SPECIMEN MATERIAL

GCSE BIOLOGY

H

Higher Tier Paper 2H

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.
- When answering questions 01.3, 02.4, 03.3, 04.2 and 08.2 you need to make sure that your answer:

– is clear, logical, sensibly structured
– fully meets the requirements of the question
– shows that each separate point or step supports the overall answer.

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

Charles Darwin proposed the theory of natural selection.

Many people at the time did not accept his theory.

0 1 . 1

There was a different theory at the same time as Darwin's theory.

The different theory said that changes in an organism during its life could be inherited.

Who proposed this theory?

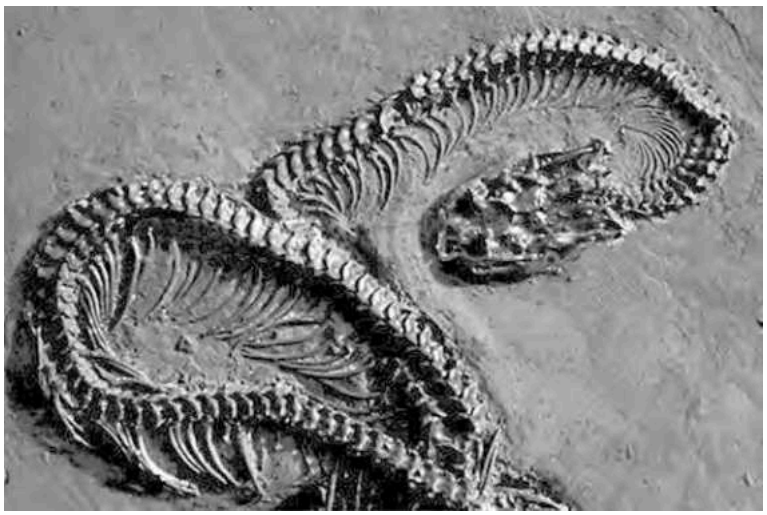
[1 mark]

Jean Baptiste Lamonk

0 1 . 2 Studying fossils helps scientists understand how living things have evolved.

Figure 1 shows a fossilised snake.

Figure 1



Explain how the fossil in Figure 1 may have formed.

[3 marks]

The dead snake was covered in sediment. The soft tissue decays, but bone does not. Therefore the bone is replaced by minerals

Question 1 continues on the next page

There are many types of rat snake in the world.

Table 1 shows two types of rat snake

Table 1

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

The different types of rat snake have evolved from similar ancestors.

0 1 . 3 Explain how the Japanese rat snake evolved to be different from the Texas rat snake. [4 marks]

Initially there are lots of different colours of snake. These colours are determined by genes. Some of these colours are closer to the green of the Japanese grass environment, so there are better camouflaged. Green snakes more likely to survive and breed so the survivors offspring will inherit these genes.

0 1 . 4 Many species of snake have become extinct.

Give one reason why a species might become extinct.

[1 mark]

New predator arriving.

ORi to change surroundings

0 2 A gardener wants to add compost to the soil to increase his yield of strawberries.

The gardener wants to make his own compost.

produces methane.

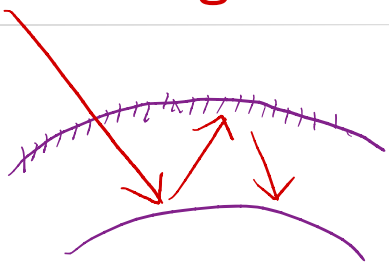
2 . 1 An airtight compost heap causes anaerobic decay.

statement + reasoning

Explain why the gardener might be against producing compost using this method.

[2 marks]

Anaerobic decay produces methane, which is a greenhousegas.



The gardener finds this research on the internet:

'A carbon to nitrogen ratio of 25:1 will produce fertile compost.'

Table 2.
Look at

Table 2

Type of material to compost	Mass of carbon in sample in g	Mass of nitrogen in sample in g	Carbon:nitrogen ratio
Chicken manure	8.75	1.25	7:1
Horse manure	10.00	0.50	20:1
Peat moss	9.80	0.20	X

0 2 . 2 Determine the ratio X in Table 2.

[1 mark]

8 9.8 ÷ 0.2 = 49

Ratio 49:1

0 2 . 3 Which type of material in Table 2 would be best for the gardener to use to make his compost?

Justify your answer.

[1 mark]

Horse manure because carbon to nitrogen ratio closest to 25:1

Question 2 continues on the next page

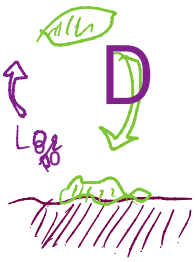
0 2 . 4 Some of the leaves from the gardener's strawberry plant die.

