OCR A GCSE BIOLOGY 9-1 PAPER 2 2022 EXAM

Advance Information for Summer 2022

GCSE (9–1)

Biology A (Gateway Science)

J247

We have produced this advance information to help support all teachers and students with revision for the Summer 2022 exams.

Information

- The format/structure of the papers remains unchanged.
- This notice covers all examined components.
- For each paper, the main list shows the major focus of the content of the exam.
- Topics **not** assessed, either directly or synoptically, have also been listed.
- The information is presented in specification order, **not** in question order.
- Assessment of practical skills, maths skills, and Working Scientifically skills will occur throughout all of the papers.
- You are **not** permitted to take this notice into the exam.
- This document has **3** pages.

Advice

- It is advised that teaching and learning should still cover the entire subject content in the specification, so that students are as well prepared as possible for progression.
- Topics not explicitly given in either list may appear in low tariff questions or via synoptic questions (e.g., questions where students are asked to bring together knowledge, skills and understanding from across the specification).
- Students will still be expected to apply their knowledge to unfamiliar contexts.

J247/04

- Section 5.1 Inheritance
- Section 5.2 Natural selection and evolution
- Section 6.1 Monitoring and maintaining the environment
- Section 6.3 Monitoring and maintaining health

Required practical skills that **will be assessed**:

- Practical Activity Group 3: The use of sampling techniques to investigate organisms in a habitat.
- Practical Activity Group 4: Investigation of the most favourable conditions for composting.
- Practical Activity Group 7: Investigate the effectiveness of antimicrobial agents on the growth of a bacterial lawn.

Topics **not assessed** in this paper:

- Section 1.1 Cell structure
- Section 1.3 Respiration
- Section 2.2 The challenges of size
- Section 3.1 Coordination and control – the nervous system

Higher Tier, grades 9 to 4

Content is split into six teaching topics B1-B6 and a practical activity skills topic B7:

- Topic B1: Cell level systems
- Topic B2: Scaling up
- Topic B3: Organism level systems
- Topic B4: Community level systems
- Topic B5: Genes, inheritance and selection
- Topic B6: Global challenges
- Topic B7: Practical skills

Paper 3 assesses content from Topics B1–B3 and B7

Paper 4 assesses content from Topics B4–B6 and B7, with assumed knowledge of Topics B1–B3.

Paper 3 J247/03 90 marks 1 hour 45 minutes Written paper	**50% of total GCSE**
Paper 4 J247/04 90 marks 1 hour 45 minutes Written paper	**50% of total GCSE**

J247/02 and J247/04 include synoptic assessment.

Note:

This revision pack only covers the main content mentioned in the paper 2 of advance information for summer 2022 OCR A GCSE Biology exam. Topics not listed in either assesses or not assessed sections may still come as low tariff questions.

Science With Saul
Tutoring & Exam Prep

OCR
Oxford Cambridge and RSA

Gateway Biology A (9-1)

OCR A GCSE paper 2 2022 exam
Baljit Saul

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **305**.
- The total number of marks may take into account some 'either/or' question choices.

1(a). Singapore is a small country.

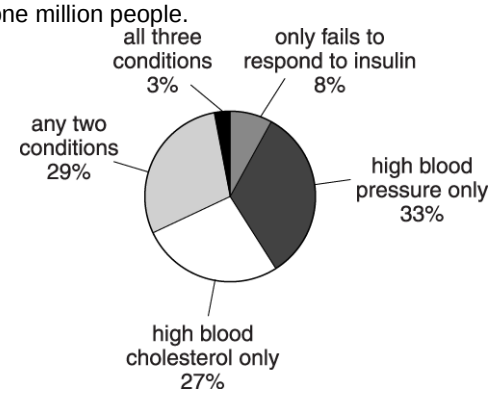
Everyone living in Singapore was offered a health check to test for three conditions.

They were tested:

- for high blood pressure
- for high levels of blood cholesterol
- to see if they failed to respond to insulin.

The check found that one million people had at least one of these conditions.

The pie chart shows the results for these one million people.



The government is worried about the possible consequences of these results for many of the people.

Explain the most serious consequences of these results for the health of the people.

Use calculations to support your answer.

The quality of written communication will be assessed in your answer to this question.

[6]

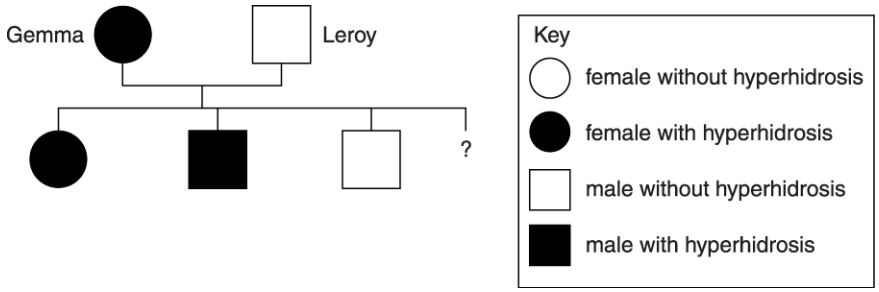
(b). It is **not** possible from the pie chart to work out how many of the one million people have high blood pressure.

Explain why.

[1]

2(a). Scientists have discovered that this is caused by a **dominant** allele.

Look at this family tree.



Gemma and Leroy are expecting a fourth child.

What is the probability that it will have hyperhidrosis?

Explain how you worked out your answer.

probability =

explanation

---

[2]

(b). Some people sweat too much.

This is called hyperhidrosis.

Gemma's doctor injects her with a drug that makes her sweat less.

i. Put a tick (✔) in the box that describes what this drug changes.

Gemma's genotype but not her phenotype	☐
Gemma's phenotype and her genotype	☐
neither Gemma's phenotype nor her genotype	☐
Gemma's phenotype but not her genotype	☐

[1]

ii. The drug contains an antigen made by bacteria.

The drug stops the sweat glands working for about 4 months.

It only works for this long because the antigens are gradually destroyed by Gemma's body.

Explain how Gemma's body destroys antigens.

---

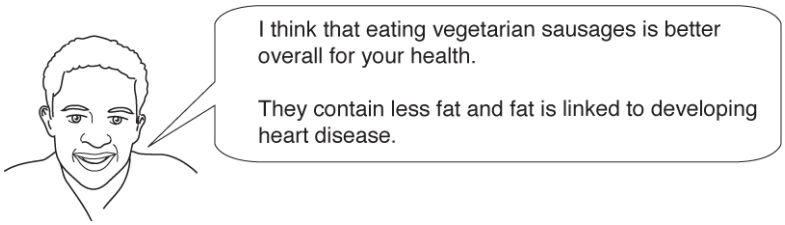
[2]

3. The table shows information about the contents of two types of sausage.

All the figures are for **100 g** of the sausages.

	Pork sausages 	**Vegetarian sausages** 
energy in kJ	1200	740
protein in g	10	9
fat in g	22	8
carbohydrate in g	10	13

A boy makes two comments about eating vegetarian sausages rather than pork sausages.



For each of the boy's comments write about whether it contains scientific **facts** or just **opinion**.

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[2]

4(a). Read this article about a disease that occurs in South America.

Doctors concerned about spread of disease

Zika is a disease that is caused by a virus.

It is spread by mosquitoes.

In most people the disease is quite mild.
However, there is evidence that in pregnant women it can slow the growth of the baby's brain.

The disease cannot be treated by antibiotics.

Scientists are trying to develop a vaccine for the zika virus.

Scientists are making a vaccine against this virus.

Explain what the vaccine is likely to contain and how it will work.

[3]

(b). When scientists develop new medicines they test the medicine in trials using placebos.

What is a **placebo** and why is it used?

[2]

5(a). Snowshoe hares live in northern Canada where there is snow on the ground for much of the year.

Snowshoe hares are preyed on by animals called lynx.
Scientists have made observations to explain why snowshoe hares have white fur.

Here are their observations.

A Hares are all born with slightly different coloured fur.

B Lynx are trying to find food and hares are trying not to be eaten.

C The hares with the fur colour best suited to the conditions survive.

D The hares that survive pass on their genes for fur colour.

Charles Darwin made observations about natural selection.

Match the scientists' observations to Charles Darwin's observations by writing the correct letter **A, B, C** and **D** in the table.

Charles Darwin's observation	Scientists' observation
survival of the fittest	
competition for resources	
inheritance of successful adaptations	
presence of natural variation	

[2]

(b). Scientists think that increasing levels of carbon dioxide pollution may affect the survival of snowshoe hares.

In 2015 the scientists collected data about the survival of the hares.

They have also predicted how the hares will survive in the future.

Their results are shown in the table.

Year	2015	2050	2080
percentage chance of a hare surviving one year	9.3	8.2	7.0

Write about how carbon dioxide pollution can change the hare's habitat and why the hares could become **extinct** if the scientists' predictions are correct.

The quality of written communication will be assessed in your answer to this question.

---

[6]

6(a). The diagram shows two types of ladybird.

7 spotted ladybird
Coccinella septempunetata

Harlequin ladybird
Harmonia axyridis

All ladybirds are arthropods.

Put a tick (✓) next to the correct comparison of the classification of the two types of ladybirds.

They are classified in …

… the **same** class, genus and species. ☐

… a **different** class, genus and species. ☐

… the **same** class and genus but **different** species ☐

… the **same** class but **different** genus and species ☐

[1]

(b). Ladybirds may get their common name from the fact that they can fly.

The Ancient Greeks might have classified ladybirds in the same group as birds.

i. What name is given to the type of classification system used by the Ancient Greeks?

[1]

ii. Give **one** reason why this type of system is not used now.

[1]

(c). Harry has been looking at the ladybirds on a bush in his garden.

He knows that there are three main types of ladybird living in the area.

The three main types of ladybird can have different numbers of spots on their body.

Type of ladybird	Number of spots on the body
harlequin	15–21
eyed	15
7 spotted	7

Harry is talking to two of his friends.

Harry
The mean (average) on the bush is 15 spots per ladybird so they must all be eyed ladybirds.

Tom
If that mean is correct then there could still be an equal spread of all three types of ladybird on the bush.

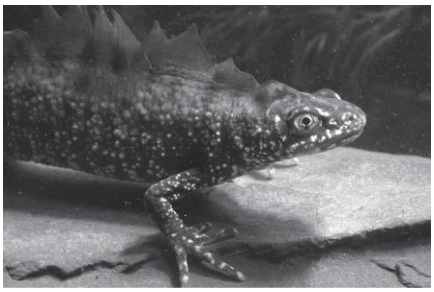
Sam
That mean shows that there could be some 7 spotted ladybirds on the bush but not many of them.

