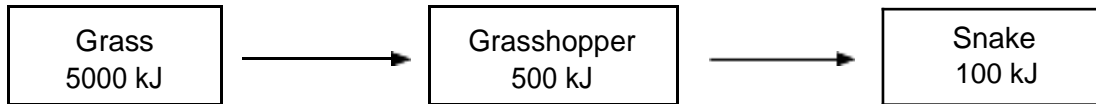


3 The diagram shows a food chain.



How much energy is lost between the producer and primary consumer?

- A 400 kJ
- B 4400 kJ
- C 4500 kJ
- D 4900 kJ

Your answer

[1]

4 Many plants can reproduce either asexually or sexually. What is a feature of **sexual** reproduction?

- A All the offspring are better adapted to the environment.
- B More offspring are produced.
- C Reproduction is faster.
- D The offspring show variation.

Your answer

[1]

5 What is the definition of a **population**?

- A All the communities that live in a habitat.
- B All the different species living in a habitat.
- C All the members of one species that live in a habitat.
- D All the organisms that live in a habitat.

Your answer

[1]

(b) Which process does the scientist's investigation demonstrate?

Tick (3) **one** box.

Genetic engineering

Natural selection

Selective breeding

[1]

(c) Explain why the results of this investigation are important for farmers.

.....

.....

.....

..... [2]

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(ii) The fungus reproduces using spores.

Which type of reproduction uses meiosis to make spores?

..... [1]

(iii) Farmers make sure that they clear all the dead barley plants from their fields in the autumn.

Explain why.

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

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19 Spinal muscular atrophy (SMA) is a genetic disease.

(a) 700 000 babies are born each year in the UK.

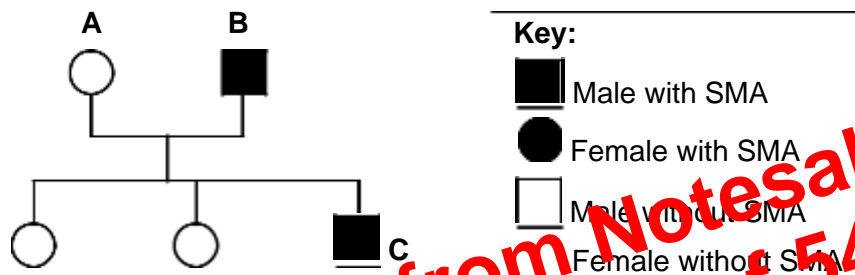
35 of these babies are born with SMA.

Calculate the percentage of babies that have SMA.

Percentage of babies with SMA = % [2]

(b) The diagram shows a family tree which contains some people with SMA.

SMA is caused by a recessive allele.



(i) Use the key to give the phenotype of person A.

..... [1]

(ii) Which term describes the genotype of person B?

Tick (3) **one** box.

Heterozygous

Homozygous dominant

Homozygous recessive

[1]

(iii) People that have SMA cannot produce a protein that is needed for their motor neurones to function.

Explain why person **C** has difficulty moving their legs.

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

(c) Researchers have developed a treatment for SMA.

This involves using a virus to insert a replacement gene into the nucleus of motor neurone cells.

(i) Why is the gene inserted into the **nucleus** of the motor neurone?

..... [1]

(ii) Researchers tested this treatment on animals

first. Suggest **one** reason why they did this.

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

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Question		Answer			Marks	AO element	Guidance								
17	(a)	<table border="1"> <thead> <tr> <th></th> <th>Number of pesticide resistant insects</th> <th>Number of pesticide sensitive insects</th> <th>Ratio</th> </tr> </thead> <tbody> <tr> <td>At the end</td> <td>4</td> <td>2</td> <td>2 : 1</td> </tr> </tbody> </table>				Number of pesticide resistant insects	Number of pesticide sensitive insects	Ratio	At the end	4	2	2 : 1	2	2.2 1.2	ALLOW 4 : 2
		Number of pesticide resistant insects	Number of pesticide sensitive insects	Ratio											
At the end	4	2	2 : 1												
	(b)	Natural selection ✓			1	2.1									
	(c)	Pesticides kill pests/insects ✓ The pests/insects may become resistant ✓			2	2 x 3.1a	ALLOW idea that may deter them from using pesticide ALLOW may choose alternative named methods / alternative pesticide/ become organic farmers								