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

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

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

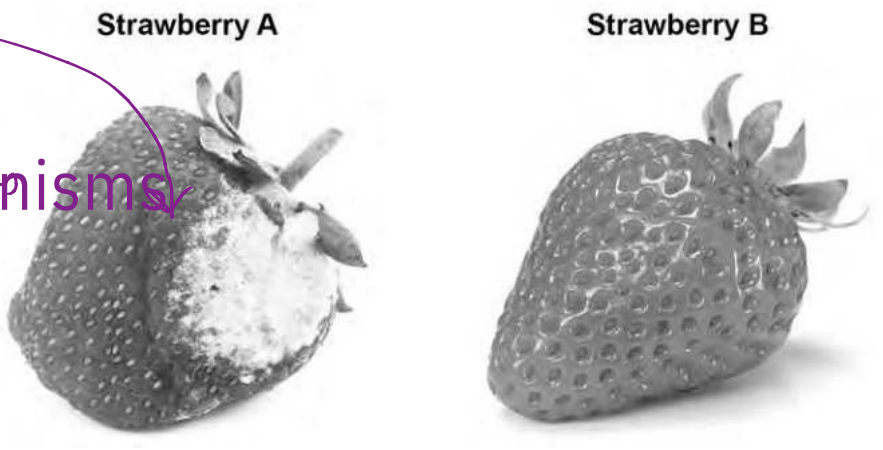
[6 marks]



0 2 . 5 Figure 2 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 2



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

[3 marks]

1 Stored at higher temperature

2 Stored in conditions with more oxygen.

3 Stored in a place with more moisture

0 3 Many different types of animals are produced using selective breeding.

Some cats are selectively bred so that they do not cause allergies in people.

to improve quality of life of cat
OR to improve cat as a pet

0 3 . 1 Suggest two other reasons why people might selectively breed cats.

[2 marks]

1 To eliminate specific genetic defects

2 for aesthetic reasons

to make them less aggressive / more docile

0 3 . 2 Selective breeding could cause problems of inbreeding in cats.

Describe one problem inbreeding causes.

[1 mark]

More likely to pass on recessive disorders

pass on recessive

OR cats are more susceptible to disease

0 3 . 3 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.

The cat does not cause an allergic reaction.

Explain how the cat has been produced using selective breeding.

[4 marks]

Cats with the desired characteristics the, lowest Fel DI are allowed to breed. Their offspring will produce a variety of hereby Fel DI those with the lowest Fel D1 levels are allowed to breed. This is repeated many generation so that over time the cats produce less Tel DI a

There are no questions printed on this page

0 4 A student plans an investigation using mould.

0 4 . 1 Mould spores are hazardous.

Give one safety precaution the student should take when doing this investigation.

[1 mark]

Wear a mask

Wear a mask.

A student made the following hypothesis about the growth of mould:

'The higher the temperature, the faster the growth of mould'.

The student planned to measure the amount of mould growing on bread.

The student used the fo

- slices of bread
- sealable plastic bags
- a knife
- a chopping board
- mould spores.

level 2: detailed, coherent, results should be quantitative, and the method repeatable

0 4 . 2 Describe how the materials and equipment could be used to test the hypothesis.

[4 marks]

Take 4 slices of bread and cut them into squares of side length 2cm. Add 6 spores to each square. Place in each bag. Place each bag at a different temperature 20, 30, 40 and 50°C. Leave for 4 days.

Measure the percentage cover of mould on the pieces of bread.