Which friend's answer is correct?

Explain your answer.

[2]

7(a). The picture shows a great crested newt.



Great crested newts live in ponds.

Scientists monitor the population of newts in one pond over 5 years.

They use the method of capture - recapture each spring to estimate the population.

The table shows their results.

Year	Number of newts captured and marked in 1st sample	Number of newts captured in 2nd sample	Number of newts in 2nd sample previously marked	Estimate of n population
1	14	13	3	61
2	21	14	5	59
3	19	12	4	57
4	18	16	5	58
5	17	11	5	

Use this formula to calculate the population estimate for **year 5**.

Give your answer to the nearest whole number.

$$\text{population size} = \frac{\text{number in 1st sample} \times \text{number in 2nd sample}}{\text{number in 2nd sample previously marked}}$$

answer .....

[2]

(b).

i. Write down **two** conclusions from the data.

1

2

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[2]

ii. Suggest **one** reason why these conclusions may not be valid.

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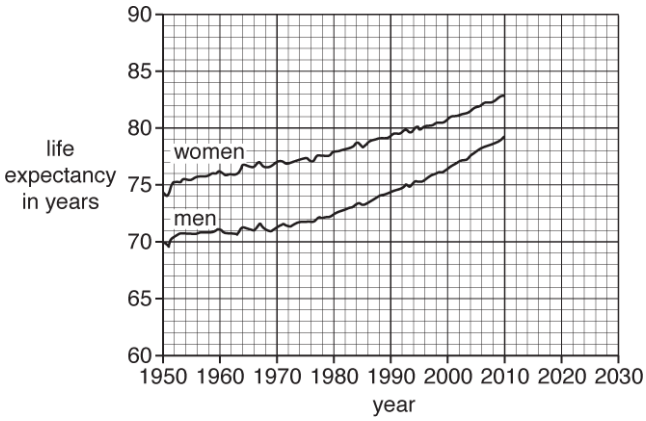
[1]

8(a). The graph shows how life expectancy has changed in England and Wales from 1950 to 2010.



Suggest **two** reasons for the change in life expectancy since 1950.

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[2]

(b). Continue the two lines on the graph to predict the life expectancy ages in 2030.

i. Write down **two** conclusions about the predicted life expectancies in 2030.

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[2]

ii. Suggest **one** reason why any prediction may **not** be correct.

---

[1]

9. Some humans and animals have an inherited condition called cornea plana.

It causes the cornea to be less curved than normal.

Scientists performed an experiment on mice to try and work out how cornea plana is inherited.

They mated together two mice who had normal vision.

There were nine offspring and three had cornea plana.

Complete these sentences about the inheritance of cornea plana.

Cornea plana is caused by a change to a gene.
A change in a gene is called a …….
The allele that is produced is …… to the normal allele.
The two parent mice must be …… for the allele for cornea plana.

[3

10. Which is a **chemical** defence of plants?

A Antimicrobial substances

B Cell walls
C Leaf cuticles
D Thorns

Your answer

11. Which is the **most** effective treatment for HIV?

A Antibiotics
B Antigens
C Antiseptics
D Antivirals

Your answer

12. Heart disease kills thousands of people in Britain every year.

Why is it difficult to decide why a person gets heart disease?

A Heart disease is caused by the interaction of many factors.
B It is not possible to measure any of the risk factors.
C Many microorganisms cause heart disease.
D There is no genetic link to heart disease.

Your answer ☐

13. Which of these processes can produce a **new** allele?

A A change in the environment
B Asexual reproduction
C Mutation
D Selective breeding

Your answer ☐

14. Which of these is an adaptation of white blood cells?

A The ability to make clotting enzymes.
B They can change their shape to pass out of capillaries.
C They can synthesise antibiotics.
D They lack a nucleus.

Your answer [ ]

15. The table shows changes in the forest cover in some continents of the world.

Continent	Total forest cover (millions of hectares)		
	1990	**2000**	**2005**
Africa	699	656	635
Asia	574	567	572
Europe	989	998	1001
South America	891	853	832

What is the approximate percentage decrease in the area of South America covered by forest between **1990** and **2005**?

A 0.9%
B 1.1%
C 6.6%
D 7.1%

Your answer [ ]

16. A scientist is estimating the number of rabbits in a field.

He has eight different estimates, 12, 12, 13, 15, 17, 19, 22 and 26.

Which is the median value for his estimates?

A 8
B 12
C 16
D 17

Your answer ☐ **[1]**

17. Why is the process of meiosis important in making gametes?

A The cells produced are diploid.
B The cells produced are genetically identical.
C The cells produced are much smaller in size.
D The cells produced have half the number of chromosomes.

Your answer ☐ **[1]**

18. What is a genome?

A A description of the number of chromosomes in an organism.
B All the proteins that one organism can produce.
C A store of seeds to preserve genetic variation.
D The entire genetic material of an organism.

Your answer ☐ **[1]**

19. A harmful protein can cause pain in the joints. A new treatment is being developed to stop the protein causing pain.

What effect would this treatment have on the person's phenotype and genotype?

A Changes both the phenotype and genotype
B Changes the genotype only
C Changes the phenotype only
D No change to their phenotype or genotype

Your answer ☐ **[1]**

20. Which statement **best** describes the development of the theory of evolution by natural selection?

A Darwin and Mendel working together
B Darwin and Wallace working independently
C Darwin and Wallace working together
D Mendel working on his own

Your answer ☐ **[1]**

21. Females aged between 12 and 13 are offered a vaccination for the human papilloma virus (HPV).

Which statement describes the reason for offering this vaccine?

A Contracting HPV greatly increases the risk of developing AIDS.
B Having the vaccination will prevent cervical cancer.
C HPV can be treated with antibiotics but cervical cancer cannot.
D HPV has been linked to about 70% of cases of cervical cancer.

Your answer ☐ **[1]**

22. Which approach would be used to classify organisms by phylogenetics?

A Compare the structure of the organisms' internal organs
B Look at DNA base sequences
C Look at the behaviour of the organisms
D Study fossils

Your answer ☐ **[1]**

23. Hedgehogs are covered in small spines.

When they are frightened they often roll up into a ball and keep still.

i. In country areas, where badgers live, this is an advantage to the hedgehogs.

In cities, where there are many roads, this is a disadvantage.

Explain these two conclusions.

---

[2]

ii. Scientists have noticed that a new type of hedgehog is increasing in numbers in cities.

These hedgehogs do not roll up. They run away when frightened. The scientists think that genes control this behaviour.

Explain how this type of hedgehog may become more common in cities.

Use ideas about natural selection.

---

[4]

24. A student investigates the plants growing underneath a tree.

He lays out a tape measure on the ground, starting at the tree. He then places a quadrat on the ground.

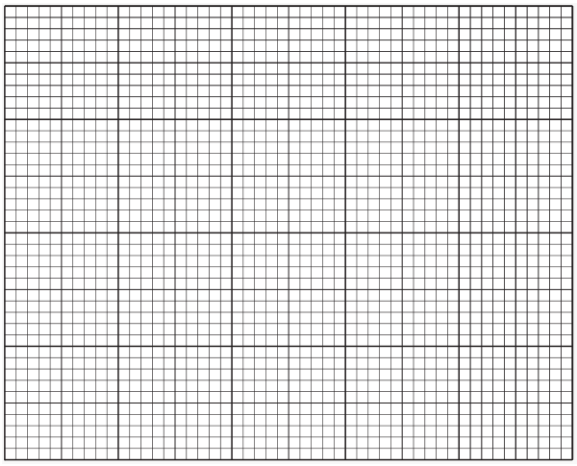
He measures the percentage of the ground in the quadrat that is covered by plants. He repeats this every metre away from the tree.

The table shows his results.

Distance from the tree (m)	Percentage of ground covered by plants (%)
1	10
2	15
3	18

4	22
5	50
6	58
7	62
8	64

Plot a graph of the student's results and draw a line of best fit.



[5]

25(a). Retinitis pigmentosa is a genetic condition that affects the eyes.

It is caused by a mutation to a gene. This mutation produces a recessive allele.

The condition causes rod cells in the retina to break down.

Explain the meaning of these terms.

Gene ---

Allele ---

--- **[2]**

(b).

i. Two people who are heterozygous for retinitis pigmentosa are expecting a baby.

Draw a genetic diagram to calculate the probability that the baby will have the condition.

Use R for the normal allele and r for the allele for retinitis pigmentosa.

Answer = ----------

ii. If the baby has retinitis pigmentosa, it will have normal colour vision but will not be able to see well in dim light.

Explain why.

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[3]

(c).

i. Explain why stem cells could be used as a treatment for this condition.

---

[2]

ii. Why is it an advantage to use stem cells from the patient rather than from another person?

---

[1]

26(a). The data in the table shows the ratio of males to females in England and Wales.

	Ratio of males to females in England and Wales
At birth	105 males : 100 females
Average over the whole population	98 males : 100 females

Describe how sex is determined in humans.

You may use a genetic diagram in your answer.

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[2]

(b). In 2015 there were approximately 698 000 babies born in England and Wales.

Calculate how many of these were male.

Answer = ---------- **[2]**

(c). There are more females than males living in England and Wales as an average over the whole population.

Suggest **one** reason why there are more females.

---

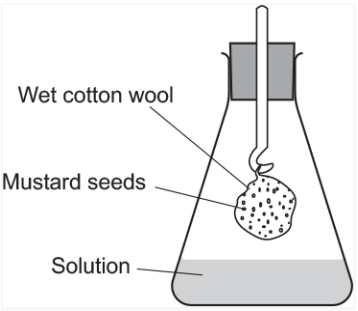
[1]

27(a). A student investigates the effect of acid rain on seed growth.

She dips some cotton wool in 20 cm^3 of water. She then puts 20 mustard seeds onto the cotton wool and places it inside a flask. The student puts the remaining water into the flask with the cotton wool.

She repeats this four more times, each time using different solutions of water and dilute sulfuric acid.

One of the flasks is shown in the diagram.



After **8 days** she counts how many of the seeds have germinated.

The table shows her results.

Volume of water in flask (cm^3)	Volume of dilute sulfuric acid in flask (cm^3)	Number of seeds that germinated
20	0	18
16	4	15
8	12	13
4	16	6
0	20	2

What is the dependent variable in this investigation?

[1]

(b). State why the student changed the volume of water in each flask.

