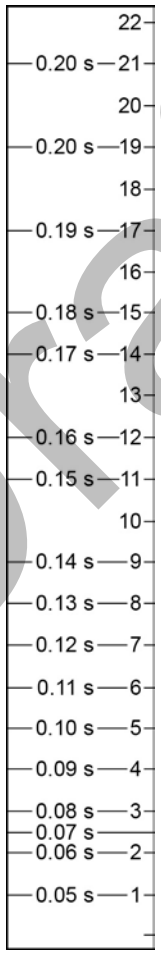
0 8 . 5 Calculate the value of **X** in **Table 4**.

[2 marks]

Mean distance ruler dropped = _____ cm

0 8 . 6 **Figure 11** shows the scale used to convert distance of the ruler drop to reaction time.

Figure 11



Use the scale in **Figure 11** to determine the mean reaction time for Student **A**.

[1 mark]

Mean reaction time for Student **A** = _____ s

Question 8 continues on the next page

0 8 . 7 What improvement could the students make to the method so the results are more reliable?

[1 mark]

Tick **one** box.

- Always use the left hand when catching the ruler ☐
- Carry out more repeats ☐
- Use a longer ruler for catching ☐
- Use more than two students to collect results ☐

0 8 . 8 Student **A** repeated the investigation to see the effect of caffeine on the reflex action.

Table 5 shows his results.

Table 5

Test number	Distance ruler dropped in cm	
	Without caffeine	**With caffeine**
1	9	5
2	7	6
3	9	4
4	6	7
5	10	4
6	2	5
7	7	4
Mean	**8**	**5**

Give **one** conclusion about the effect of caffeine on reflex actions.

[1 mark]

Turn over for the next question

0 9 Our understanding of genetics and inheritance has improved due to the work of many scientists.

0 9 . 1 Draw **one** line from each scientist to the description of their significant work.

[3 marks]

Scientist	Description of significant work
Charles Darwin	Carried out breeding experiments on pea plants.
Alfred Russell Wallace	Proposed that all living organisms evolved from simple ancestors.
Mendel	Worked on plant defence systems.
	Worked on warning colouration in animals.

0 9 . 2 In the mid-20th century the structure of DNA was discovered.

What is a section of DNA which codes for one specific protein called?

[1 mark]

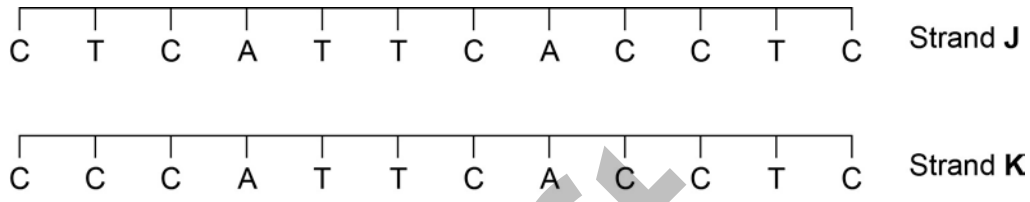
Figure 12 shows two strands of DNA, **J** and **K**.

Each strand has a sequence of bases (A, C, G and T).

The sequence codes for the same characteristic.

Strand **K** has a mutation.

Figure 12



0 9 . 3 **Circle** the base that shows a mutation on strand **K** in **Figure 12**.

[1 mark]

0 9 . 4 How many amino acids does strand **J** code for?

[1 mark]

Tick **one** box.

2 ☐

3 ☐

4 ☐

6 ☐

Question 9 continues on the next page

Mutations of DNA cause some inherited conditions.

One inherited condition is cystic fibrosis (CF).

A recessive allele causes CF.

0 9 . 5 Complete the genetic diagram in **Figure 13**.

- Identify any children with CF.
- Give the probability of any children having CF.

[3 marks]

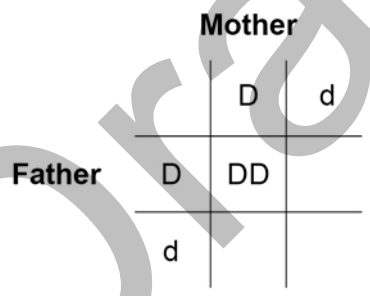
Each parent does not have CF.

The following symbols have been used:

D = dominant allele for **not** having CF

d = recessive allele for having CF

Figure 13



Probability of having a child with CF = _____

0 9 . 6 What is the genotype of the mother shown in **Figure 13**?

[1 mark]

Tick **one** box.