level 2 detailed, coherent, logical

results should be quantitative, repeatable

detailed

control variable

Question 4 continues on the next page

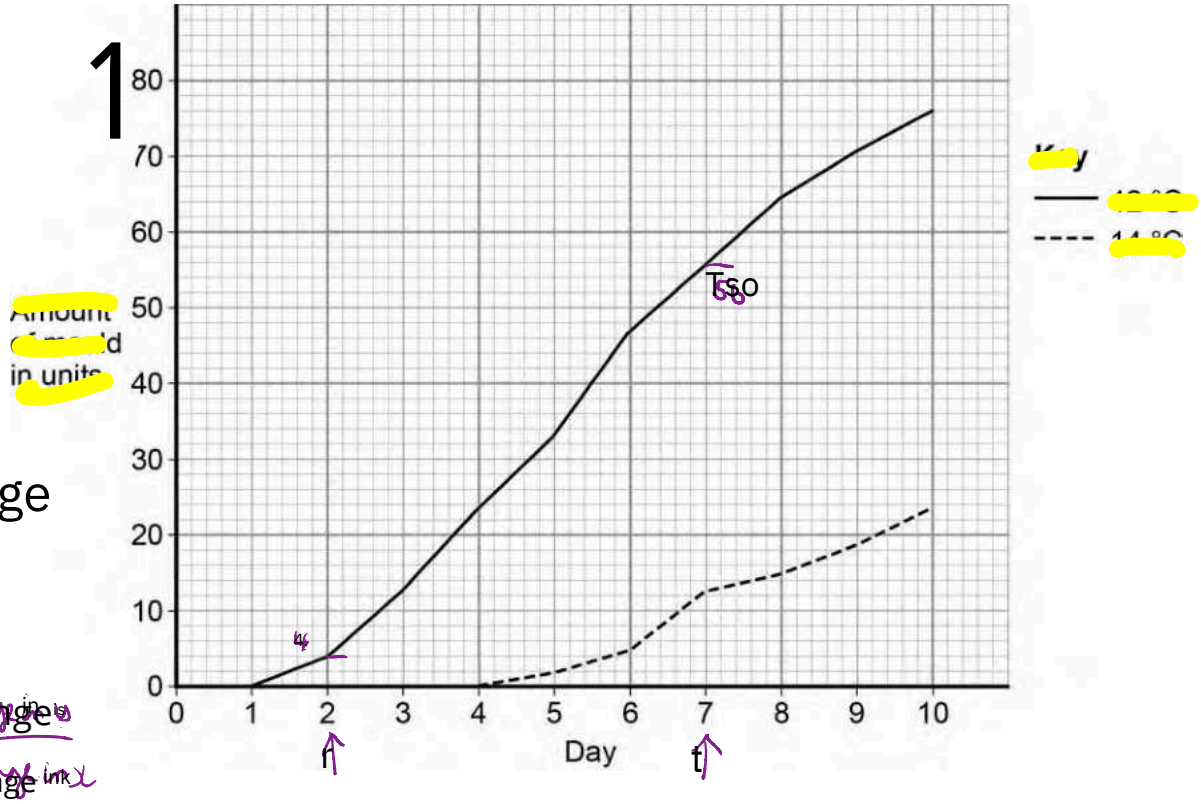
0 4 . 3 Give one variable the student should control in the investigation.

[1 mark]

Another student did a similar investigation.

Figure 3 shows the results.

Figure 3



0 4 . 4 Determine the rate of mould growth at 42 °C between day 2 and day 7.

[2 marks]

Rate of mould growth = 10.4

10.4 units per day

m

0 4 . 5 The growth of mould shows decomposition of the bread.

Give a conclusion about decomposition from the results in Figure 3.

[1 mark]

the rate of decomposition is higher at higher temperatures.

ratty decomposition ahigher athigher temperatures -

↑ temperature, ↑ mould

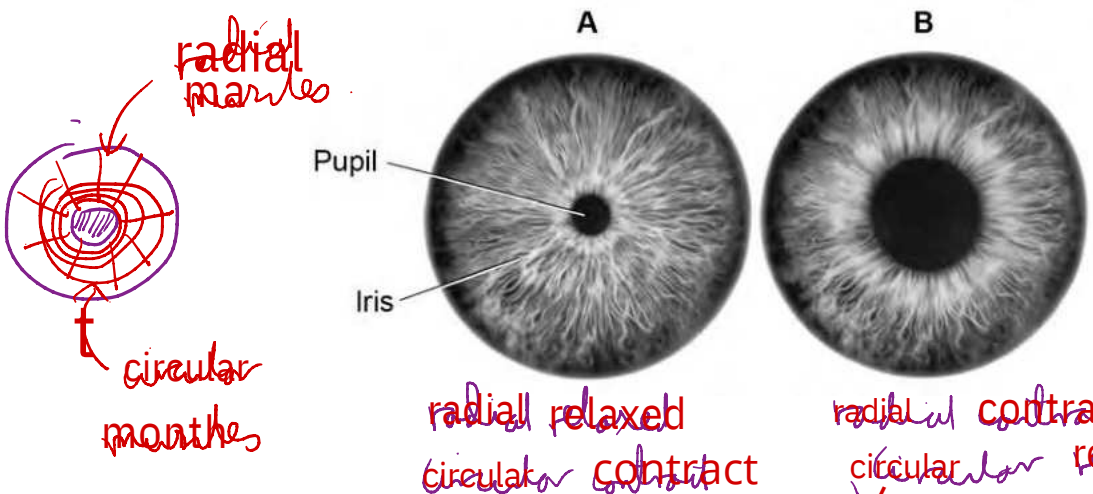
T temperatureT,mould

so .- ↑ temperature, ↑ decomposition

Turn over for the next question

0 5 Figure 4 shows a reflex in the iris of the human eye in response to changes in light levels.