[1]

(c). The student kept each flask at the same temperature during the experiment to make it a fair test.
Explain **one** other reason why she kept each flask at the same temperature.

[1]

(d). Explain what this experiment shows about the effect of acid rain on seed germination.

[2]

(e). The student used a formula to describe the germination of seeds called the viability index (**VI**).

i. For the seeds in 20 cm^3 of sulfuric acid, the mean root length was 5 mm and the mean shoot length was 2 mm.

Calculate **VI** for these seeds.

Use the equation:
VI = mean root length × mean shoot length × percentage of seeds that germinated

Answer =

ii. Using **VI** is a better way of comparing the effects of acid rain than just using the number of seeds germinated.

Explain why.

[2]

28(a). Methamphetamine is a drug.

Scientists are investigating the use of antibodies as a treatment to control the negative effects of the drug.

What is an antibody?

[2]

(b). As the human body does not naturally make antibodies against methamphetamine, scientists are using mice to make antibodies.

Describe how large amounts of the antibodies can be made using monoclonal antibody techniques.

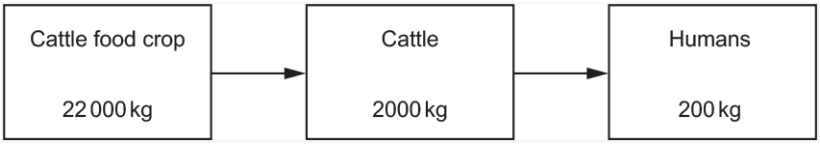
[4]

(c). These antibodies would **not** work against other drugs.

Explain why.

[2]

29. The diagram shows the flow of biomass through an agricultural food chain.



High levels of light intensity can damage plants. To prevent damage, plants have a protection mechanism.

When light intensity levels get **too high**, the protection mechanism switches on. This stops the plant absorbing too much light.

When the light intensity drops to safe levels, the protection mechanism switches off **slowly**.

Explain why this mechanism would **reduce** the biomass available to humans.

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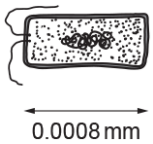
[6]

30. Look at the bacterial cell that causes disease in humans.



The human eye can see objects 0.1 mm in size.

What **minimum** magnification will be needed before the eye can see this bacterial cell?

A 12.5×
B 125×
C 1250×
D 12500×

Your answer ☐ **[**

31. What was Mendel's contribution to modern genetics?

A He developed the theory of natural selection.
B He discovered that most characteristics are controlled by multiple genes.
C He worked out how sex determination occurs in mice.
D He found a pattern that shows how characteristics are passed on.

Your answer [ ]

32. Many human diseases are caused by risk factors.

Food and drink can be major risk factors.

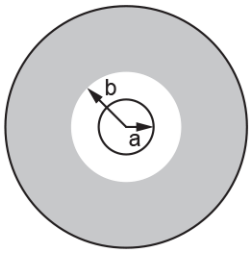
Which disease does **not** have food or drink as a major risk factor?

A Type 1 diabetes
B Cirrhosis of the liver
C Type 2 diabetes
D Cardiovascular disease

Your answer [ ]

33. A student places an antibiotic disc onto the surface of agar that is covered in bacteria.

She calculates the area around the disc that is free from bacteria.



Which formula should she use?

A $2\pi b^2 - 2\pi a^2$
B $\pi b^2 + \pi a^2$
C $\pi b^2 - \pi a^2$
D $\pi(b - a)^2$

Your answer ☐ **[1]**

34. Which row on the table is correct for HIV?

	Destroyed by antibiotics	Causes cervical cancer	Sexually transmitted
A	✓	X	X
B	X	X	✓
C	X	✓	✓
D	✓	✓	✓

Your answer ☐ **[1]**

35. Which of these is an example of ecotourism?

A Setting up monkey parks in the UK.
B Allowing people to sponsor endangered animals.
C Encouraging people to view animals in their natural environment.
D Educating children about the benefits of conservation.

Your answer ☐ **[1]**

36. Which is a definition of cancer?

A An infection of foreign cells which divide uncontrollably.
B Body cells that divide uncontrollably many times.
C Body cells that lose the ability to divide and make stem cells.
D Pathogens that grow and divide unchecked.

Your answer ☐ **[1]**

37. What does a vaccine contain that protects a person from infection?

A Antibiotics that will attach to antigens.
B Antigens that will stimulate antibody production.
C Antibiotics that kill pathogens.
D Antivirals that destroy viruses.

Your answer ☐ **[1]**

38. Which of these is a feature of an **artificial** classification system?

A It shows evolutionary links between organisms.
B It can be based on similarities in DNA.
C It may compare the amino acids in proteins.
D It uses a single difference or similarity between organisms.

Your answer ☐ **[1]**

39. New drugs are tested using preclinical trials.

Which statement describes a preclinical trial?

A One group of volunteers are given a placebo, another group the drug.
B The drug is tested on human cells.
C Volunteers are given a placebo only.
D Volunteers are given the new drug.

Your answer ☐ **[1]**

40. What is the role of antibiotic resistance markers in producing genetically engineered bacteria?

A To identify which genes to insert into the bacteria.
B To identify which bacteria have taken up the plasmid.
C To identify which plasmids contain the genes.
D To identify which proteins are produced by the bacteria.

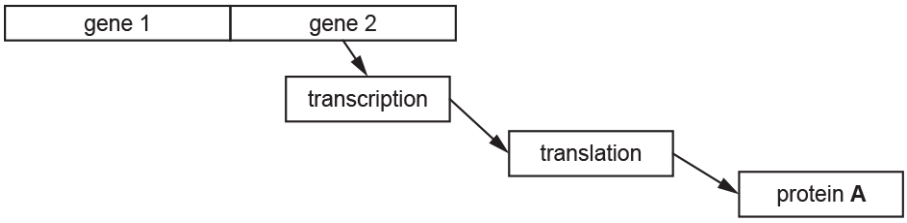
Your answer ☐ **[1]**

41. How does the fossil record provide evidence for evolution?

A It provides information about **all** extinct organisms.
B It shows that all organisms have evolved at the same rate.
C It shows that many small changes can result in a large change in organisms over time.
D It shows that changes in phenotype occurring during life can be passed on in the genes.

Your answer ☐ **[1]**

42. Gene **1** and gene **2** are both needed for the production of protein **A**.



What is the function of **gene 1** in this process?

A It codes for the amino acids in protein **A**.
B It codes for the mRNA needed to make protein **A**.
C It acts as the site for protein synthesis.
D It controls the expression of **gene 2.**

Your answer ☐ **[1]**

43(a). Two farmers grow barley in their fields.

They both have a problem with barley powdery mildew infecting their crops.

Powdery mildew is caused by a fungus.

Describe how fungal infections can spread and how they enter plant leaves.

[3]

(b). The farmers want to prevent their crops from getting powdery mildew.

i. Explain how burning plants after the barley has been harvested can protect the crops.

[1]

ii. Explain how growing barley in the fields one year, then wheat the next year can protect the crops.

[2]

(c). The farmers test two different fungicides.

They each grow barley in one of their fields. Each farmer sprays a different fungicide on their field. They then compare the crop yield in the two different fields.

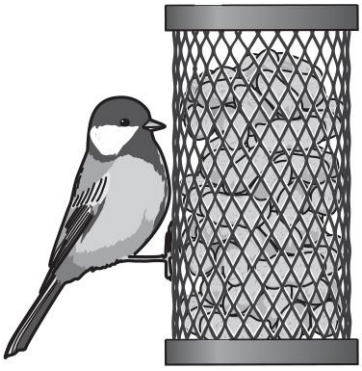
How could you improve the farmers' experiment?

Explain your answer.

[2]

44(a). Blue tits are small birds seen in gardens.

Many people in the UK feed birds nuts using a bird feeder, as shown in the diagram below.



Scientists measured the mean lengths of blue tits' beaks in the UK.

They found that blue tit beaks in the UK are slightly longer than blue tit beaks in the rest of Europe.

Very few people in the rest of Europe put bird feeders out for their birds.

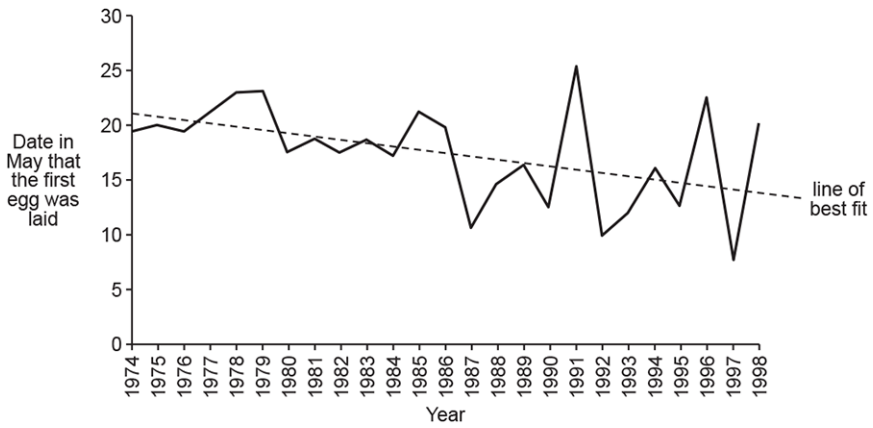
Use Charles Darwin's theory of natural selection to explain why the blue tits in the UK have slightly longer beaks than those in the rest of Europe.

[4]

(b). Blue tits usually lay their eggs in the month of May.

For many years, the scientists have recorded the first day that an egg was laid.

This data is shown in the graph.



The scientists made this explanation for the results:

The results are due to climate change.

Suggest arguments **for** and **against** this possible explanation.

Use information from the graph in your answer.

---

[4]

45(a). Some people get very painful headaches called migraines.

Scientists think that this is caused by a protein in the brain called CGRP.

Levels of the CGRP protein are higher in the brains of people who get migraines.

Doctors are trying to find a treatment to prevent migraines.

They have produced an antibody against the CGRP protein.

Describe how antibodies are usually made in the human body.

---

[2]

(b). The doctors test the antibody treatment on migraine patients.

The patients are divided into two groups:

- One group is given an injection of the antibody
- The second group receives an injection of a placebo.

They record the mean number of days each patient had migraines before and after treatment.

The table shows their results.

Treatment	Mean number of migraine days per patient **before** treatment	Mean number of migraine days per patient **after** treatment	Percentage decrease in migraine days per patient
antibody injection	9.1	4.4	

placebo	9.1	6.4	29.7

i. Explain why a placebo group is used in drug testing.

