Candidate Marks Report

Series : 6 2018

This candidate's script has been assessed using On-Screen Marking. The marks are therefore not shown on the script itself, but are summarised in the table below.

Centre No :		Assessment Code :	J257
Candidate No :		Component Code :	03
Candidate Name :			

Total Marks : **35 / 90**

In the table below 'Total Mark' records the mark scored by this candidate.
'Max Mark' records the Maximum Mark available for the question.

Paper:	**J257/03**
Paper Total:	**35 / 90**

Question	Total Mark / Max Mark
1ai	2 / 2
1aii	1 / 1
1bi	1 / 1
1bii	1 / 1
1ci	1 / 2
1cii	2 / 2
1ciii	1 / 1
1civ	2 / 2
2a	0 / 4
2b	0 / 2
3ai	1 / 2
3aii	1 / 1
3aiii	0 / 1
3b	0 / 2
3ci	1 / 1
3cii	1 / 1
3ciii	1 / 1
4ai	0 / 1
4aii	0 / 2
4aiii	1 / 4
4b	0 / 2
4c	0 / 2
4d	0 / 1
5ai	1 / 2
5aii	1 / 1
5aiii	2 / 2
5aiv	1 / 1
5bi	1 / 1
5bii	2 / 2
5biii	0 / 1
5biv	0 / 3

5ci	1 / 4
5cii	0 / 2
5ciii	0 / 1
5d	0 / 3
6ai	0 / 2
6aii	0 / 2
6bi	1 / 3
6bii	1 / 3
6biii	0 / 1
6biv	0 / 3
7ai	3 / 3
7aii	2 / 2
7b	0 / 1
8a	2 / 4
8b	0 / 2
8c	0 / 2

Answer **all** the questions.

1 The Galapagos Islands are a group of 13 islands found in the Pacific Ocean.

(a) Charles Darwin visited the Galapagos Islands during the 19th century.

He collected samples and made observations.

This work helped Darwin to develop a new explanation for the evolution of species.

(i) Which of the following are observations made by Darwin?

Tick (✓) **two** boxes.

There are differences between fossils and living examples of similar organisms.	☑
Pea plants with red flowers can produce offspring with white flowers.	☐
There is usually extensive variation within a population of a species.	☐
Some bacteria have become resistant to antibiotics.	☐
Isolated populations of the same species living in different places have different characteristics.	☑

[2]

(ii) Darwin suggested a theory to explain his observations.

Write down the name of the theory he suggested.

Natural Selection [1]

(b) Algae live in the marine environment around the Galapagos Islands.

Photosynthesis takes place in the cells of algae.

(i) In which cell structure does photosynthesis take place?

Chloroplasts [1]

(ii) Many factors can limit the rate of photosynthesis.

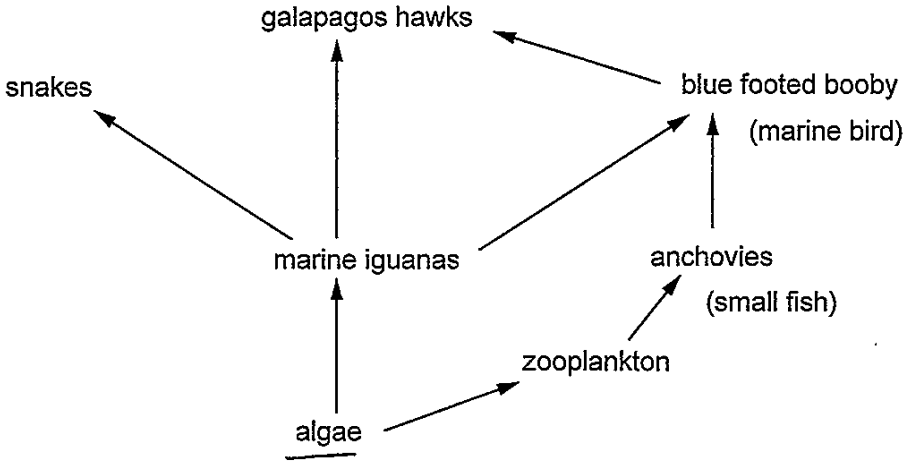
Which factor will **not** limit the rate of photosynthesis in the algae?

Put a (ring) around the correct answer.

carbon dioxide concentration **light intensity** **temperature** **(water availability)**

[1]

(c) The food web shows the feeding relationships of some Galapagos Islands species.



