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OCR
Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

TWENTY FIRST CENTURY SCIENCE BIOLOGY B

J257

For first teaching in 2016

J257/03 Summer 2023 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Paper 3 series overview

The candidates sitting this paper had clearly spent time consolidating their biology knowledge in preparation for this examination. Candidates engaged well with the whole paper, there were very few omissions observed and there were some interesting suggestions for questions that required a little more creative thought, demonstrating an ability to apply their knowledge to unusual contexts. Candidates demonstrated a good range of knowledge and there were some exemplary answers highlighting their abilities in this subject. The questions that focused on practical skills were answered better than in Summer 2022 but this remains an area to focus on. There were again some examples of questions where candidates did not read the question rubric carefully enough and as a result did not answer the question being asked. Candidates showed they were able to analyse data to perform calculations, draw conclusions and make judgements.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• were able to apply their knowledge to unusual contexts and able to express their ideas in prose • understood and used scientific knowledge accurately • were more familiar with the practical work tested in questions • performed well in the calculation questions.	• were unable to demonstrate depth of understanding • were less able to use the appropriate key terminology • were less familiar with the practical aspects assessed • found it more difficult to apply knowledge to unusual contexts and to present their ideas in prose • found the calculations more challenging.

Question 1 (a) (i)

1 (a) (i) Complete the table to compare cellular aerobic and anaerobic respiration in humans.

Tick (✓) the correct boxes in each row.

Process	It requires glucose	It requires oxygen	It produces carbon dioxide	It produces water	It produces lactic acid
Aerobic respiration					
Anaerobic respiration					

[3]

A large proportion of candidates correctly identified the products and reactants of both aerobic and anaerobic respiration, gaining full marks for this question. Common errors included the identification of carbon dioxide as a product of anaerobic respiration and not acknowledging that glucose was a reactant in anaerobic respiration. Some candidates wrote balanced equations underneath the table to help them work out the correct answer; it was pleasing to see candidates adopting strategies to assist them in reaching the correct answer.

Question 1 (a) (ii)

(ii) Which statement about respiration is correct?

Tick (✓) **one** box.

Aerobic respiration produces more ATP than anaerobic respiration. ☐

Anaerobic respiration produces more ATP than aerobic respiration. ☐

Both aerobic and anaerobic respiration produce the same amount of ATP. ☐

Neither aerobic or anaerobic respiration produces ATP. ☐

[1]

The vast majority of candidates correctly identified that aerobic respiration produces more ATP than aerobic respiration. Those that answered this question incorrectly often selected the second option which identified anaerobic respiration as the process which produced more ATP.

Question 1 (b) (i)

(b) Heart muscle contains approximately 5000 mitochondria in every cell.

(i) Suggest why heart muscle cells need so many mitochondria.

.....

.....

..... **[2]**

This question tested candidates' understanding of the role of mitochondria in the production of ATP during aerobic respiration, and the requirement of ATP for muscle contractions. Very few candidates were awarded both marks; those that were given 1 mark most often described mitochondria as the site of respiration, with many correctly qualifying this by stating aerobic respiration. Very few candidates linked the production of ATP to the requirement by muscle cells for contraction. Suggesting that perhaps candidates are not as aware of the uses of ATP.

Misconception

This question highlighted a problem that we see frequently in questions related to respiration, that respiration 'produces energy'. Centres are encouraged to address this misconception and work with candidates to make sure they correctly communicate the role of the mitochondria in the production of ATP, which in turn releases energy for use by cells such as cardiac muscle cells.

Exemplar 1

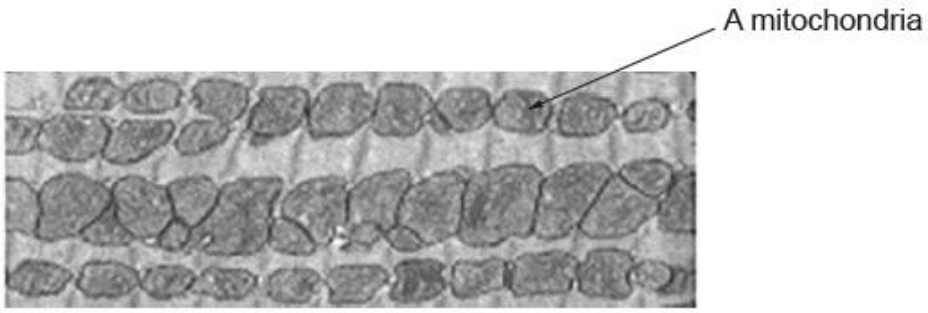
Because mitochondria has lots of enzymes, and the so the respiration can happen more to produce enough energy to pump the heart so the blood can travel through the whole body **[2]**

In this exemplar we can see that the candidate understands that mitochondria are the site of (aerobic) respiration but has the misconception that they **produce** energy.

Question 1 (b) (ii)

(ii) The image shows the mitochondria in a section of heart muscle. The mitochondria are different sizes.

One of the mitochondria is labelled.



Estimate the number of mitochondria in this image.

Number of mitochondria = ... **[1]**

The vast majority of candidates demonstrated their ability to use the process to estimate correctly by counting the number of mitochondria in one row and multiplying it by 3.

Question 2 (a) (i)

2 The table shows the percentage of land covered in rainforest in a country.

Year	Percentage of land covered in rainforest (%)
1940	75
1950	72
1961	53
1977	31
1983	26
1987	21
1997	42
2000	45
2005	50

(a) (i) Describe the trend in the data.