Figure 4



0 5 . 1 Describe the changes in the pupil and iris going from A to B in Figure 4.

Explain how these changes occur.

Refer to the changes in light level in your answer.

[4 marks]

Pupils dilated at B ✓ in low light levels ✓
Radial muscles contract and circular muscles relaxed ✓

0 5 . 2 Some people wear glasses to improve their vision.

Figure 5 shows light entering the eye in a person with blurred vision.

Figure 6 shows how this condition is corrected with glasses.

Figure 5

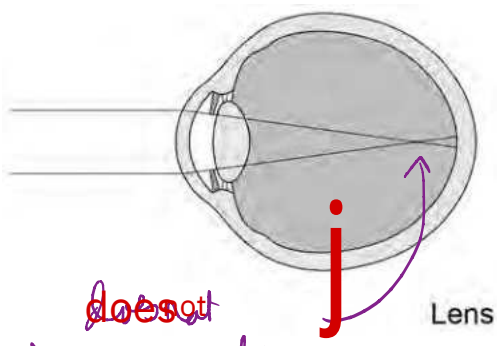
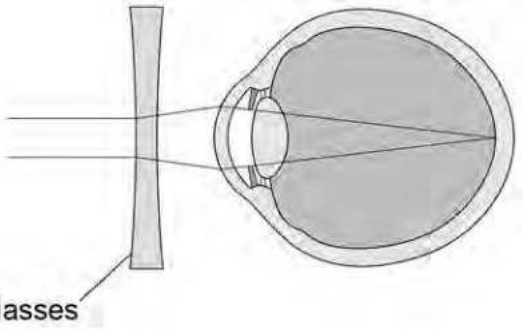


Figure 6



does not focus on retina

focus

MYOPIA (nearsighted)

Compare Figure 5 and Figure 6.

Explain how the blurred vision is corrected.

[2 marks]

Figure 5 shows myopia where light journos before the retina, in figure 6 the lens bends the light so that it focusses on the retina. ✓ height

onthe retina. ✓

Turn over for the next question

0 6 Two students investigated reflex action times.

This is the method used.

1. Student A sits with her elbow resting on the edge of a table.

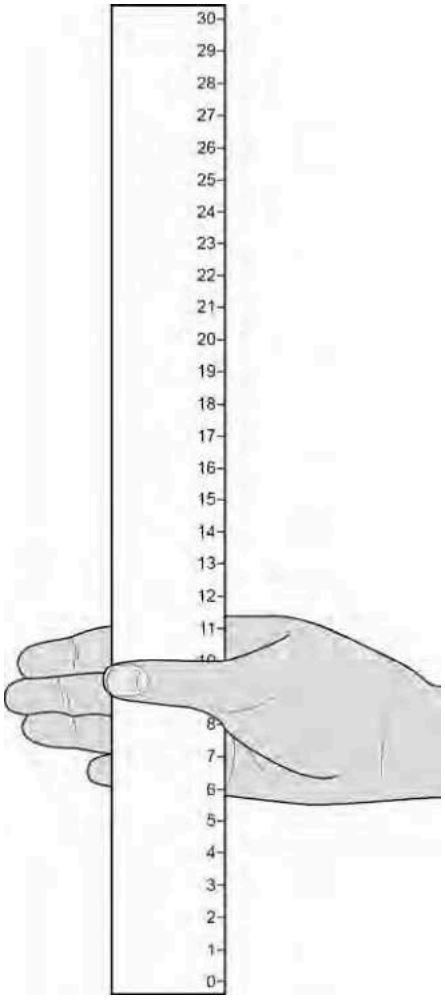
2. Student B holds a ruler with the bottom of the ruler level with the thumb of Student A.

3. Student B drops the ruler.

4. Student A catches the ruler and records the distance, as shown in Figure 7.

5. Steps 1 to 4 were then repeated.

Figure 7



of pealahk control variables

repeatable (control variables)

0 6 . 1 Suggest two ways the student would give valid results.

[2 marks]

some

1 Drop from same height

2 Use the same type of ruler.

Question 6 continues on the next page

Table 3 shows Student A's results.