(i) A weather event called El Niño occurs every three years. This causes the population of algae to decrease.

Explain what effect this could have on the population of marine iguanas.

The marine iguanas' population will decrease since they are getting eaten by blue footed boobys and also have nothing themselves to eat. **[2]**

Scientists have discovered that during this event the marine iguanas can shrink in size.

(ii) The length of the marine iguana is determined by measuring the distance from the snout to the end of the tail.

Below is a drawing of a marine iguana.

Use the scale bar to calculate the actual length of this marine iguana in metres.

÷100

150cm → 1.5

Length of marine iguana = ... 1.5 ..... m **[2]**

(iii) Some marine iguanas can shrink by up to 20% of their original length.

Calculate the length of this marine iguana after maximum shrinkage.

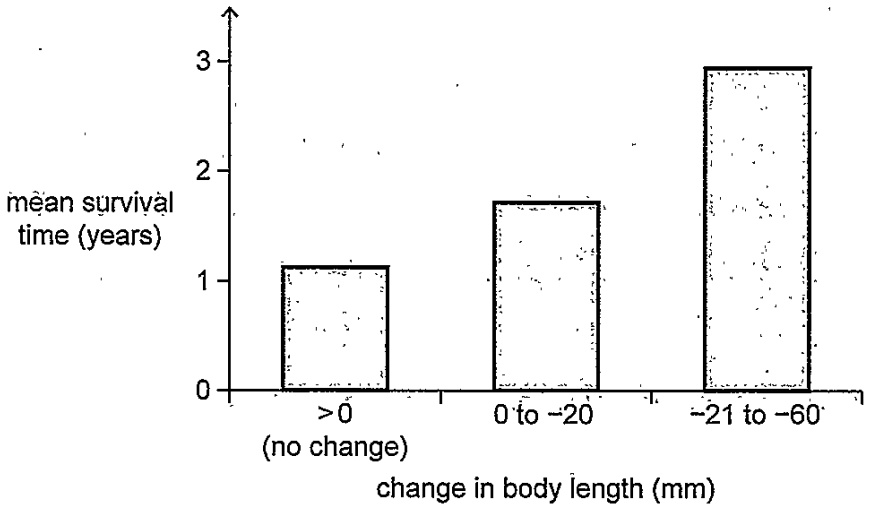
1.5 0.3

1.5 − 0.3 = 1.2

Length after maximum shrinkage = ... 1.2 ..... m **[1]**

Scientists calculated the change in body length of the iguanas and measured how long they survived during the El Niño event.

The results are shown in the graph.



(iv) What can be concluded from the data?

Tick (✓) **two** boxes.

- The marine iguanas that decreased in size the least survived longer. ☐
- The change in body length made no difference to the survival time of the marine iguanas. ☐
- The marine iguanas that decreased in size the most on average lived for a greater length of time. ☑
- The marine iguanas that did not decrease in size survived for approximately 2 years less than the marine iguanas that decreased in size by up to 60 mm. ☑
- The marine iguanas that decreased in size by 20 mm survived more than double the length of time than those that did not change in size. ☐

[2]

2 A student is carrying out a field investigation to determine the population of woodlice in the school's wildlife garden.

(a) Describe a method the student could use to determine the population size of woodlice.

They should use a poster to count how many woodlice are in a specific area. The areas used should be picked randomly using a computer generator for co-ordinates.

[1]

(b) Woodlice are often found under logs and bark where it is damp.

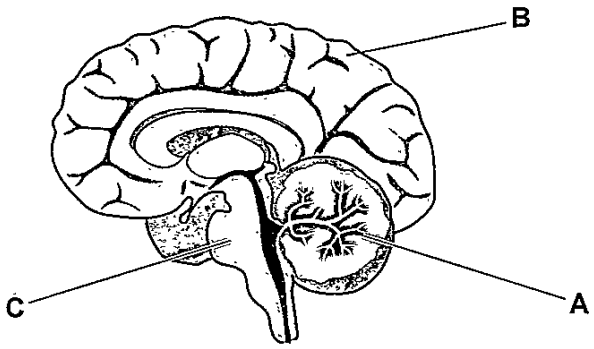
Suggest why woodlice prefer damp places.

Woodlice may prefer damp places since they are adapted to those areas due to evolution and natural selection.