.....

.....

.....

..... **[2]**

Most candidates interpreted the data in the table correctly and identified that between 1987 and 1997 the decrease in rainforest was reversed and began to increase. Candidates that were not awarded both marks often did not give a date between 1987 and 1997 to indicate when this change occurred or focused more on the idea that there was an overall net decline in rainforest from 1940 to 2005. Candidates generally articulated their responses well.

Question 2 (a) (ii)

(ii) The government of the country started to protect areas of the rainforest and even paid people to regrow it.

Suggest when the government started to do this.

..... **[1]**

This question proved a little trickier for candidates and required them to engage with the data a little more deeply rather than just looking at trends. Those that did consider the data in a little more detail realised that the increase in rainforest percentage must have occurred before 1997, and subsequently gave a date after 1987, but before 1997. Some candidates gave a range, demonstrating that they understood the date lay somewhere between those times, but that an exact date would be difficult to suggest. Candidates that did not process this data correctly often gave an incorrect response of 1997. Some candidates misinterpreted this question and wrote a response that suggested they thought the question asked why the rainforest needed protecting by the government. Centres should remind candidates to read the question carefully.

Question 2 (a) (iii)

(iii) Predict when the rainforest will reach the percentage land coverage seen in 1940, if it increases by the same rate as shown from 1997 to 2005.

Predicted year = ... **[1]**

This question required candidates to use the data to initially determine the rate of rainforest regeneration between the dates that had been provided, to then use this information to generate an estimated year by which % regeneration would be achieved. Candidates found this question a little more challenging and centres are encouraged to use this question to show how we can use patterns in data to make predictions.

Question 2 (b) (i)

(b) A rainforest is one of the most biodiverse areas of the Earth.

(i) Suggest why the government wants to continue to regrow the rainforest.

.....

.....

.....

..... **[2]**

This question was answered well with candidates offering some interesting and important suggestions as to why the government would want to restore the rainforests. Examples included the rainforest being a resource, providing us with medicines and materials, allowing endangered animals to exist in their natural habitat, tourism bringing in money for the government and local businesses, and the important role the rainforests play in combating climate change. Most candidates gained both marks, with nearly all gaining at least 1 mark. Some candidates were not credited marks for the use of incorrect terminology, for example referring to the rainforest as a 'home' for animals, rather than a habitat.

Question 2 (b) (ii)

(ii) Suggest **two** challenges of regrowing the rainforest.

1. .....

.....

2. .....

.....

[2]

Candidates engaged well with this question with the vast majority being given both marks. The most common responses focused on the length of time it would take to regrow the rainforest and the expense of this enormous project. There were some very thoughtful answers given that considered the rate of deforestation by illegal loggers hampering the efforts of replanting, that the soil may lack fertility after it has been used for farming, or the idea of conflict between land being needed for homes/industry/infrastructure and the land being used for regrowing.

Those candidates that did not gain both marks often gave vague responses lacking in detail, for example referring to a lack of space for the trees to grow in, rather than clarifying this by explaining what the land was currently being used for.

Question 2 (c)

(c) Some plants in the rainforest reproduce sexually, but others reproduce asexually.

Which statements describe sexual reproduction, and which describe asexual reproduction?

Tick (✓) **one** box in each row.

	Sexual reproduction	**Asexual reproduction**
Occurs at a slower rate		
Offspring are all susceptible to the same diseases		
Only one parent is needed		
Provides offspring with genetic variation		

[3]

Candidates answered this question well, with many being given 3 marks and thus demonstrating that they have a good understanding of sexual reproduction and asexual reproduction.

Question 3 (a)

3 **(a)** Describe the relationship between health and disease.

.....

.....

.....

..... **[2]**

Describing the relationship between health and disease is challenging, but candidates embraced this challenge and presented a wealth of good responses identifying that disease compromises health, defining health as a state of physical and mental wellbeing. There were also some excellent examples of how those with a disease would be at greater risk of another disease, for example if someone is unhealthy and has diabetes, they are more likely to suffer from CHD.

Some candidates misunderstood the question's purpose and wrote at length about the immune system and its response which did not gain credit.

Question 3 (b)

(b) Complete the sentences about the immune system. Use words from the list.

antibodies	**antigens**	**attack**	**digest**	**memory**
mitochondria	**pathogens**	**red**	**vaccines**	**white**

The immune system protects us against disease-causing ..... .

White blood cells from the immune system have receptors that recognise antigens on the surface of pathogens.

They act in three ways to protect us:

1. Ingest and ..... pathogens.
2. Produce ..... to disable the pathogens or tag them for attack by other white blood cells.
3. ..... cells stay in the body to make antibodies quickly upon re-infection.

[4]

The role of the immune system/white blood cells in the prevention of disease is clearly an area that candidates are confident in. The majority of candidates were given 3 or 4 marks. The most common incorrect response was for selecting the word attack in place of digest when describing a phagocytes mode of action.

Question 3 (c)

(c) Cholera is a disease caused by a bacterium. Diarrhoea is a symptom of cholera. People with cholera can lose up to 1 litre of water per hour.

Why is this a concern?

.....

..... **[1]**

A large range of responses was seen for this question, though the majority of candidates highlighted the role of water loss in dehydration and the detrimental effect this could have on an individual. It was pleasing to see some candidates considering the effect on cells, these candidates discussed crenation and cells shrivelling. It would be helpful for centres when discussing homeostasis to consider the need for osmoregulation with specific reference to the impact on cells.