Table 3

Test Number	Distance ruler dropped in mm
1	117
2	120
3	115
4	106
5	123
6	125
7	106

0 6 . 2 What is the median result?

[1 mark]

Tick one box.

106 ☐

115 ☐

116 ☐

117 ☑

123 ☐

0 6 . 3 The mean distance the ruler was dropped is 116 mm.

Calculate the mean reaction time.

Use the equation:

[3 marks]

10mm = 1cm.

$$\text{reaction time in s} = \sqrt{\frac{\text{mean drop distance in cm}}{490}}$$

Give your answer to 3 significant figures

μ = 116mm = 11.6 cm

$\sqrt{\frac{11.6}{490}} = 0.1539$ ✓

Mean reaction time = 0.154 ? s

0 6 . 4 The students then measured Student A's reaction time using a computer program.

This is the method used.

1. The computer shows a red box at the start.

2. As soon as the box turns green the student has to press a key on the keyboard as fast as possible.
3. The test is repeated five times and a mean reaction time is displayed.

Student A's mean reaction time was 110 ms.

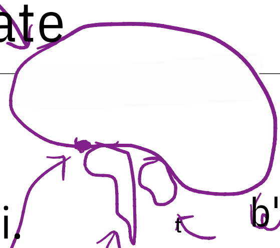
Using a computer program to measure reaction times is likely to be more valid than the method using a dropped ruler.
Give two reasons why.

[2 marks]

1 You might be able to tell when the other person is about to drop the ruler

2 Measurement of time more precise using computer.

fQuestion 6 con-tinues on the next page



0 6 . 5 A woman has a head injury.

Her symptoms include:

- finding it difficult to name familiar objects
- not being able to remember recent events.

Suggest which part of her brain has been damaged.

[1 mark]

Cerebral cortex

0 6 . 6 A man has a head injury.

lack coordination

He staggers and sways as he walks.

hypothalamus: temp

Suggest which part of his brain has been damaged.

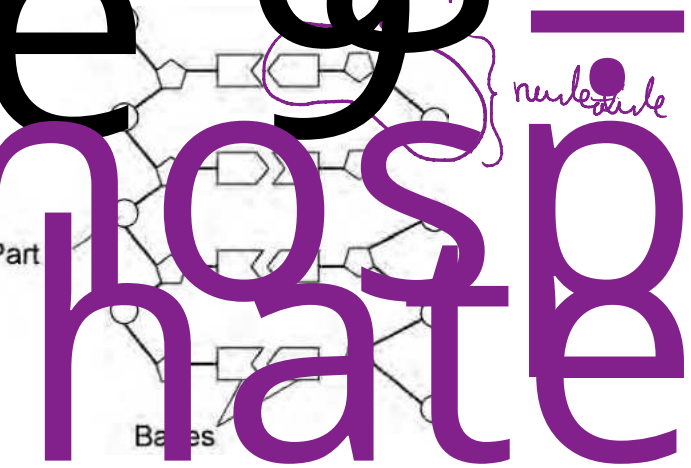
[1 mark]

cerebellum

0 7 Figure 8 shows an image of a small section of DNA.

Figure 9 shows the structure of a small section of DNA.

Figure 8



neukoliik.

0 7 . 1 What is Part B?

[1 mark]

Phosphate group .

0 7 . 2 In Figure 8 the structure of DNA shows four different bases.

There are four different bases and they always pair up in the same pairs.

Which bases pair up together?

[1 mark]

Adenine with thymine, cytosine with Guanine

OR Adenine with thymine, (with

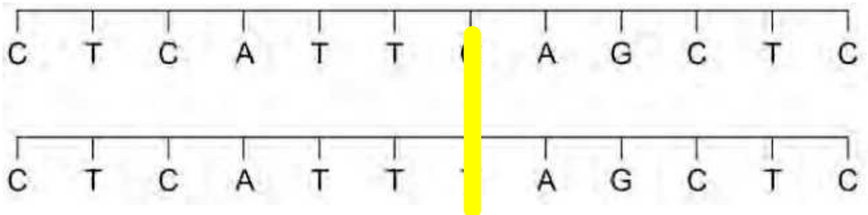
Question 7 continues on the next page

Syndrome H is an inherited condition.

People with syndrome H do not produce the enzyme IDUA.

Figure 9 shows part of the gene coding for the enzyme IDUA.

Figure 9



Strand K shows a mutation in the DNA which has caused syndrome H.

The enzyme IDUA helps to break down a carbohydrate in the human body.