---**[3]**

ii. Calculate the percentage decrease in migraine days in the patients that had the antibody injection.

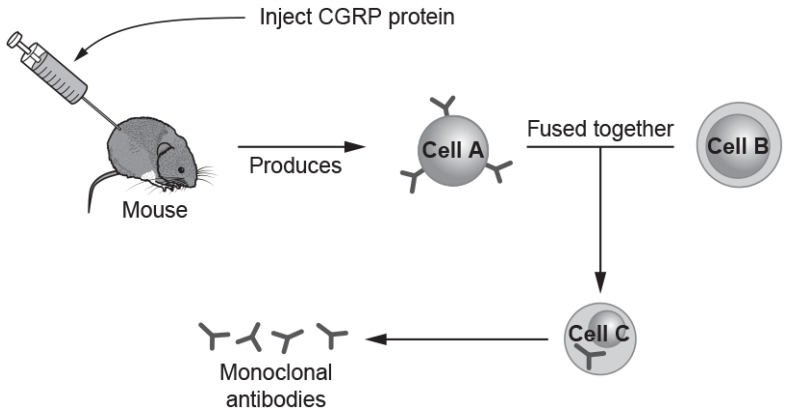
Give your answer to **1** decimal place.

Percentage decrease = ... %
[3]

(c). The antibodies used in the investigation were monoclonal antibodies.

They can be made by injecting CGRP protein into a mouse.

The diagram shows this process.



Draw lines to identify each type of cell shown in the diagram.

Cell A	Cancer cell
Cell B	Lymphocyte
Cell C	Hybridoma

[2]

46(a). Huntington's disease is a genetic condition. It is caused by a **dominant allele**.

Explain what is meant by the term dominant allele.

---

[2]

(b). *The symptoms of Huntington's disease usually appear after the age of 40.

There is no cure and people with the disease usually die after 10-15 years.

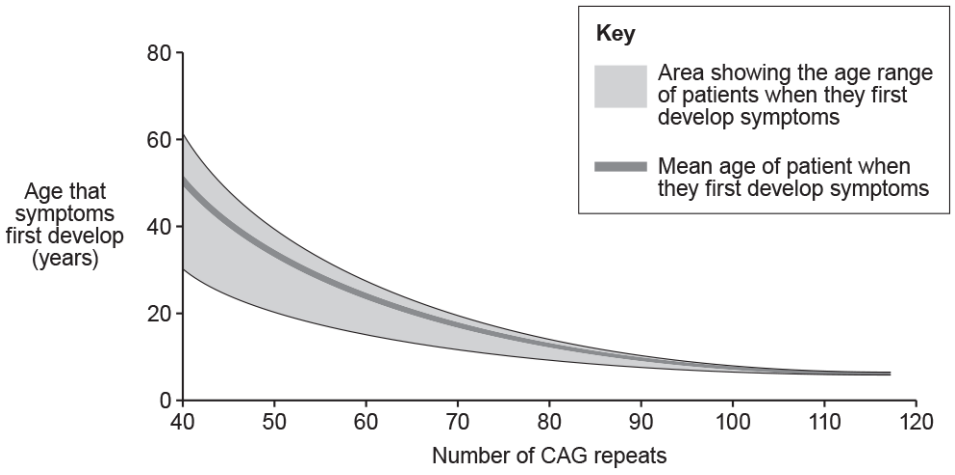
Scientists now know that there are a number of different forms of the allele that causes Huntington's disease. The allele has a sequence of three bases, CAG, that repeats many times. The number of repeats varies between patients.

Patients can be tested to see if they have the allele and how many repeats it has.

Doctors have studied many patients to see:

- The number of CAG repeats a patient has
- The age that the patient starts to show symptoms of the disease.

The results are shown on the graph.



Discuss how useful the gene test and the graph are for people who have a history of Huntington's disease in their family.

---

[6]

(c). A new study is giving hope for a treatment for Huntington's disease.

Doctors gave patients an injection of a drug that blocks the action of mRNA that is produced by the Huntington allele.

Explain how this drug could prevent the symptoms of Huntington's disease.

[6]

47(a). Rats are a major pest in many areas of the world. They can reduce food security and spread diseases.

Warfarin is a chemical that is used as a rat poison. It stops the correct functioning of platelets in the blood.

Explain why warfarin can be used as a rat poison.

[2]

(b). In 1958, some rats were found that were resistant to warfarin. They did not die, even when fed with large amounts of the poison. Scientists found that the resistance was due to dominant allele **R**.

Two resistant rats can mate and produce non-resistant rats.

Draw a genetic diagram below to show how these non-resistant rats can be produced.

[

(c). When scientists studied the resistant rats they found that there were two different types.

Homozygous rats are resistant to warfarin but need to eat 20 times more vitamin K.

Heterozygous rats are resistant to warfarin but only need slightly increased amounts of vitamin K.

The scientists found that the non-resistant rats never died out completely.

Explain why.

---

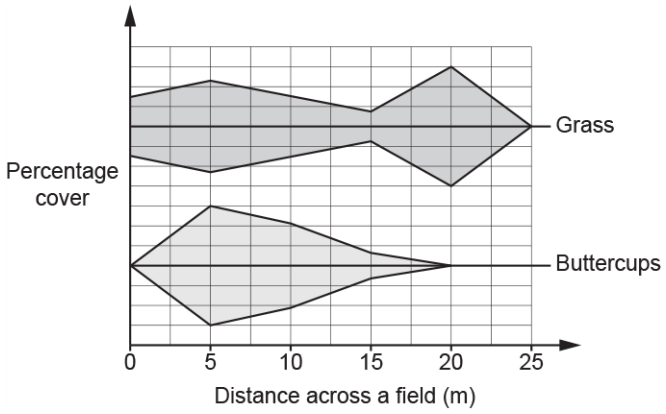
[2]

48. Why are the effects of most mutations **not** observed?

A Most mutations do not affect the genotype or phenotype.
B Most mutations do not affect the phenotype.
C Mutations mainly affect internal body processes.
D Mutations often kill the organism.

Your answer ☐ [1]

49. A group of students collected some measurements from a field.
They plotted the measurements on this graph.



Which technique have the students used to collect the data?

A Capture-recapture
B Random quadrats
C Scaling up
D Transect line with quadrats

Your answer ☐ [1]

50. Which of these is a **similarity** between selective breeding and natural selection?

A Cause a change in organisms' genotypes but not phenotypes.
B Humans decide which organisms will reproduce.
C Only some organisms reproduce.
D Take place over many thousands of years.

Your answer ☐ **[1]**

51. The table describes meiosis.

	Genetic description of cells made	Genetic variation introduced	Type of cells made
A	haploid	✓	body cells
B	diploid	*X*	body cells
C	haploid	✓	gametes
D	diploid	✓	gametes

Which row in the table is correct?

Your answer ☐ **[1]**

52. Darwin and Wallace both developed theories of natural selection. Both of their theories were developed after making observations on islands.

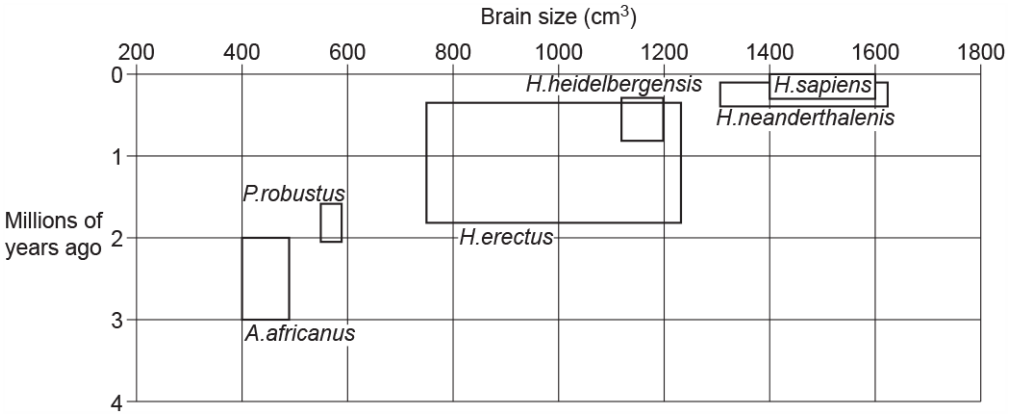
What is the most likely explanation for this?

A Conditions on neighbouring islands are very similar.
B Different characteristics were observed in organisms on islands compared to the mainland.
C There are no selection pressures for organisms on islands.
D There is no competition for food on islands.

Your answer ☐ **[1]**

53. Humans belong to the species *H.sapiens*.

H.sapiens have evolved from a number of possible ancestors. The graph shows five of these ancestors.



What conclusion about human evolution can be made from the graph?

A A larger brain meant that the species were better adapted to their environment.
B *H.sapiens* outcompeted the other species which then became extinct.
C In general, the more recently a species first appears, the larger its brain size.
D There is no correlation between brain size and when a species first appeared.

Your answer [ ] **[1]**

54. The table shows estimated data about the global population and the number of deaths from HIV and tuberculosis (TB).

	Year	
	2000	**2017**
Total population in millions	6143.5	7464.0
Number of people with HIV in millions	36.1	36.8
Percentage of total population with HIV	0.6	0.5
Total number of HIV related deaths in millions	3.0	1.0
Total number of TB deaths in millions	2.2	1.6
Number of TB deaths in people with HIV in millions	0.5	0.3

Which is a correct conclusion from the data in the table?

A Half of HIV related deaths were due to TB in 2000.
B HIV became more life-threatening between 2000 and 2017.
C People with HIV are more likely to die from TB than people without HIV.
D The percentage of HIV in the population has increased between 2000 and 2017.

Your answer [ ] **[1]**

55. Doctors are able to offer a diagnosis and treatment targeted to a patient's genome, known as genomic medicine.

Which is an example of the type of treatment used in genomic medicine?

A Comparing patients' phenotypes so the best treatment can be given.
B Designing drugs that are specific to a particular variant of a gene.
C Using genetic engineering to produce new drugs.
D Using monoclonal antibodies to destroy pathogens.

Your answer ☐ **[1]**

56. How can a mutation in non-coding DNA change the activity of a cell?

A It can change the amino acid sequence in a protein.
B The base sequence of mRNA may be altered.
C The shape of a protein may be changed.
D Transcription of mRNA may be stopped.

Your answer ☐ **[1]**

57. When a person has measles they are unlikely to be ill again with the disease for many years.

What is the reason for this?