Common responses that were not creditworthy focused on general statements describing the body being made up of lots of water or that the body needs water to function.

Question 3 (d)

(d) Cholera is a communicable disease.

Suggest **one** way to prevent transmission of cholera between people.

.....

..... **[1]**

In this question candidates were asked to consider how to stop the spread of a disease that is unfamiliar to them, cholera. It was clear from the responses that candidates used their experiences from the pandemic and applied them to this situation. Candidates that provided more successful answers engaged more with the context and suggested examples of good sanitation and hygiene, such as hand washing, and using clean water. Others focused more on isolating infected individuals or quarantining them; some of the less successful responses suggested wearing a mask as a preventative measure. Candidates did not always pick up on the subtlety of the question, which was the prevention of transmission from one person to another.

Question 3 (e)

(e) Identify **three** similarities between a cholera cell and a eukaryotic cell.

1 .....

2 .....

3 .....

[3]

Many candidates did not appear to pick up on the description of cholera as a prokaryote and this impacted their answer. Common incorrect responses included identifying that both cells had mitochondria and nuclei. Some candidates stated that both had genetic information. This was too vague to give credit. Very few candidates were awarded 3 marks for this question as a result, and it is suggested that centres spend time identifying the similarities and differences between eukaryote and prokaryote cells.

Question 4 (a)

4 (a) Which statements about cell division are **true**, and which are **false**?

Tick (✓) **one** box in each row.

Statement	True	False
During interphase the number of chromosomes double.		
Gametes are produced by mitosis.		
In meiosis there are two cell divisions.		
Interphase occurs in both mitosis and meiosis.		

[2]

This question was testing candidates' understanding of the cell cycle and the two forms of cell division, mitosis and meiosis. There appeared to be some confusion regarding the number of cell divisions in meiosis and the role of interphase. Comparing these two processes may be something centres would like to focus on in future.

Question 4 (b)

(b) Why is it important that the number of chromosomes halves when gametes are formed?

.....

..... **[1]**

Candidates found this question more challenging, and this area would certainly be an area for centres to focus on. Candidates found it difficult to express their ideas and this often resulted in either muddled answers or answers that lacked sufficient detail, for example, they often identified that half the chromosomes would be provided by each parent but did not develop this to explain that this allowed the return to the original number at fertilisation. The way in which fertilisation was described was also variable. Some candidates referred to the gametes as 'joining', 'meeting' or 'binding' rather than fusing. That said, there were some successful responses which indicated a clear understanding of gametes being haploid (n) to form a diploid (2n) zygote.

Centres should also make it clear to candidates that only humans have 46 chromosomes in a somatic cell and 23 chromosomes in a gamete, other species chromosome numbers will be different. This question was a more general question about meiosis and ideally candidates would have answered it using the general principles. If specific examples are being used to highlight a point, the species should be named, for example humans have 46 chromosomes in a body cell and 23 in their gametes. Centres could get students to practise this by using this question as a base question but creating a more contextual question from it.

Question 4 (c)

(c) Describe how a cancer tumour forms.

.....

.....

.....

..... **[2]**

There were some exceptional responses given to this question that referred to mutations in genes which control cell division mutate, leading to uncontrolled cell division.

Those candidates that were only given 1 mark for this question generally gained credit for the identification of uncontrolled cell division, rather than for the mutation in DNA. Incorrect responses that gained no credit referred to 'cells mutate' or general descriptions of cell multiplication.

Some candidates did seem to think that the reason a tumour forms is because the cells grow. In the formation of a tumour the size of the growth of the tumour is the result of more cells as opposed to bigger cells (although some cells in some tumours may get slightly larger).

Question 5 (a)

5 (a) The components of the nervous system work together allowing it to function.

Draw lines to connect each **component** with its correct **role in nervous system functioning**.

Component	Role in nervous system functioning
Effector	Detects stimuli and initiates an electrical impulse in the sensory neuron
Motor neuron	Is a gland or a muscle that produces the desired response
Sensory neuron	Transmits the electrical impulse to the central nervous system
Sensory receptor	Transmits the electrical impulse from the central nervous system to the effector

[3]

The majority of candidates correctly identified the roles of the different parts of the nervous system. Those candidates that were given 1 or 2 marks usually correctly identified the role of the sensory receptor or effector.

Question 5 (b)

(b) Wobblers disease in dogs is a condition that affects the spinal cord.

- It can be caused by compression of the spinal cord.
- It causes problems with the functioning of the motor neurons.

Suggest **one** symptom that a vet may look for in dogs with wobblers disease.