[2]

3 Different areas of the brain are responsible for different functions.

Three areas have been labelled **A**, **B** and **C** on the diagram of the brain.



(a) (i) The table describes the functions of areas **A**, **B** and **C**.

Complete the table by writing the correct area of the brain for each function.

Area of the brain	Function
B	Responsible for conscious movement.
A	Responsible for intelligence, memory, consciousness and language.
C	Responsible for the regulation of heart rate and breathing rate.

[2]

(ii) Scientists want to find out more about the functions of the brain. One way they can do this is to use patients with brain damage.

Suggest why there are concerns about using patients with brain damage.

They cannot give consent as ~~they~~ their brain isn't functioning correctly. [1]

(iii) Write down **one other** way scientists could study the brain.

Electrical rods NBOD [1]

(b) The cerebral cortex is a highly folded area of the brain made up of billions of neurons.

Describe the features of a neuron that allow it to transmit electrical impulses quickly and over long distances.

Neurons travel quicker than hormones since theyre are electrical impulses.

[2]

(c) Parkinson's disease is a disease of the central nervous system.

It is caused by the loss of neurons in one part of the brain. These neurons are responsible for producing a transmitter substance called dopamine.

(i) Dopamine acts as a transmitter substance in parts of the brain and nervous system that control movement.

Which neurons are most likely to be affected by Parkinson's disease?

Tick (✓) **one** box.

Relay neurons only.	☐
Relay and motor neurons.	☑
Sensory neurons only.	☐
Sensory and motor neurons.	☐

[1]

(ii) At a synapse, transmitter substances are released from the first neuron.

Which word describes how the transmitter substances move across the gap from the first neuron to the second neuron?

Tick (✓) **one** box.

Active transport	☐
Diffusion	☑
Net movement	☐
Osmosis	☐

[1]

(iii) Scientists have been investigating the use of stem cells in the treatment of Parkinson's disease.

Suggest **one** feature of stem cells that makes them useful in the treatment of Parkinson's disease.

They can become specilized.

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

4 Plants respond to their environment.

(a) (i) What term is used to describe a plant's growth response to light?

Trophism [1]

(ii) The growth response to light can be explained by the distribution of the plant hormone auxin in the plant shoot.

Jamal finds three diagrams that could explain what happens in the plant shoot.

Key

← direction of light

• auxin

Diagram **A**

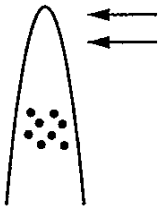


Diagram **B**

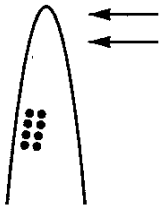
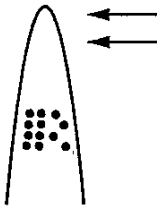


Diagram **C**



Which diagram, **A**, **B** or **C**, best explains what happens to make the plant shoot grow towards the light?

Explain your choice.

Diagram B

Explanation The auxin line up along the opposite side to the light so they can elongate in order for the plant to then bend towards the light [2]

(iii) Jamal's teacher gives him two boxes of cress seedlings, each box contains ten seedlings.

Describe an experiment Jamal could do to investigate the growth response to light in the cress seedlings.

Jamal should place one box next to the light and one in a dark place. He should treat both plants the same other than the amount of light each plant gets. Every week, he should check on his cress to see compare what he sees within both plants.

[4]

(b) A gardener is growing fruit. He wants to ripen his fruit quickly and decides to use the plant hormone gibberellin.

Do you agree with his choice of hormone?

Explain your answer.

I agree with his choice of hormone since it will stimulate ripening.

[2]

(c) Plants can be infected by communicable diseases, so they need to protect themselves against pathogens.

Describe **one** chemical defence and **one** physical defence that plants have against pathogens.

Chemical defence Sprayed with pesticide.

Physical defence waxy layer on leaves

[2]

(d) State the function of stomata in plants.

To allow water in and out of the plant [1]

5 Cancer is a non-communicable disease.

(a) (i) Describe what causes cancer.

Cancer is caused by mitosis which is the dividing of cells to produce 2 identical cells. In this case, harmful tumour cells undergo mitosis. [3]

(ii) Identify **one** factor that could increase a person's risk of developing cancer.

Obesity ..... [1]

(iii) In the past it has been estimated that 1 in 3 people will develop cancer in their lifetime.

Recent estimates suggest the ratio is 1 in 2.