A Antigens from the pathogen remain in the body.
B Memory cells remain in the blood and can release antibodies.
C The disease can now be treated with antibiotics.
D White blood cells engulf the pathogens before antibodies are made.

Your answer ☐ **[1]**

58. What is meant by the term phylogenetics?

A Classifying organisms using many common characteristics.
B Constructing diagrams to predict how characteristics are inherited.
C The study of evolutionary relationships based on molecular studies.
D Using a single common feature to determine evolutionary relationships.

Your answer ☐ **[1]**

59(a). Zebras (**Fig. 17.1**) have evolved to live in hot grassland in Africa.

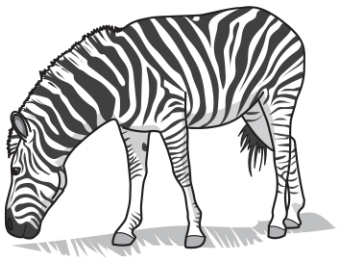


Fig. 17.1

Scientists have tried to find out why zebras have evolved stripes on their body.

One theory is that the stripes help to keep the zebra cooler than other colours. Scientists did an experiment to test this theory. They covered barrels of cold water with the skin of different animals. Then they measured the temperature of the water several hours later.

The results are shown in **Fig. 17.2**.

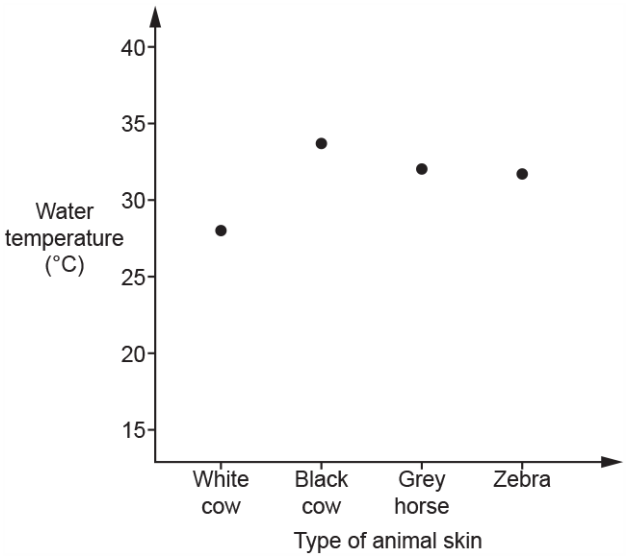


Fig. 17.2

i. Do the results in **Fig. 17.2** support the theory that stripes keep zebras cool?
Explain your answer.

---

[1]

ii. The scientists were aiming to investigate if it was **only** the colour of the skin that affected temperature regulation.

Suggest **one** improvement the scientists could make to ensure they **only** investigate the **colour** of the skin.

Explain your answer.

---

[1]

(b). Another theory says that the stripes make a zebra less likely to be bitten by insects.

To test this theory scientists made models of zebras and covered them with sticky tape. One model was black. The other models had different widths of stripes.

Fig. 17.3 shows the number of insects that stuck to the tape.

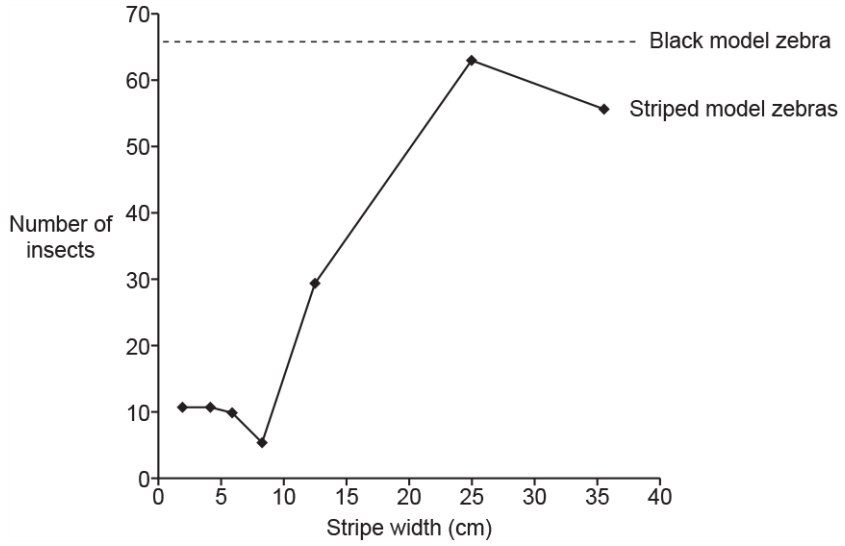


Fig. 17.3

i. Describe what **Fig. 17.3** shows about the link between zebra stripes and protection from insects.

[2]

ii. Horse blankets are used to cover horses when they are outside. Companies have started to produce horse blankets with zebra stripes.

Use the information in **Fig. 17.3** to suggest what width of stripe should be used to reduce insect bites.

Explain your answer.

[1]

iii. Biting insects can spread pathogens between animals.

Use the theory of natural selection to explain how zebra stripes could have developed.

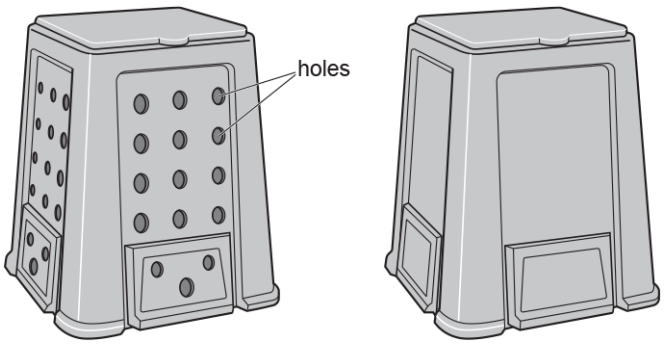
[3]

60(a). Gardeners often turn dead plant material from their garden into compost. They then add this compost to the soil where they are growing plants.

Compost can be made in a composting bin. In the bin **aerobic bacteria** turn dead plant material into compost.

Some people use a different way of making compost, called bokashi. In this process the compost is made **anaerobically.**

The drawings show a normal composting bin and a bokashi bin.



Normal composting bin Bokashi bin

Explain the difference in the design of the two composting bins.

[2]

(b). Scientists investigate the two methods of making compost.

This is their method:

- Take one large pile of dead plant material
- Divide the material into two samples of equal mass
- Place one sample into the normal composter and place one sample into the bokashi composter
- Measure the temperature in each composter every 10 days
- After 40 days, measure the mass of the compost.

Write down **one** way that the scientists make sure that they can draw valid conclusions.

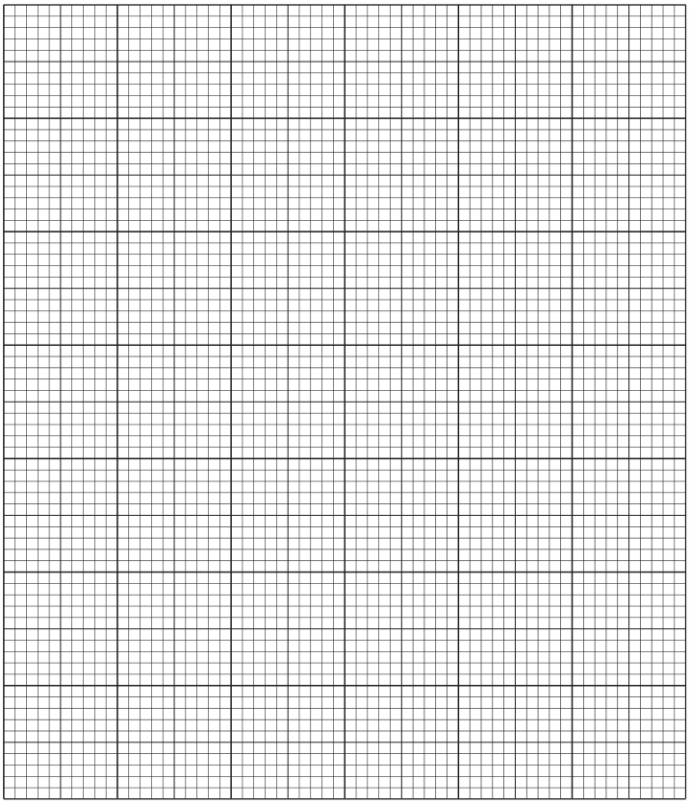
[1]

(c). Table 18.1 shows the scientists' temperature readings.

	Temperature of the compost (°C)	
Time (days)	normal compost	bokashi compost
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

Table 18.1

i. Plot the scientists' results on the grid for normal and bokashi compost, and draw **two** curves of best fit.



[5]

ii. Explain why the temperature of the compost in the **normal** bin changed as shown in the graph.

---

[2]

iii. Explain the difference in the temperature changes between the aerobic normal compost and the anaerobic bokashi compost.

---

[2]

(d). Table 18.2 shows the scientists' results for the mass of the compost.

	Normal compost	Bokashi compost
Mass at start (kg)	1500	1500
Mass after 40 days (kg)	750	1100

Table 18.2

A gas is given off in the formation of the compost. This causes most of the decrease in mass.

i. The percentage decrease in the mass of the normal compost is 50%.

Calculate the percentage decrease in the mass of the bokashi compost.

Give your answer to **2** significant figures.

Percentage decrease = ... % **[3]**

ii. The scientists concluded that the bokashi method of composting might be better for the environment.

Use your answer from part **(i)** to justify the scientists' conclusion.

---

[2]

61(a). Fanconi anaemia is a genetic disorder. It results in the bone marrow being destroyed. This causes a decrease in the numbers of red blood cells, white blood cells and platelets.

Explain **two** possible symptoms of Fanconi anaemia.

1

2

---

[2]

(b). Table 19.1 shows normal ranges for blood components in people **without** Fanconi anaemia.

Blood component	Number per mm^3
red blood cell	$4.5 – 6.5 \times 10^6$
white blood cell	$6.0 – 16.0 \times 10^3$
platelet	$1.5 – 4.0 \times 10^5$

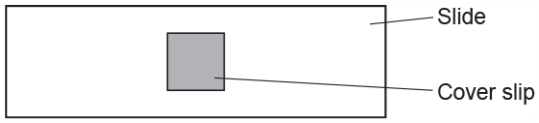
Table 19.1

i. Suggest why there is such a wide range of white blood cell numbers.