..... **[1]**

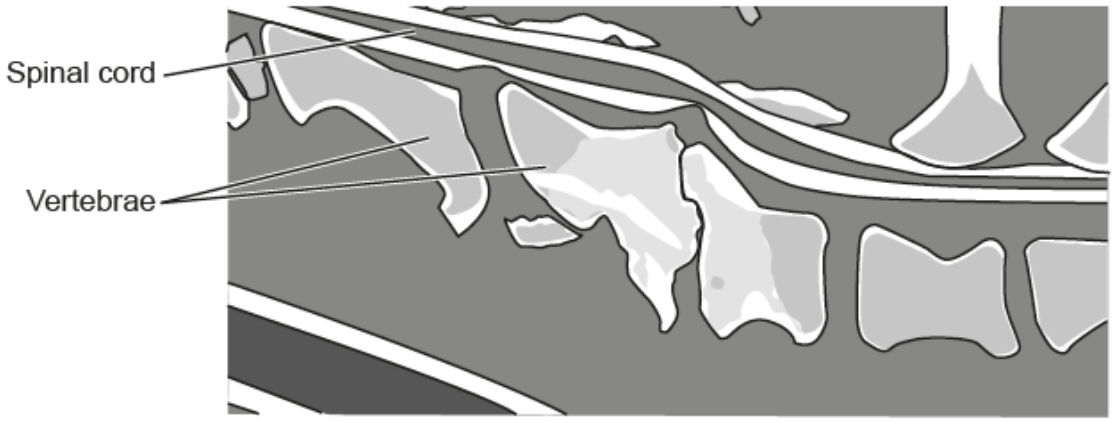
Candidates engaged well with the context of this question and came up with some good suggestions as to the symptoms that the dog would present, with many focused on how the dog may move. Some common incorrect responses included not reacting to stimuli or pain.

Question 5 (c)

(c) When diagnosing wobblers disease vets use imaging techniques. They look for areas where the spinal cord appears to be squeezed by the vertebrae of the spine (backbone).

Fig. 5.1 shows an image a vet would look at where the spinal cord is squeezed by the vertebrae.

Fig. 5.1



Draw an arrow on **Fig. 5.1** to an area where you think there is evidence of wobblers disease in this dog. **[1]**

Candidates engaged well with this question, carefully digested the information presented and were therefore successful in annotating the diagram to identify evidence of a spinal compression. The most common error was drawing a line to the vertebrae that were causing the spinal compression. There were some no responses for this question; centres are reminded to tell candidates to look beyond answer lines to indicate there is a question.

Question 5 (d)

(d) Surgery is the only treatment option for dogs with wobblers disease.

Suggest **one** factor that would need to be considered when deciding whether to operate.

.....

..... **[1]**

There were some excellent suggestions for additional considerations before embarking on surgery, these ranged from the age and general health/body condition of the dog, likelihood of positive outcomes from the surgery to include the quality of life for the dog, recovery time post-surgery was a common response and many considered the reaction of the dog to anaesthetic. Candidates that did not gain credit often stated consent from the owner was required or gave general statements about the benefits outweighing the risks; though this was certainly seen less than in previous questions, indicating that centres are asking candidates to engage more with scenarios where risks and benefits need to be identified.

Question 5 (e)

(e) Some dog owners train their dogs in dog agility. The dogs are trained to react rapidly to certain commands.

Explain why this rapid response is not classed as a reflex response.

.....

.....

.....

..... **[2]**

Candidates found this final part very difficult. Very few were given marks and those that were generally only identified that the brain would not form part of a reflex response but would be involved in the trained response. Some candidates did highlight the role of the brain, but then lost the mark for identifying that reflex arc requires the CNS. Very few candidates knew that a reflex response used only a relay neuron located in the spinal cord.

Question 6 (a)

6 Horses can develop a condition called laminitis.

Excess carbohydrate in a horse's diet is one risk factor.

(a) Explain why horses that are at risk of laminitis should spend less time in fields eating grass.

.....

.....

.....

.....

.....

..... **[3]**

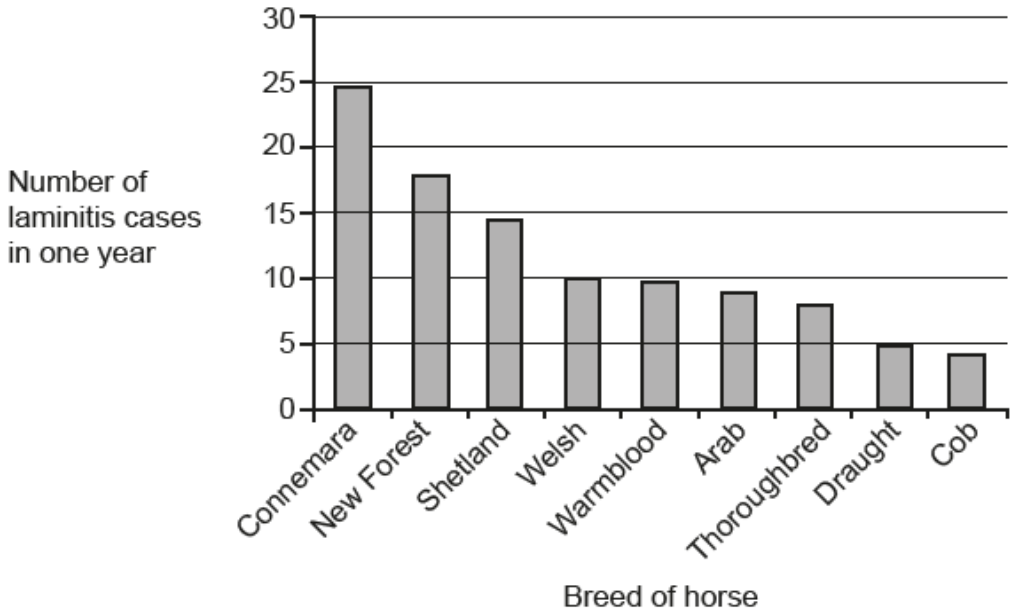
Candidates engaged well with this context. Most candidates identified that grass would contain carbohydrates and the more successful responses named the carbohydrate as glucose or starch, identifying that this would be produced when the plant photosynthesised. Candidates found it harder to explain why the time the horse was allowed to graze for needed to be restricted. In some cases, this was due to candidates not expressing themselves clearly, but many just simply repeated the stem without qualifying that more grazing would result in a greater intake of grass which in turn would increase the amount of carbohydrate consumed by the horse. Some candidates did take the alternative approach that it would be easier to restrict carbohydrate by a controlled diet that did not involve grazing. A common response that did not gain credit referred increasing the horse's exercise, unfortunately the question was focused on intake of carbohydrates and not use in the body.