The UK population is 65 640 000.

If the **recent estimate** is correct, how many people can be expected to develop cancer?

Give your answer to 2 significant figures.

$\frac{65\,640\,000}{2} = 32\,820\,000$

Number of people = 33000000 [2]

(iv) Suggest why the figure calculated in **(a)(iii)** will be an estimation.

Since the ratio is an estimate ..... [1]

(b) Cancer of the ovaries is a common type of cancer. Most women diagnosed with cancer of the ovaries will have an operation to remove their ovaries.

(i) Before the operation, the doctor will discuss the risks of the operation with the patient. This is a high risk operation.

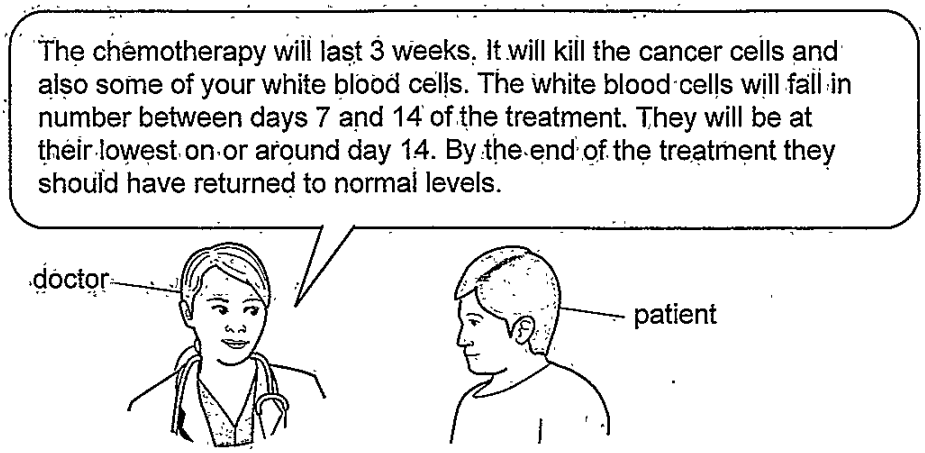
Suggest why a patient would decide to go ahead with this operation.

Ovian cancer can kill you and is more likely to than the operation ..... [1]

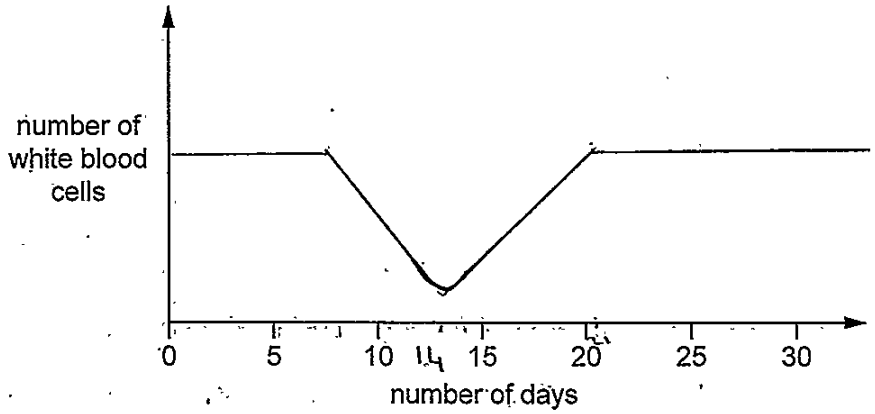
After surgery, the patient may have chemotherapy to kill any remaining cancer cells.

Chemotherapy also kills white blood cells.

A doctor describes this effect to the patient.



(ii) Draw a line graph on the axes below to show what happens to the number of white blood cells during each cycle of chemotherapy.



[1]

(iii) During the chemotherapy treatment, the patient is advised to seek urgent medical attention if they become ill and have a raised temperature.

Suggest between which days the patient is most at risk of becoming ill.
Use data from the graph in your answer.

5 - 7 + 21

..... [1]

(iv) Why is a high temperature in the human body a problem?

A high temperature in the human body means that the kidneys must produce small amounts of ~~the~~ concentrated urine in order to keep the body hydrated. It also means that the hypothalamous must begin to maintain the bodys internal ~~env~~ environment. [3]

(c) New drugs and treatments have to go through rigorous clinical trials.

A clinical trial was conducted to see if using a particular combination of chemotherapy drugs increased survival rates for a type of cancer of the ovaries.