Heterozygous ☐

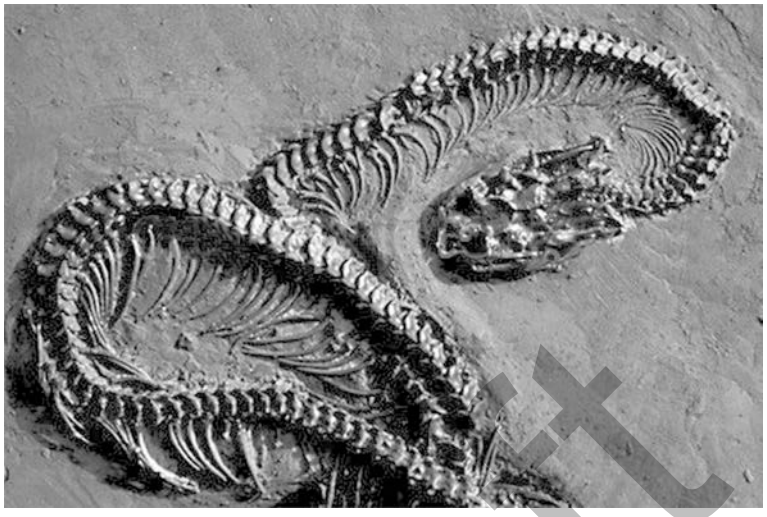
Homozygous dominant ☐

Homozygous recessive ☐

1 0 Studying fossils helps scientists understand how living things have evolved.

Figure 14 shows a fossilised snake.

Figure 14



1 0 . 1 Explain how the fossil in **Figure 14** may have formed.

[3 marks]

1 0 . 2 Many species of snake have become extinct.

Give **one** reason why a species might become extinct.

[1 mark]

Question 10 continues on the next page

There are many types of rat snake in the world.

Table 6 shows two types of rat snake

Table 6

		
Type of snake	Japanese rat snake	Texas rat snake
Colour of snake	Green	Pale brown
Type of environment	Grass	Dry and dusty

1 0 . 3 The different types of rat snake have evolved to suit their environments.

Explain how the Japanese rat snake might have evolved.

[4 marks]

1 0 . 4 Charles Darwin proposed the theory of natural selection.

Many people at the time did not accept his theory.

Give **two** reasons why his theory was **not** accepted until much later.

[2 marks]

1 _____

_____

2 _____

_____

1 0 . 5 A different theory said that changes in an organism during its life could be inherited.

Who proposed this theory?

[1 mark]

_____

Turn over for the next question

1 1 A gardener wants to add compost to the soil to increase his yield of strawberries.

1 1 . 1 The compost will add nitrates to the soil.

Describe how plants use nitrates.

[2 marks]

1 1 . 2 The gardener is going to make his own compost.

The gardener finds this research on the Internet:

'A carbon to nitrogen ratio of 30:1 will produce fertile compost.'

Look at **Table 7**.

Table 7

Type of material to compost	Carbon:nitrogen ratio	Cost per bag in £
Chicken manure	7:1	10.00
Horse manure	20:1	0.50
Peat moss	58:1	2.00

Which type of material in **Table 7** would be **best** for the gardener to use to make his compost?

Give **two** reasons for your answer.

[2 marks]

Best type of material _____

Reason 1 _____

_____

Reason 2 _____

_____

Question 11 continues on the next page

1 1 . 3 Some of the leaves from the gardener's strawberry plant die.

The dead leaves fall off the strawberry plant onto the ground.

The carbon in the dead leaves is recycled through the carbon cycle.

Describe how the carbon is recycled into the growth of new leaves.

[4 marks]

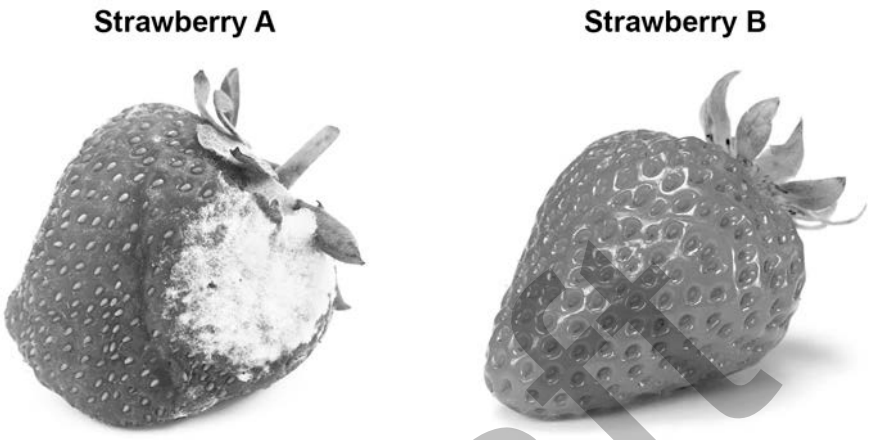
1 1 . 4 **Figure 15** shows two strawberries.

Both strawberries were picked from the same strawberry plant.

Both strawberries were picked 3 days ago.

The strawberries were stored in different conditions.

Figure 15



Give **three** possible reasons that may have caused strawberry **A** to decay.

[3 marks]

1 _____

2 _____

3 _____

Turn over for the next question

1 2 Many people have breathing problems because they are allergic to cats.

The allergy is caused by a chemical called Fel D1.

Different cats produce different amounts of Fel D1.

A cat has been bred so that it does not produce Fel D1.

This means the cat does **not** cause an allergic reaction.

1 2 . 1 Describe how the cat has been produced using selective breeding.

[4 marks]

1 2 . 2 Selective breeding could cause problems of inbreeding in the cats.

Give **one** problem inbreeding causes.

[1 mark]

END OF QUESTIONS