---

[2]

ii. The diagram shows a microscope slide containing blood from a patient.



The square cover slip is 10 mm wide and the thickness of the blood underneath is 0.001 mm.

Calculate the volume of blood under the cover slip.

Volume of blood = ... mm^3 **[1]**

iii. Under the cover slip are 1000 white blood cells.

Does the blood sample provide evidence that the patient has Fanconi anaemia?

Use **Table 19.1** and your answer to part **(ii)** to justify your answer.

---

[3]

(c). There are many different genetic disorders that can affect blood cells. Details of three of these are found in **Table 19.2**.

Name of disorder	Cause of disorder	Symptom
D-B anaemia	dominant allele	low red blood cell numbers
S-D syndrome	recessive allele	low white blood cell numbers
Fanconi anaemia	recessive allele	small numbers of all blood cells

Table 19.2

A blood smear from another patient shows that he has 3×10^6 red blood cells per mm^3 of blood. Neither of his parents have a blood disorder.

Use **Table 19.1** and **Table 19.2** to explain which blood disorder the patient could have.

Name of disorder

Explanation

---

[3]

62(a). Hypercholesterolemia (HC) is the result of a mutation in the genome. It is caused by a dominant allele on chromosome 19. The mutation involved causes a change in the DNA nucleotides.

Write the words **allele, chromosome, genome** and **nucleotide** in the boxes to show their size from smallest feature to largest feature.

Smallest feature	
Largest feature	

[1]

(b). One in 500 people are heterozygous for HC.

There are 66 000 000 people in the UK.

Calculate how many people in the UK are heterozygous for HC.

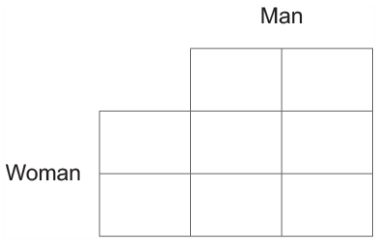
Number of people = ... **[1]**

(c). A woman who does not have HC and a man who is heterozygous are expecting a baby.

What is the probability of the baby having HC?

Complete the genetic diagram to explain your answer.

Use **D** for the dominant HC allele and **d** for the recessive allele.



Probability = ... **[2]**

(d). The allele that is affected by HC codes for a protein called LDL receptor protein.
The faulty allele often has four extra nucleotides, making a total of 2521 nucleotides.

Calculate the number of **amino acids** found in the healthy, **unaffected** protein.

Number of amino acids = ... **[2]**

63(a). Large quantities of one type of antibody can be made by the process shown in **Fig. 20.2**.

These antibodies are called monoclonal antibodies.

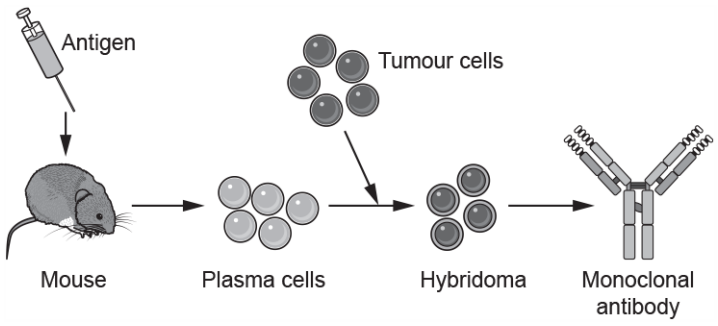


Fig. 20.2

i. Give **two** uses of monoclonal antibodies.

1 ----------

2 ----------

[2]

ii. Why are tumour cells used in this process?

---

[1]

(b). Fig. 20.1 is a diagram of an antibody molecule. Antibodies are protein molecules.
The ends of the antibody molecule bind with a particular antigen molecule.

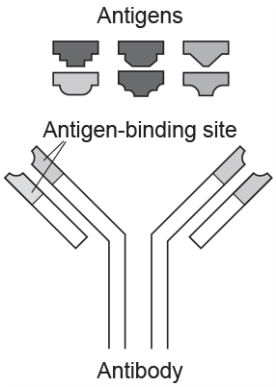


Fig. 20.1

Explain why a different antibody molecule is needed for each antigen.

---

[2]

64(a). Hypercholesterolemia (HC) is the result of a mutation in the genome. It is caused by a dominant allele on chromosome 19. The mutation involved causes a change in the DNA nucleotides.

People with HC are more likely to develop heart disease. **Fig. 21.1** shows the heart of a person who has heart disease.

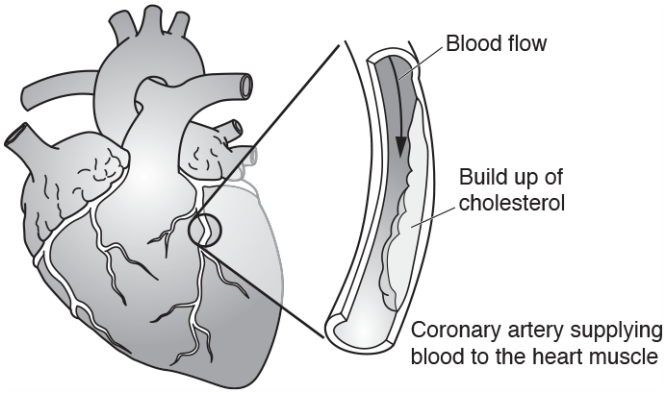


Fig. 21.1

The LDL receptor protein is found on the cell membrane of liver cells. The receptor picks up cholesterol from the blood and transports it into the liver cell. Inside the liver cell the cholesterol is broken down or used.

Explain why people who have the mutation in the allele for the LDL receptor are much more likely to develop heart disease.

[6]

(b). A drug is being developed that might help protect people from heart disease.
To test the drug patients were divided into three groups.
Each group was given a different treatment and their blood cholesterol measured.

The results are shown in **Fig. 21.2.**

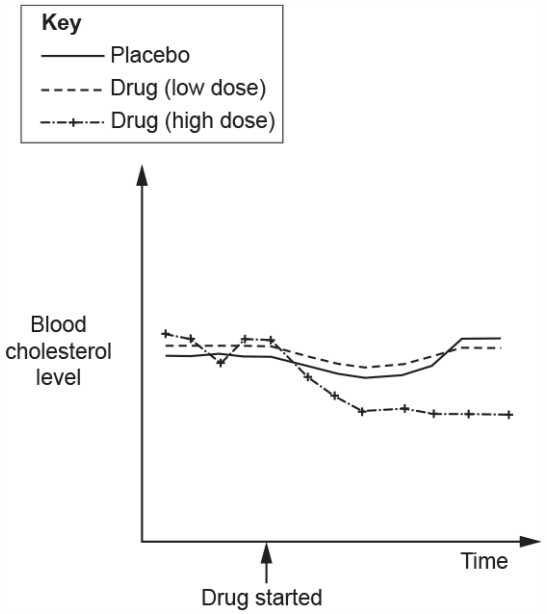


Fig. 21.2

Evaluate the results of the test.

[3]

65(a). Scientists investigate antibiotic pollution in two different lakes.

They collect samples of water from the two lakes. The scientists then use aseptic techniques to investigate how resistant the bacteria in the water are to antibiotics. **Fig. 16.2** shows the apparatus they use.

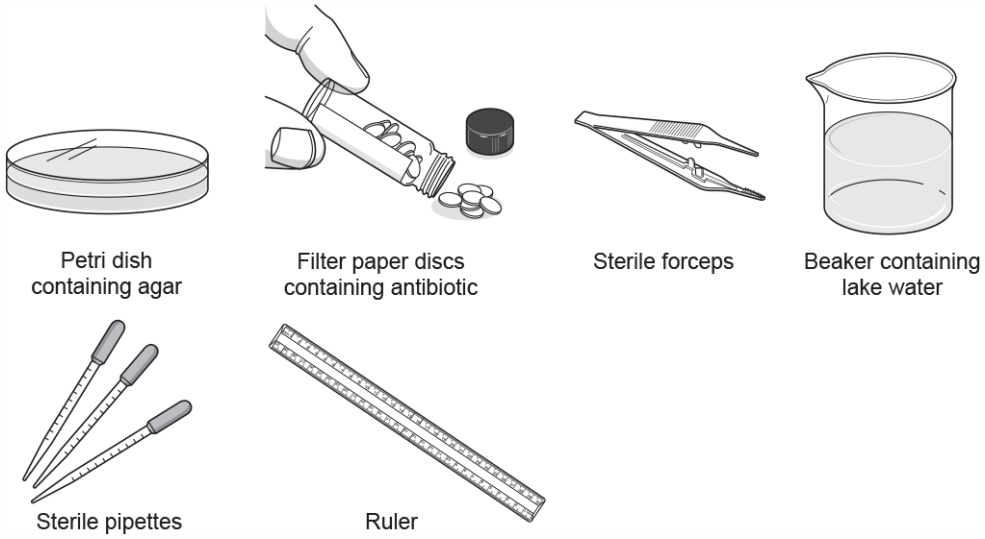


Fig. 16.2

Describe how the scientists could use **this** apparatus to **measure** how resistant the bacteria are to antibiotics.

[4]

(b). The scientists also counted how many species of bacteria were resistant to antibiotics and how many species of bacteria were killed by antibiotics.

The scientists found these results.

	Number of different species of bacteria	
	In Lake Bellandur	In Lake Jakkur
Resistant to antibiotics	53	35
Killed by antibiotics	28	37

Which lake has the **highest** levels of antibiotic pollution?

Tick (✓) **one** box.

Lake Bellandur ☐

Lake Jakkur ☐

Explain your answer.

---**[2]**

66(a). Gardeners use dead plant material to make compost. They add this compost to soil where they are growing plants.

A new way of making compost is called bokashi. In this process the compost is made **anaerobically** in a different type of composter.

Scientists compare the normal methods of making compost with bokashi.

This is their method:

- Take one large pile of dead plant material
- Divide the material into two samples of equal mass
- Place one sample into the normal composter and place one sample into the bokashi composter
- Measure the temperature in each composter every 10 days
- After 40 days, measure the mass of the compost.

Why did the scientists put the same mass of compost in each composter?

Tick (✓) **one** box.

To allow valid comparisons of the results. ☐

To decrease the temperature. ☐

To make the measurements more accurate. ☐

To make the results repeatable. ☐

(b). Table 20.1 shows the scientists' temperature measurements.