The two drug combinations being tested were:

- drugs 1 and 2
- drugs 3 and 4.

(i) The table shows some details of the clinical trial design.

Use your knowledge of clinical trials to justify each part of the design.

Design	Justification
Only women took part in the trial.	men do not get overian cancer
All women who took part in the trial had ovarian cancer.	No need to give it to women who don't
A placebo was not used.	Cancer isn't a pathogen it is caused by uncontrolable cells.
An open trial was conducted.	Benefits everyone.

[4]

The results of the trial are shown in the table.

	Group A (Drugs 1 and 2)	Group B (Drugs 3 and 4)
Number of women who took part in the trial.	**305**	**314**
Number of women who were still alive two years after treatment.	**247**	**222**
Most severe side effects.	• A drop in total blood cell number • Nerve damage • Joint pain	• Loss of appetite • Diarrhoea • Feeling or being sick • High temperature • Low white blood cell number

(ii) Use the information in the table to recommend which drug combination the doctors should use.

Justify your decision.

Group A: This combination saw the least people dying after two years. The side effects are more concerning for B since it would be hard to fight against illness and could become dehydrated.

(iii) Explain why scientists should communicate findings such as these to a range of audiences.

In order to get an opinion from the public. **[1]**

(d) Scientists have been developing the use of monoclonal antibodies in cancer treatment.

Monoclonal antibodies specific to a cancer cell antigen are produced and are injected into the blood of a cancer patient.

Describe how monoclonal antibodies are used to treat cancer.

The antibodies are injected into the cancer patient then begin to attach to the specific ^ antigen. Many antibodies are injected making it easier to destroy all of the antigens to stop them from reproducing **[3]**

6 The female mosquito *Aedes aegypti* is responsible for the transmission of diseases such as Zika virus.

In May 2015, Zika virus was reported in Brazil and began to spread rapidly.

The mosquito feeds mainly on human blood. The virus is spread when a female *Aedes aegypti* mosquito bites an infected human and then bites an uninfected human.

(a) Zika virus is a communicable disease.

Visitors to Brazil in 2016 were concerned that they could become infected with the virus.

There is no vaccination for this virus.

(i) Explain what a communicable disease is and suggest how a visitor to Brazil could reduce the risk of becoming infected with Zika.

A communicable disease is a disease that can be passed on. Visitors should avoid contact with infected people and objects and should avoid drinking unboiled water. [2]

(ii) The first ever human case of Zika was discovered in Nigeria in 1954. The timeline below shows how Zika spread.

1954 Nigeria → 1977–78 Pakistan, Malaysia, Indonesia → 2007 Micronesia → 2013 French Polynesia → 2015 Brazil

The Zika virus can also be transmitted by sexual intercourse.

People were concerned that hosting the Olympic games in Brazil in 2016 would increase the spread of the virus to other countries.

Suggest how the virus could be spread to other countries **and** how this could be prevented.

People visiting would be in contact with contaminated things and would arrive back at home with the ~~disease~~ disease and would be able to spread it. [2]

(b) (i) The mosquito responsible for the spread of Zika has become resistant to some of the insecticides used to kill it.

Explain how a population of mosquitos could have become resistant to an insecticide.

The mosquito could have had a genetic mutation which meant that they became resistant to the insecticide. Survival of the fittest (natural selection) would then occur which means only mosquitos resistant to repellent would be able to reproduce. [3]

(ii) One way scientists tried to solve the problem was to make genetically engineered mosquitoes that had a 'kill switch' gene. This gene caused the mosquitoes' offspring to die.

Describe the steps a scientist would use when genetically engineering a mosquito to have the 'kill switch' gene.

firstly, the scientist would isolate the gene that they wished to remove and find desired characteristic. They would then cut the gene using a restricting enzyme and would insert the desired gene. [3]

(iii) The 'kill switch' gene codes for the production of a protein called tTAV.

The tTAV protein blocks the transcription of other genes essential for mosquito survival.

When breeding the mosquitos in the laboratory a chemical called tetracycline is used. Tetracycline binds to the tTAV protein and deactivates it.

Suggest why scientists use tetracycline when breeding the genetically engineered mosquitos.

In order for the mosquito to survive [1]

(iv) Scientists thought using genetically engineered mosquitos was a better solution than using insecticide.

Do you agree?