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Question		Answer	Marks	AO element	Guidance
23	(a)	Growing crops with their roots in water ✓	1	1.1	
	(b)	Suitable scale ✓ Axes labelled ✓ Bars correctly drawn ✓	3	3 x 2.2	
	(c)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Identifies and explains a reason why people may be short of food AND Compares the information between Haiti and USA recognising the difference between percentage and the actual number of people.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Identifies and explains reasons why people may be short of food OR Compares the information between Haiti and USA recognising the difference between percentage and the actual number of people.</p>	6	2 x 1.1 2 x 2.1 2 x 3.2a	<p>AO1.1 Demonstrates knowledge and understanding of scientific ideas to give reasons why people might be short of food.</p> <ul style="list-style-type: none"> Increasing populations New pests and pathogens Changes to the environment / weather Conditions might not be right Costs of agricultural inputs e.g., fertilisers, feed stuffs, pesticides, irrigation systems, equipment Land availability <p>AO2.1 Applies knowledge and understanding to explain why people might be short of food</p> <ul style="list-style-type: none"> Increasing population means there is less food to go round New pests and pathogens will result in lower yields of crops Changes to the environment / weather might reduce crop yields Costs of agricultural inputs may be too high for farmers to afford

Question		Answer	Marks	AO element	Guidance
25	(a)	Antibiotics are used inside the body, but antiseptics are not ✓	1	1.1	DO NOT ALLOW more than one box ticked
	(b)	(i) Use a wire / (inoculating) loop / pour liquid culture over the agar ✓ Lift lid of Petri dish slightly / sterilise (wire) ✓	2	2 x 1.2	ALLOW pour solution with bacteria over the agar ALLOW use a spreader / rod / swab / pipette / cotton buds ALLOW idea of aseptic technique ALLOW ECF for incorrect named wire/loop
		(ii) Allow oxygen to enter the dish / prevent anaerobic conditions ✓ Stop pathogens/harmful bacteria grow/reproducing/creating ✓ Otherwise, pathogens/harmful bacteria could grow/reproduce/create ✓ OR Stops oxygen to enter the dish / anaerobic conditions ✓ Pathogens/harmful bacteria grow/reproduce ✓	2	2 x 1.2	ALLOW (for bacteria) to carry out aerobic respiration ALLOW stop anaerobic bacteria from growing = 2 ALLOW bacteria need oxygen to carry out aerobic respiration = 2 (lack of oxygen, bacteria) can't carry out aerobic respiration bacteria ALLOW anaerobic bacteria can grow = 2 ALLOW bacteria can't get oxygen which is needed for aerobic respiration = 2
	(c)	(i) Idea that B is the most effective/killed the most/removed all the bacteria ✓ Idea C is the least effective/killed/removed the least bacteria ✓	2	2 x 3.2b	IGNORE references to petri dish A ALLOW B is more efficient than C/D (at killing bacteria) ALLOW D is more efficient than C (at killing bacteria) Correct order of efficiency (of killing bacteria) is B → D → C = two marks IGNORE strongest/weakest

Question		Answer	Marks	AO element	Guidance
	(ii)	<p>Any two from:</p> <p>Using different concentrations/volume of disinfectant / make each disinfectant more dilute ✓</p> <p>Using different concentrations/amounts of bacteria ✓</p> <p>Using different types of bacteria ✓</p>	2	2 x 3.3b	<p>IGNORE amount</p> <p>IGNORE stronger bacteria</p> <p>ALLOW repeat for one mark if no marks are awarded</p> <p>IGNORE reference to time</p>

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