Question 6 (b)

(b) There are other factors that increase the risk of a horse developing laminitis:

- the breed of horse
- if the horse has a medical condition called equine metabolic syndrome (EMS)
- if the horse is overweight.

The graph shows data about the number of laminitis cases in one year for different breeds of horse.



The table provides some information about four horses.

Horse	Breed	Body condition
A	Arab	Normal weight and has EMS
B	Connemara	Normal weight
C	New Forest	Overweight and has EMS
D	Thoroughbred	Slightly overweight

Which horse is most at risk of developing laminitis?

Explain your answer.

Horse .....

Explanation .....

.....

.....

[2]

Most candidates were given at least 1 mark for this question. Some candidates did not use the graph in their answer when presenting the reasons why they felt the New Forest pony was most at risk of laminitis, candidates should be reminded to use all available information when formulating responses to this type of question.

Question 6 (c)

(c) Blood glucose concentration is controlled by the same hormones in horses and humans.

Name a hormone that controls the blood glucose concentration of the horses' blood.

..... **[1]**

Most candidates correctly identified insulin or glucagon as the hormone that would regulate blood glucose. Occasionally adrenaline was seen. Thyroxine and haemoglobin were occasional incorrect responses.

Question 6 (d)

(d) When a horse eats grass, not all of the biomass that makes up the grass becomes part of the horse's biomass.

Explain this statement.

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.....

.....

.....

.....

..... **[3]**

This question differentiated well, and a range of marks were seen. Some candidates clearly understood why not all the biomass from the grass would become part of the horse's biomass and identified respiration, faeces and parts of the plant that would not be eaten in their response. Others were only able to identify one or two reasons. It was good to see that some candidates could distinction between egestion and excretion and used both terms correctly.

Misconception

There were many examples of candidates using these terms incorrectly and a significant number stating that biomass would be 'excreted in faeces'.

Exemplar 2

The grass is broken down into smaller biological molecules like ~~glucose~~ glucose, however not all of this glucose is rebuilt into larger molecules to build biomass in the horse. Some of it is used for respiration and dissipates as heat. Some of it is also undigested material, and excreted as faeces. **[3]**

In this exemplar we can see that the candidate has the misconception that faeces are an example of excretion.

Question 7 (a)

7 A student reads an article that states one way to measure a person's fitness is to measure their recovery rate after exercise.

(a) Describe a method the student could use to work out a person's recovery rate.

.....

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.....

.....

.....

..... **[3]**

Most candidates tackled this question well and gained some if not all marks for this question. Those that were given 2 marks often did not mention that they would take the measurement after exercise or did not state that the first measurement needed to be the resting or normal rate. Occasionally candidates jumped between two different measurements, for example heart rate and breathing rate. It is important that candidates reread their responses to check for consistency.

Question 7 (b)

(b) Suggest the number of people the student should use in their investigation to determine if recovery rates are different for different people.

Justify your answer.

.....

.....

.....

..... **[2]**

Candidates found this question more challenging and confused sample size with repeating an experiment, resulting in many incorrectly stating that 3 would be an adequate sample size and indicating that this would be sufficient for a reliable result. Those that did think about the question more contextually often correctly suggested large sample sizes. As a general rule, even those that did select a sensible sample size had difficulty expressing why this was chosen with very few used the word representative.

OCR support

Centres are encouraged to refer to OCR's Language of measurement in context to help develop candidate understanding of the scientific process and the language used. This resource makes use of the ASE's Language of measurement.

Question 8 (a) (i)

8 A new contraceptive pill called Lovima is now available in the UK.

It can be purchased online without a prescription from a doctor.

Before the pill is sent to the consumer, the online pharmacy asks several questions.

(a) (i) Suggest **one** health-based question the pharmacy may ask the consumer before they agree to send them this contraceptive pill.

.....

..... **[1]**

There was a large range of sensible questions suggested by candidates. These included asking if the patient had any allergies, if they were on any other medication, had any existing health problems, as well as asking for their age or if they could you be pregnant. Marks were not able to be credited when candidates did not read the question correctly and posed a question for the pharmacist.

Question 8 (a) (ii)

(ii) Identify **one** risk and **one** benefit of being able to buy Lovima **without** seeing a doctor.

Risk .....

.....

Benefit .....

.....

[2]

There were some very good responses to this question for both risks and benefits to this approach to prescribing. Many explained how 'the patient may be less informed about side effects without a doctor's appointment' or they may have adverse reactions, many also highlighted that this method was open to misuse or that they may lie when asked the questions.

The most common benefit outlined the idea of convenience or privacy.

Question 8 (b)

(b) Lovima is a progesterone-only contraceptive pill.

Explain how this contraceptive pill prevents pregnancy.

.....

.....

.....

.....

.....