The enzyme IDUA produced from Strand K will not work.

Explain how the mutation could cause the enzyme not to work.

[5 marks]

The mutation has changed one base of DNA from C to T. This changes the amino acid coded for in the sequence. This could change the shape of the protein formed so that the enzyme's active site was a different shape so the enzyme no longer complementary to the substrate.

or say carbohydrate

0 7 : 4

A recessive allele causes syndrome H.

A heterozygous woman and a homozygous recessive man want to have a child.

Draw a Punnett square diagram to determine the probability of the child having syndrome H.

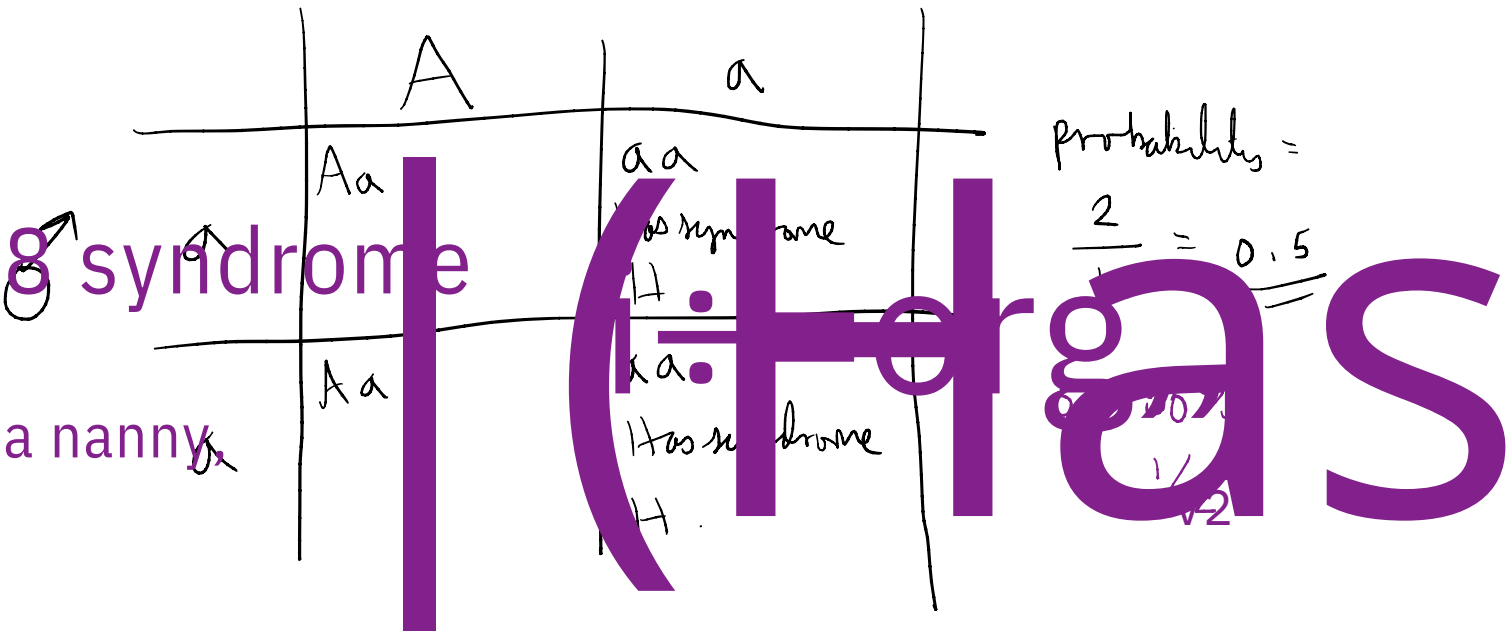
Identify any children with syndrome H.

[5 marks]

Use the following symbols:

A = dominant allele

a = recessive allele



Probability = 0.5

Turn over for the next question

0 8 Food security is when a population has enough food to stay healthy.

Lack of food security is a global problem.

One way to maintain food security is to increase the efficiency of food production.

Figure 10 shows how some pigs are farmed using intensive methods.

Figure 10

0 8 . 1 Some people think the farming methods shown in Figure 10 are unethical.

Suggest two other possible disadvantages of intensive farming methods.

[2 marks]

1 Diseases spread more rapidly

2 Heating requires an increased way from fuels

Level 2: clear statements linked to relevant explanations x2

0 8 . 2 Explain how the intensive farming of pigs increases the efficiency o ood production.