Explain your reasons.

I ~~disagree~~ agree since the genetically engineered mosquitoes won't become resistant to anything and therefore will stop the spreading unlike using insecticide which the mosquitoes can become resistant to. [3]

7 A gene affects whether people have dimples in their cheeks. There are different variants of this gene.

An individual with the dominant variant, D, of this gene will have dimples.

(a) Jack and his wife Nina both have dimples.

Their daughter Mia does not have dimples.

(i) Complete the table to show the genotype of each individual.

Individual	Genotype
Jack	Dd
Nina	Dd
Mia	dd

[3]

(ii) Jack and Nina decide to have another child.

What is the probability that the second child will have dimples?

Use the Punnett square to show your working.

	D	d
D	Dd	Dd
d	Dd	dd

Probability that the child will have dimples = 3/4

(b) Scientists consider this trait an 'irregular' dominant trait. This is because sometimes a person can have dimples but their children do not.

What could be responsible for this difference?

The recessive gene Alleles

[1]

8 Amaya reads an article in a magazine which explains that genes code for the production of a taste receptor on the tongue.

Taste receptors are proteins.

(a) Complete the sentences to describe how a protein is made.

Use words from the list.

Each word can be used once, more than once, or not at all.

~~amino acids~~ ~~bases~~ ~~DNA~~ **fatty acids** **gene**

~~genetic variant~~ **mitochondrion** **mRNA** **protein** ~~ribosome~~

A copy of the bases is made from DNA.

This molecule travels to a ribosome in the cytoplasm.

Here amino acids are joined together to form a protein.

A mutation would create a genetic variant and therefore a different receptor.

[4]

(b) Scientists think that a mutation created the type of receptor that allows someone to taste a bitter substance.

Explain how a mutation could affect the structure of the receptor protein.

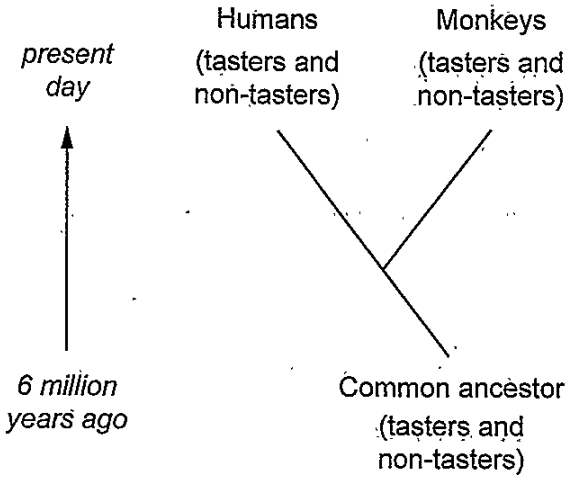
The ~~bases~~ ~~ribosom~~ ribosome would read the mutation and would produce the corrosponding amino acid that then codes for a protein that allows people to taste bitter substances.

[2]

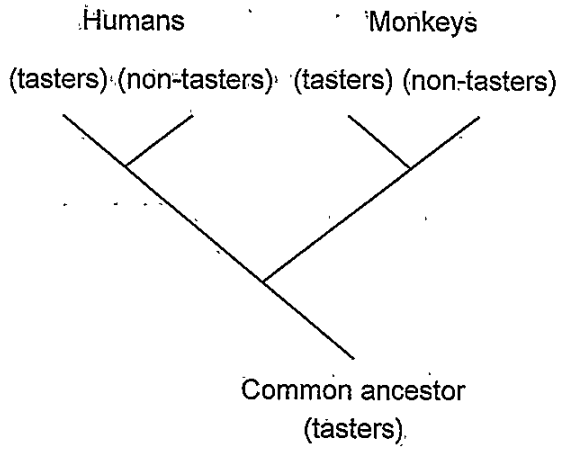
(c) Monkeys also have different variants of the gene that affects how they taste bitterness.

Scientists have proposed two explanations for how the non-tasting variants could have evolved in humans and monkeys.

Explanation 1



Explanation 2



Scientists have discovered that the non-tasting variants in humans and monkeys have different DNA sequences, even though they have the same effect.

Which explanation of how they evolved is most likely to be correct?

Explain your answer.

Explanation 2: The tasters and non-tasters come from ~~the~~ ~~same~~ different DNA ~~as well as~~ since it is a different code.

..... [2]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

SEEN

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