..... **[3]**

Many candidates correctly stated that the pill would prevent the release of FSH, and that the consequence would be prevention of ovulation. There were some good examples of logical responses that detailed the consequences - that progesterone would inhibit FSH and LH, FSH normally triggers a follicle to mature, and LH causes ovulation, so if these are inhibited, then no follicle would mature, and there would be no mature follicle for ovulation.

Those that did not answer the question as well often stated that the pill stopped progesterone being released or 'tricks the body into thinking it is already pregnant', or only mentioned the inhibition of LH.

Exemplar 3

Progesterone causes the ~~the~~ lining of the uterus to be maintained but it also inhibits LH & FSH being secreted from the pituitary gland. This means no egg can mature & release from the ovaries - which prevents pregnancy as there's no egg present to fuse with sperm (be fertilized). **[3]**

This is an excellent, well-constructed and concise response to this question. Clearly identifying how the progesterone-only contraceptive pill prevents pregnancy.

Question 8 (c)

(c) Progesterone is a hormone.

Which **three** describe the principles of hormonal communication?

Tick (✓) **three** boxes.

- Hormones are always fast-acting. ☐
- Hormones are always slow-acting. ☐
- Hormones bind to receptors on effectors. ☐
- Hormones provide slower, longer-lasting responses. ☐
- Hormones are secreted by glands. ☐
- Hormones are transported by neurons. ☐

[2]

The majority of candidates scored 1 mark for this question. The most common incorrect answer selected was 'hormones are always slow acting'. Centres can remind candidates that while most are slow acting some, such as adrenaline are fast acting.

Question 8 (d)

(d) Some hormones are made from proteins, others are made from lipids.

Complete the sentences to describe how to test for the presence of proteins, and for lipids.

Put a (ring) around each correct option.

To test for the presence of proteins we use **benedicts / biuret / ethanol**. If protein is present, the sample will turn **blue / cloudy / purple**.

To test for the presence of lipids we use **benedicts / biuret / ethanol**. If lipid is present, the sample will turn **blue / cloudy / purple**.

[2]

Some candidates correctly identified both reagents and their positive result and were awarded both marks. When 1 mark was given it was often for the correct identification for the test for lipids and the positive result.

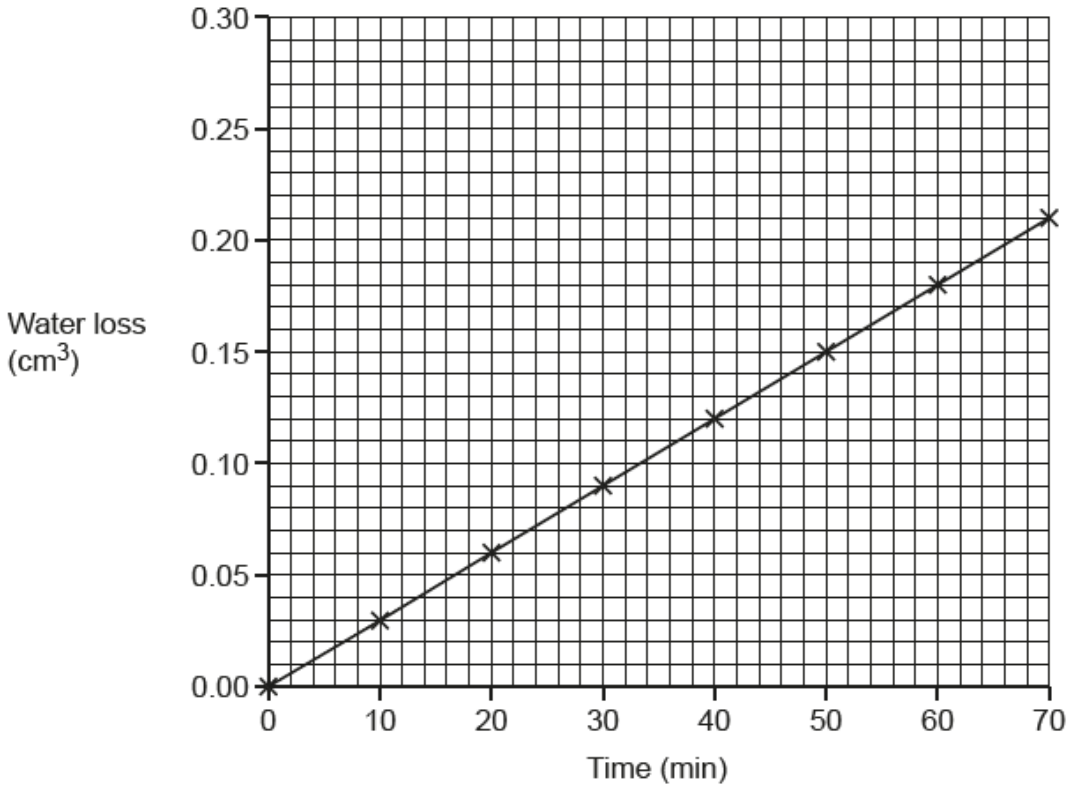
Question 9 (a)

9 A student investigates the rate of transpiration in **two** different species of plant, plant **A** and plant **B**.

The student uses a potometer to collect the data in the table.

Time from the start of the investigation (min)	Plant A water loss (cm^3)	Plant B water loss (cm^3)
0	0.00	0.00
10	0.03	0.04
20	0.06	0.09
30	0.09	0.13
40	0.12	0.16
50	0.15	0.20
60	0.18	0.24
70	0.21	0.28

The student plots the data for plant **A** on the graph.