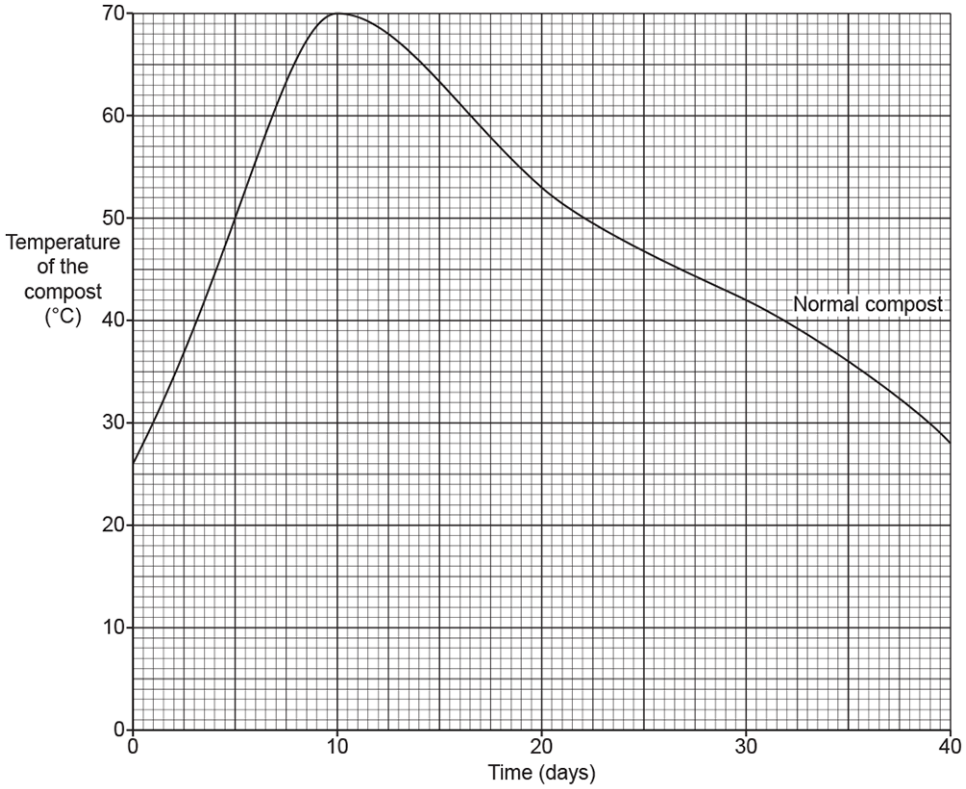
	Temperature of the compost (°C)	
Time (days)	**Normal compost**	**Bokashi compost**
0	26	26
10	70	27

20	53	29
30	42	31
40	28	28

Table 20.1

i. The scientists' results for the normal compost are plotted on the grid.

Complete the graph by plotting the results for the **bokashi** compost and draw a curve of best fit.



ii. Describe the change in the temperature of the **normal** compost during the investigation.

---

[2]

iii. Use data from **Table 20.1** to calculate the difference between the maximum temperature of the normal compost and the maximum temperature of the bokashi compost.

Difference = ...

iv. Which **two** statements explain this difference in temperature between the two types of compost?

Tick (✓) **two** boxes.

Both types of compost are made by aerobic respiration.

Normal compost is made by aerobic respiration.

Normal compost is made by anaerobic respiration.

Aerobic respiration and anaerobic respiration release the same amount of energy.

Aerobic respiration releases more energy than anaerobic respiration.

Aerobic respiration releases less energy than anaerobic respiration.

(c). Table 20.2 shows the scientists' results for the mass of the compost.

	Normal compost	**Bokashi compost**
Mass at start (kg)	1500	1500
Mass after 40 days (kg)	760	1200

Table 20.2

i. The mass of the normal compost has decreased by 19 kg per day.

Calculate the decrease in mass of the bokashi compost per day.

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

Decrease = ...kg p

ii. Carbon dioxide is given off in the making of the compost. This causes most of the decrease in mass.

Scientists think that the bokashi method of composting might be better for the environment.

Use your answer from part **(i)** to justify the scientists' conclusion.

---

[1]

67(a). Scientists investigate antibiotic pollution in two different lakes.

They collect samples of water from the two lakes. The scientists then use aseptic techniques to investigate how resistant the bacteria in the water are to antibiotics. **Fig. 22.2** shows the apparatus they use.

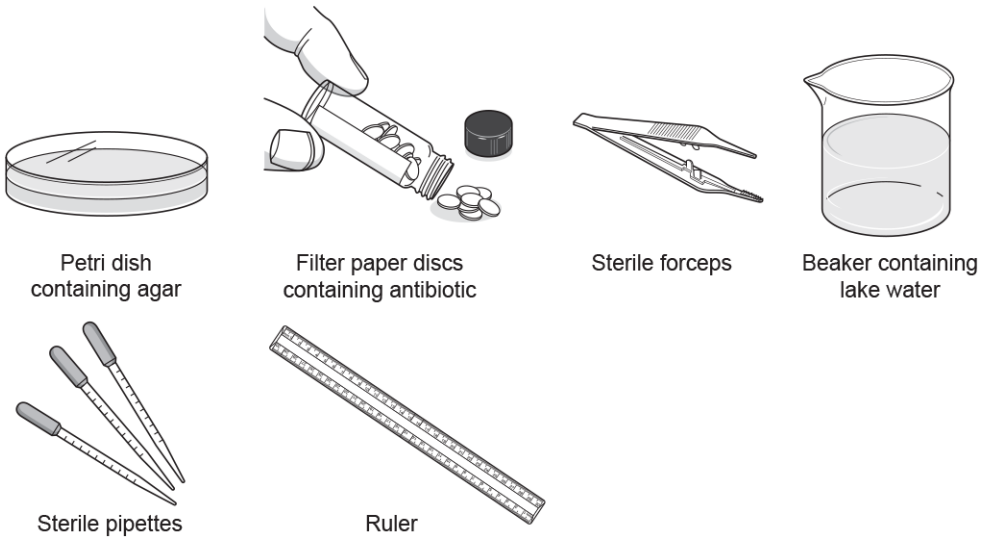


Fig. 22.2

Describe how the scientists could use **this** apparatus to **measure** how resistant the bacteria are to antibiotics.

---

[4]

(b). The scientists also counted how many species of bacteria were resistant to antibiotics and how many species of bacteria were killed by antibiotics.

The scientists found these results.

	Number of different species of bacteria	
	In Lake Bellandur	In Lake Jakkur
Resistant to antibiotics	53	35
Killed by antibiotics	28	37

Which lake has the **highest** levels of antibiotic pollution?

Tick (✓) **one** box.

Lake Bellandur ☐

Lake Jakkur ☐

Explain your answer.

---

[2]

68. The rock pocket mouse is a small grey coloured mouse that lives in Mexico.

These mice are the main food for owls.

Rattlesnakes also feed on these mice.

The mice get most of their food from grass plants.

Scientists want to construct a pyramid of biomass for this food web.

They first need to estimate how many organisms there are in the area.

They decide to do this using sampling.

i. Describe how the scientists would sample an area and ensure that the sample was not biased

---

---

[2]

ii. * To estimate grass cover and the number of animals, they use a quadrat.

Why do scientists use sampling when studying the organisms living in a habitat?

Identify the limitations of this method and potential improvements that could be made to ensure that the estimated population size of plants and animals closely matches the actual value.

---

[6]

69(a). A salt marsh is a large, muddy area of land where a river joins the sea.

Student **A** and student **B** study the plants growing on a salt marsh.

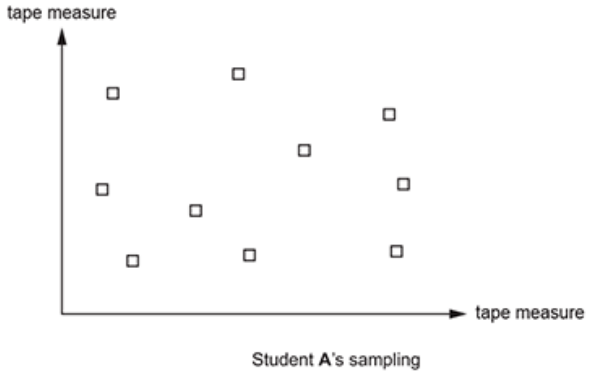
They both sample the plants present by laying out two tape measures at right angles across the salt marsh.

They then place a square frame on the ground in different places and count the number of plants in the square, as shown below.

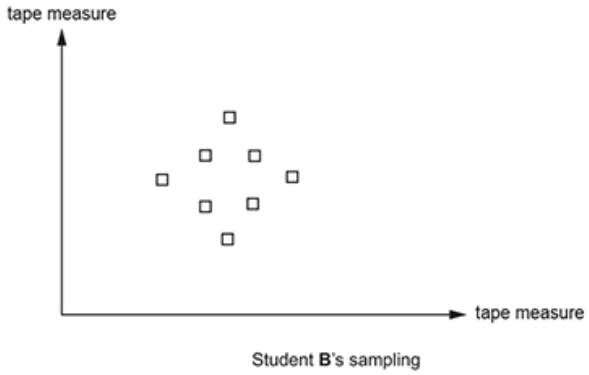
What is the name of the square frame that they use to sample the plants?

[1]

(b). The diagrams show the position of each student's samples across the salt marsh. Each small square in the diagrams represents one sample.



Student **A**'s sampling



Student **B**'s sampling

i. The whole salt marsh has an area of 2500 m^2.

Each square frame has an area of 0.25 m^2.

Calculate the percentage of the whole salt marsh that was sampled by student A.

Percentage = ...

ii. Look at the two students' sampling shown in the diagrams.

Explain which student is likely to get the most accurate estimate for the number of plants in the salt marsh.

student ----------

explanation ----------

---

iii. Their teacher said that they should take care as there may be harmful bacteria in the salt marsh.

State **two** things that the students could do to reduce the risk of infection from the harmful bacteria.