[4 marks]

statement

Kept in a temperature controlled environment ✓

so less energy required to maintain body temperature, and less energy transferred to the environment ✓

explanation

Their movement is restricted since they are kept in cages. Therefore, less energy is required for movement and more energy is available for growth. ✓

Question 8 continues on the next page

A newspaper reported that:

'Food security is a serious problem in remote communities in Canada.
This is because Aboriginal communities are eating fewer traditional foods.'

One traditional food eaten by Aboriginal communities in Canada is seal. .

Look at Table 4.

Table 4

Year	Number of seals caught in thousands
2004	362
2005	316
2006	348
2007	224
2008	215
2009	91
2010	67

% change = final − initial / initial × 100

b-be safe

assume 3 s.f. to be safe

0 8 . 3 Calculate the percentage (%) decrease in the number of seals caught from 2004 to 2010.

dueb decrease.

due to decrease

[2 marks]

67 − 362 / 362 × 100 = −81.49

67323-262

Decrease in seals 81.5 %

81.5

0 8 . 4 The conclusion in the newspaper might not be correct.

Suggest two reasons why.

[2 marks]

1 They may eat other foods, unclear if they are good

2 We do not know if other traditional foods have declined

Turn over for the next question

0 9

Homeostasis controls the internal conditions of the body.

Explain how blood glucose levels are controlled in the body of someone who does not have diabetes.

[4 marks]

Suggest how each type of diabetes can be treated.

[4 marks]

SPECIMEN MATERIAL

0 9 . 3 Look at Table 5.

Table 5

Population of UK in 2015	6.5 × 107
Number of people diagnosed with diabetes	3.45× 106
Estimated number of people with undiagnosed diabetes	5.49×105

Calculate the percentage (%) of the UK population estimated to have diabetes.

You should include both diagnosed and undiagnosed people in your calculation.

Give your answer to 2 significant figures.

[3 marks]

b

3.45×10+05=39,99✗1,+549✗,Io✓

x100 b"

¥4

round up)

2 Estimated percentage of population with diabetes = 6.2 ✓ %

Question 9 continues on the next page

0 9 . 4 A urine test can be used to check for the presence of glucose in the urine.

Diabetes can also be diagnosed with a blood test to measure the concentration of blood glucose.

Suggest why a blood test is more reliable than a urine test.

[1 mark]

Blood test gives current result, urine levels may be hours old.

+ not always glucose in urine

A blood test called the glucose tolerance test checks how well the body processes glucose.

Concentrations of glucose in the blood are measured before and after drinking a glucose drink.

Patients are not allowed to eat food for 8 hours before the glucose tolerance test.

Suggest why patients are not allowed to eat for 8 hours before the test.

[1 mark]

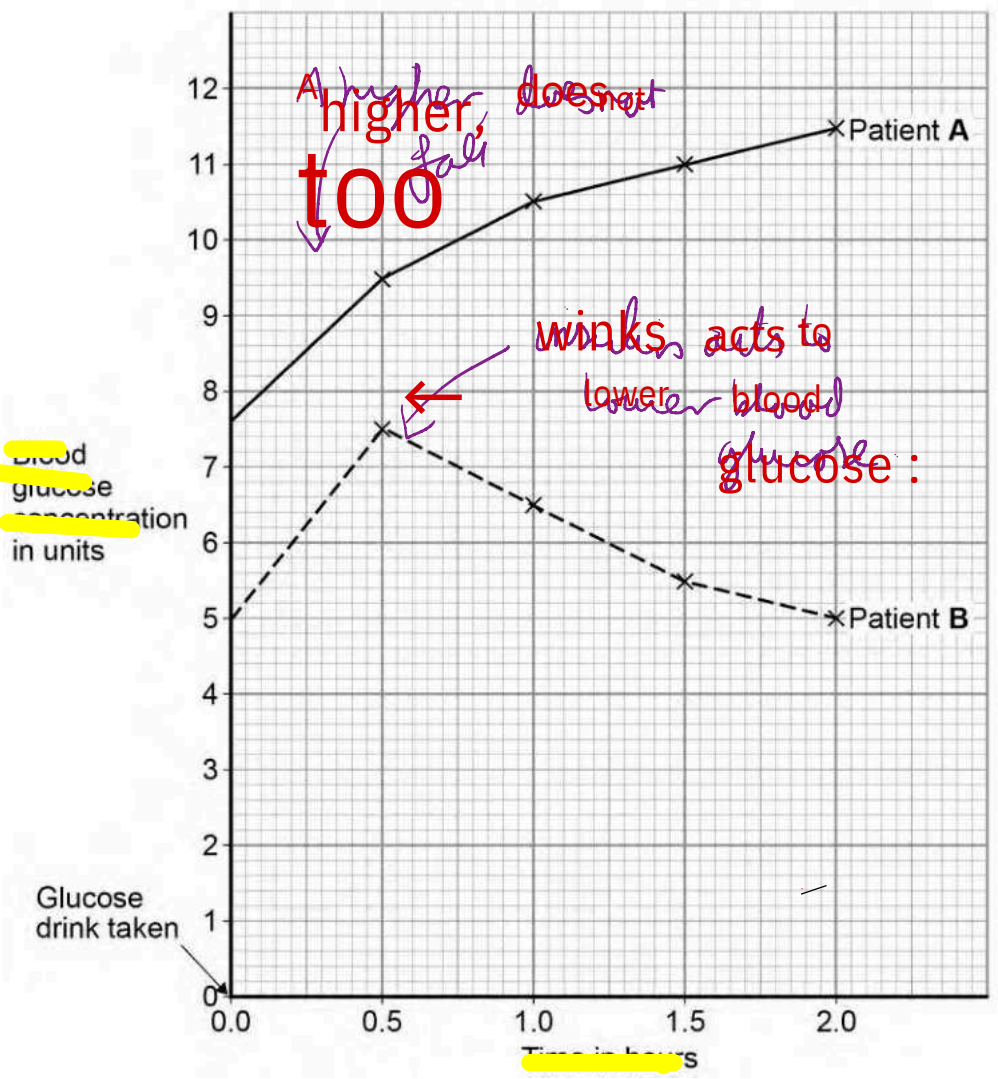
8 hours is sufficient time for insulin to act on glucose from the food