(a) Plot the data for plant **B** on the graph. **[2]**

Most candidates were given both marks for plotting the data for plant B. A very small minority of candidates made plotting errors and some candidates made no obvious indication of the plotted point at 0,0. Centres should remind candidates that all data should be plotted even if they overlap with results from the data.

Question 9 (b)

(b) Calculate the rate of water loss for plant **A**.

Rate of water loss ..... cm^3/min **[2]**

The majority of candidates were given both marks for the correct calculation of the rate of transpiration. Some candidates made scaling errors following a correct initial fraction, and as a result their answer was out by a factor of 10. Those who did not score often calculated the rate for plant B. There were a few unusual attempts to perform some sort of calculation, e.g. work out the means of column A.

Question 9 (c)

(c) What conclusion can be made from the data?

.....

..... **[1]**

The majority of candidates correctly stated that plant B lost more water than plant A or had a faster transpiration rate. Some candidates simply stated that as time increases, water loss increases, with no mention of 'in both plants', and therefore were not given the mark.

Question 9 (d)

(d) Explain why an increase in temperature will increase the transpiration rate for both species of plant.

.....

.....

.....

..... **[2]**

Candidates did not perform well on this question, with very few being awarded both marks. Those that were given a mark generally achieved this through the identification of water loss through the stomata. Very few candidates offered diffusion as a response and with the vast majority stating it evaporated out of the leaf. It is important to explain to students that evaporation occurs from the cells within the leaf, this then diffuses out of the plant.

Incorrect responses often referred to the impact of temperature and gave descriptions of enzyme-controlled reactions or simply described the trend in the data, and offered no explanation as to why temperature would increase water loss.

Question 10 (a)

10 Haemochromatosis is a recessive hereditary disease. It causes iron to build up in the body over many years.

People with this disease begin to show symptoms between the ages of 30 and 60.

(a) Jane is 31, and she has started to develop symptoms of the condition.

Neither of her parents has the disease.

Calculate the probability that Jane has haemochromatosis.

Use a Punnett square.

Probability = ... **[3]**

It was pleasing to see candidates engaging well with this question, working through the information provided to deduce the correct answer. The most successful responses made it explicitly clear which of the offspring genotypes (hh) related to the percentage answer. Many did not make this clear and their selection had to be implied from their probability. Some students incorrectly used mixed letters for the alleles or gave crosses which involved incorrect parental genotypes or in some rarer cases used the sex chromosomes to generate an answer. Some candidates did not construct a Punnett square; it was therefore impossible to determine how they had arrived at their probability.

Question 10 (b)

(b) If detected early those with the condition are less likely to have serious health problems.

Jane's sister is 24.

Explain why she decides to have a genetic test.

.....

.....

.....

..... **[2]**

Few candidates were given both marks for this question. Very few candidates described what the outcome of the genetic test would be, in terms of it revealing the genotype or the alleles present, most just stated that it would determine whether she had the disease or not, which was a repeat of the stem. Many candidates correctly identified that a genetic test confirming she had the disease would result in receiving treatment sooner. The most successful responses linked this to a test that confirmed her genotype/alleles/homozygous recessive alleles and did not just state 'if she has the disease' and some candidates even discussed future implications such as family planning. In this question there were many more examples of candidates simply rewording the stem of the question, by saying 'if she finds out if she has the disease then she will have less health issues'.

Question 10 (c)

(c) There are three common variations that cause this condition.

The table shows the number of people with each of the three common variations.

Variation	Number of people with this variation
C282y/C282y	9 in 10
C282y/H63d	5 in 100
H63d/H63d	5 in 100

It is estimated that 1 in 150 people in England have haemochromatosis.

The population in England is 56 500 000.

Calculate the number of people in England that are likely to have the H63d/H63d variation.

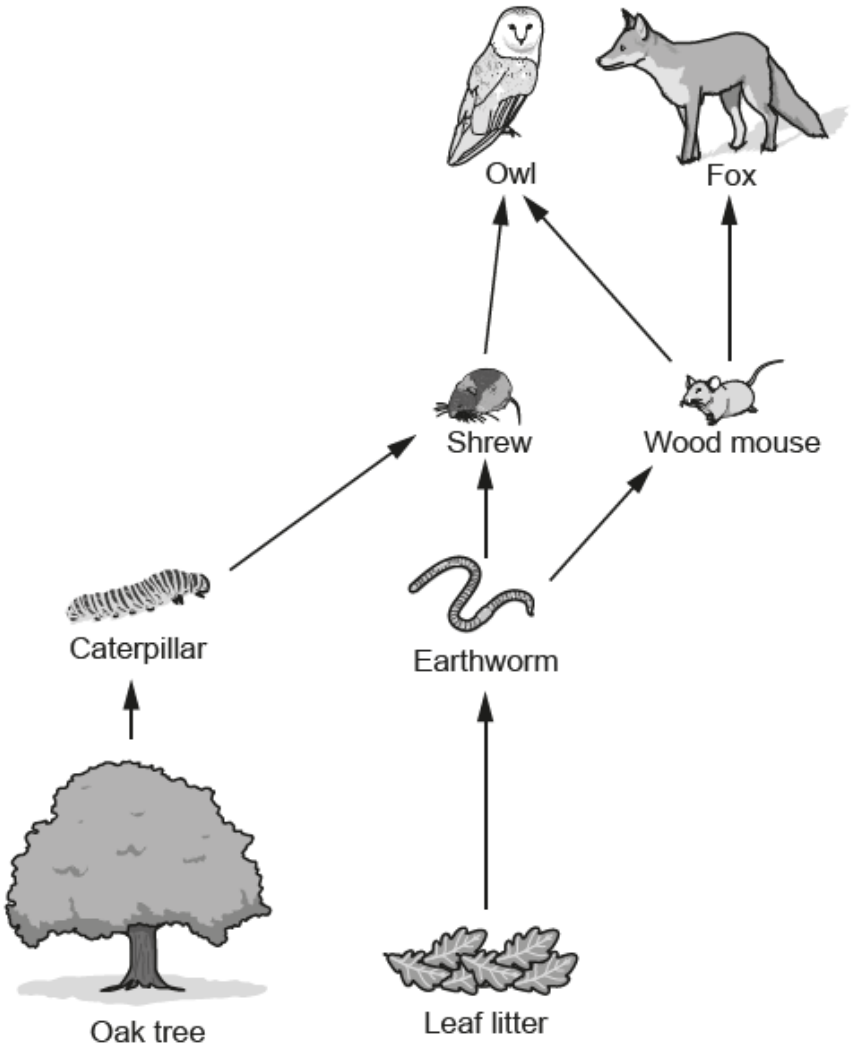
Give your answer to the nearest **whole** number.