1 _____

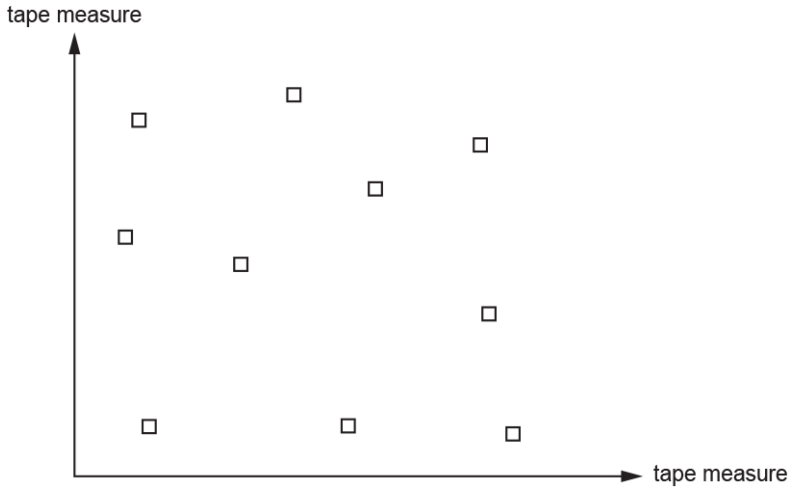
2 _____

70. A salt marsh is a large muddy area of land where a river joins the sea. This is a rare habitat and some plants grow on salt marshes but nowhere else.

A student investigates the plants growing on a salt marsh. He uses a quadrat to sample the plants.

He puts down two long tape measures at right angles to each other across the salt marsh. He then picks numbers at random and uses them to decide where to place a quadrat.

The diagram shows the position of all his quadrats across the salt marsh.



i. The salt marsh measured 50 m x 50 m.

Each quadrat measured 0.5 m x 0.5 m.

Calculate the percentage of the whole salt marsh that was sampled by the student.

Percentage = ... % **[3]**

ii. A second student sampled by placing five quadrats close together in the centre of the salt marsh.

Evaluate the sampling method of the second student compared to the method of the first student.

---

[3]

iii. Suggest **one** factor that the students should consider in a risk assessment for their experiment.

---

[1]

71. The photograph shows a great crested newt.

Great crested newts live in ponds.

Scientists monitor the population of newts in a pond over 5 years.

They do this by collecting a sample of newts swimming in the pond.

Which piece of apparatus would they use to collect the newts?

Put a (ring) around the correct answer.

net
pooter
quadrat
pit fall trap

72. A student estimates the number of snails in a pond. Part of his method involves collecting snails and marking them.

What is the name of the method he is using?

A Aseptic technique
B Capture-recapture
C Percentage increase
D Scaling-up

Your answer

73. A student estimates the number of snails in a pond.

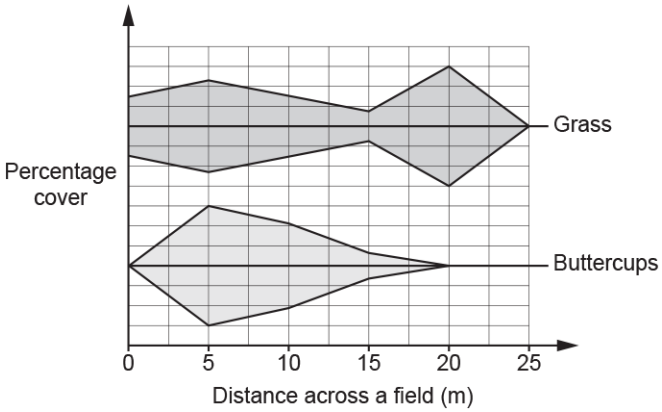
Part of his method involves collecting snails and marking them.

What is the name of the method that he is using?

A Aseptic technique
B Capture-recapture
C Percentage increase
D Scaling-up

Your answer

74. A group of students collected some measurements from a field.
They plotted the measurements on this graph.



Which technique have the students used to collect the data?

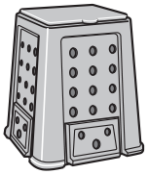
A Capture-recapture
B Random quadrats
C Scaling up
D Transect line with quadrats

Your answer ☐

75. Gardeners use dead plant material to make compost. They add this compost to soil where they are growing plants.

Compost can be made in a composting bin. In the bin **aerobic** bacteria turn dead plant material into compost.

The drawing shows a composting bin.



Explain why the composting bin needs holes in it.

---

[2]

76. Which is a **chemical** defence of plants?

A Antimicrobial substances
B Cell walls
C Leaf cuticles
D Thorns

Your answer

77. There are many different types of microorganisms that live in soil.

The table gives the average number of each type of microorganism in one gram of soil.

Type of microorganism	Average number of microorganisms in one gram of soil
viruses	150 000 000
bacteria	3 000 000
fungi	1 000 000

Lucy knows that bacteria are important in soil.

She wants to find out if the soil in her garden contains the average number of bacteria.

She reads about a way of estimating the number.

It involves taking one gram of soil, mixing it with water and spreading the mixture on an agar plate.

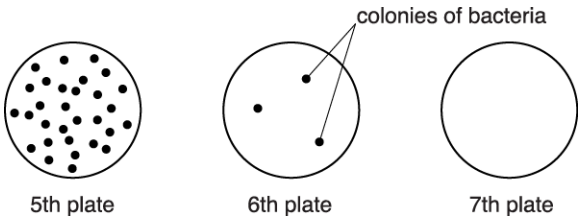
Each single bacterium reproduces many times and makes a colony.

Lucy then makes a series of agar plates by diluting the mixture.

The second plate receives 10 times fewer bacteria than in the soil sample.

The third plate receives 100 times fewer bacteria and so on.

The diagram shows some of her results.



Do the results show that Lucy's soil contains the average number of bacteria?

Use her results and the data in the table to work out your answer.

---

[2]

78. Erythromycin is an antibiotic drug.

i. It is important to get the dose of erythromycin right.

Too much erythromycin can be harmful.

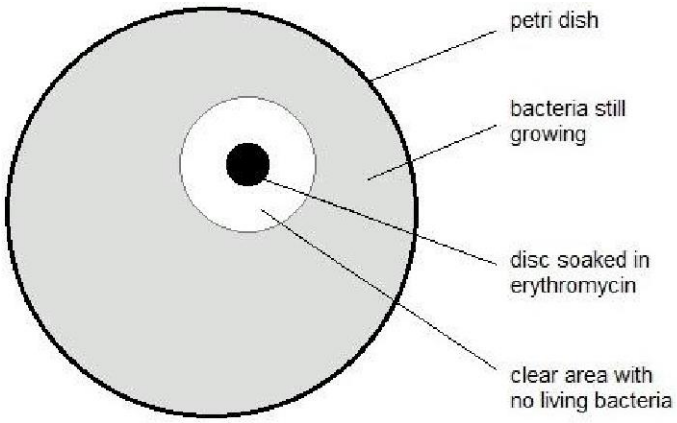
However, recently some strains of bacteria have developed resistance to low concentrations of erythromycin.

To see how effective erythromycin is, it is tested using bacteria grown on agar plates.

This method is used:

- A petri dish is used that has the bacteria growing evenly over the surface.
- A disc of filter paper is soaked in erythromycin.
- The disc is placed on the agar in the centre of the petri dish using sterile forceps.
- The dish is incubated at 37°C.

The diagram shows the actual size of the dish after incubation.



This table is used to analyse the results of the experiment.

Area clear of bacteria including the area of the disc in mm^2	Level of resistance
less than 133	resistant
133 to 416	intermediate resistanc
more than 416	not resistant

Use the results of the experiment and the table to judge the level of resistance in this strain of bacteria. (The area of a circle = Πr^2 and $\Pi = 3.14$.)

answer = ... mm^2

ii. Suggest any limitations to measuring the level of resistance with this method.

---

[2]

79. There are many different types of microorganisms that live in soil.

The table gives the average number of each type of microorganism in one gram of soil.

Type of microorganism	Average number of microorganisms in one gram of soil
viruses	150 000 000
bacteria	3 000 000
fungi	1 000 000

Lucy wants to find out if the soil in her garden contains the average number of bacteria.

She mixes one gram of soil with water.

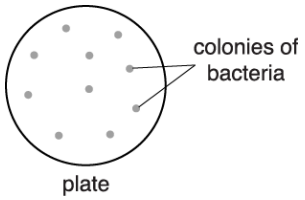
She then **dilutes** this mixture and spreads some on an agar plate.

The mixture in the agar plate contains 100 000 times fewer bacteria than in the soil.

She puts the plate in an incubator.

Each single bacterium reproduces to form a colony.

Here are her results.



Do the results show that Lucy's soil contains the average number of bacteria?

Use the results from the plate and the data in the table to work out your answer.

---

[2]

80. Erythromycin is an antibiotic drug.

It is important to get the dose of erythromycin right.

Too much erythromycin can be harmful.

However, recently some strains of bacteria have developed resistance to low concentrations of erythromycin.

To see how effective erythromycin is, it is tested using bacteria grown on agar plates.

This method is used:

- A petri dish is used that has the bacteria growing evenly over the surface.
- A disc of filter paper is soaked in erythromycin.
- The disc is placed on the agar in the centre of the petri dish using sterile forceps.
- The dish is incubated at 37°C.

i. Why did the scientists incubate the dish at 37°C rather than at higher or lower temperature?

---

[2]

ii. Why is the filter paper disc moved using sterile forceps?

---

[1]

81. Sinusitis is an infection that can be caused by bacteria or viruses.

Sinusitis causes a runny nose and bad headaches.

i. Doctors only give antibiotics to patients with these symptoms if they are sure their illness is caused by bacteria.

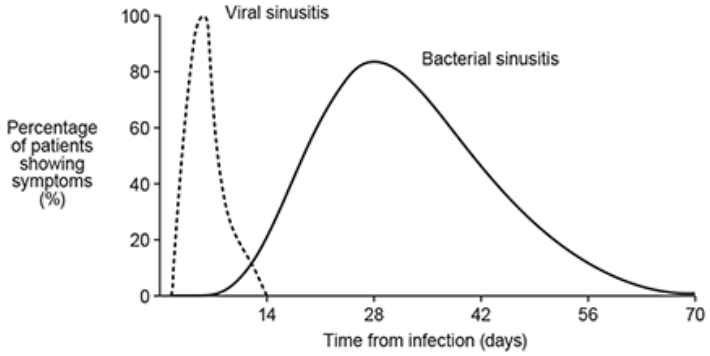
Write down **two** reasons why.

1

2

---

ii. Look at the graph. It shows the length of time that patients show symptoms of sinusitis.



Doctors usually wait 14 days after infection before giving patients antibiotics for sinusitis.

Use the graph to explain why.

---

82. Gardeners often turn dead plant material from their garden into compost. They then add this compost to the soil where they are growing plants.

Why do gardeners add compost to their soil?

Tick (✓) **one** box.

Bacteria in the compost kill disease causing fungi.

The compost is sterile and so is aseptic.

The compost provides carbon dioxide for photosynthesis.

The compost provides minerals for the plants.

END OF QUESTION PAPER