OR low starting point to show effects

OR so results not affected by glucose from food

0 9 . 6 Figure 11 shows the results of a glucose tolerance test for two patients, A and B.

Figure 11



Which patient has diabetes?

Justify your answer.

[2 marks]

Patient A

Justification patient A's glucose levels are too high.

1 0 Endocrine glands produce hormones.

1 0 . 1 Hyperthyroidism is caused by an overactive thyroid gland.

Suggest what would happen in the body of a person with hyperthyroidism.

[3 marks]

Increased production of thyroxine therefore increased BMR Increased rate of respiration any metabolic process
e.g. increased rate of protein formation.

1 0 . 2 Describe the roles of FSH and LH in the menstrual cycle.

[2 marks]

FSH causes the egg to mature and stimulates ovaries to produce oestrogen
LH causes the release of the egg at ovulation

FSH = follicle stimulating hormone.
↳ produced in pituitary
↳ causes egg to mature
↳ stimulates production of oestrogen
LH = luteinizing hormone
↳ also produced in pituitary

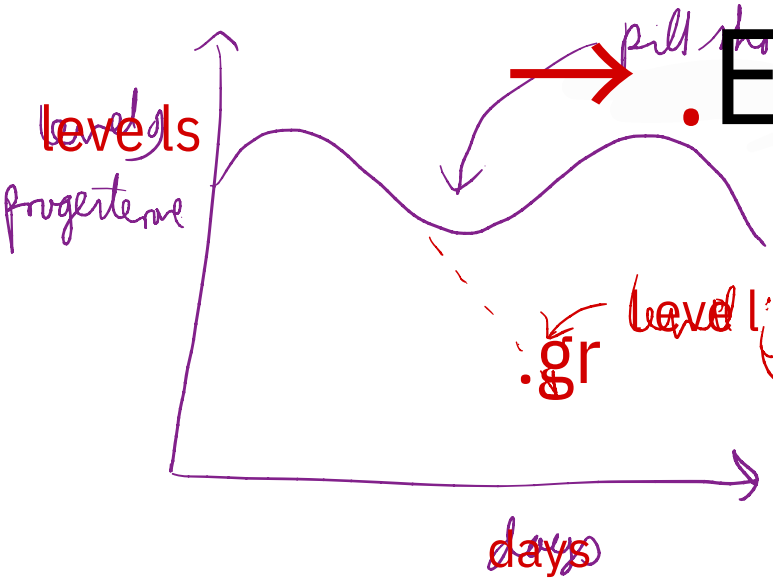
The combined pill is a contraceptive that contains progesterone and oestrogen.

The 'mini-pill':

- is a contraceptive that only contains the progesterone hormone
- has to be taken at the same
- The success rate of the mini-pill in preventing pregnancy is lower than that of the combined pill.

Explain why missing a dose of the mini-pill would reduce the success rate of the mini-pill.

[4 marks]



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