Number of people = ... **[4]**

A range of marks was observed for this question. Those awarded 3 marks often forgot to round to the nearest whole number and gave 18833.33 as their answer, or there was some confusion over the nearest whole number and one significant figure. Those scoring 2 often completed one correct step in the calculation and then rounded this number marks to the nearest whole number.

Question 11 (a)

11 A food web is shown for a woodland ecosystem.



(a) Describe the differences between the organisms found at trophic level 2 and trophic level 3 in the food web.

.....

.....

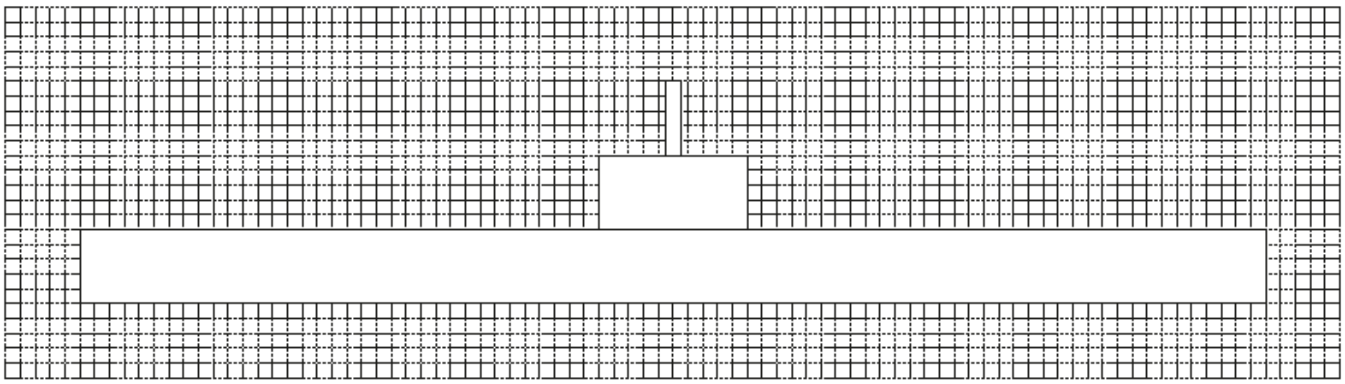
.....

..... **[2]**

Many candidates found this question difficult. It was rare to see primary and secondary consumers identified in the response and there appeared to be some confusion over which trophic level was which. Many candidates did identify trophic level 2 as herbivores and trophic level 3 as carnivores. Responses often focused on descriptions of the organisms at the trophic level, caterpillar/earthworm and shrew/mouse which did not score. Some candidates stated that trophic level 2 were all insects and trophic level 3 were all animals, clearly harbouring a misconception that insects are not animals.

Question 11 (b)

(b) A pyramid of biomass is shown.
The bars are drawn to the same scale.



Calculate the percentage efficiency of biomass transfer between primary consumers and secondary consumers.

Percentage efficiency of biomass transfer = ... % **[3]**

The confusion around trophic levels continued into this question and many candidates were given 2 of the 3 marks available marks for the incorrect bar selection but the correct efficiency calculation. This happened quite frequently which suggests that students struggled to interpret the pyramid of biomass in the context of primary/secondary consumers.

Question 11 (c)

(c) Explain why photosynthetic organisms are the source of all biomass on Earth.

.....

.....

.....

..... **[2]**

This was a challenging question that revealed that very few candidates understood or were unable to articulate why plants can be considered the providers of all biomass. Often candidates started well by stating that plants photosynthesise and produce glucose but did not develop this further to explain how this glucose would be used by plants to make its own biomass.

Question 11 (d)

(d) Name **two** substances that cycle through the biotic and abiotic components of an ecosystem.

1 .....

2 .....

[1]

Few candidates were given this mark as two correct items were required. Those that did score often correctly identified carbon and water as components cycling through the biotic and abiotic, oxygen and nitrogen were seen less often. Common incorrect responses included carbon dioxide and glucose. Some candidate misinterpreted the question and tried to suggest one biotic and one abiotic factor that cycled.

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