

- (a) Suggest **two** reasons why carbon dioxide emissions from paper production decreased from 2006 to 2015.

1 _____

2 _____

(2)

- (b) Suggest **two** reasons why carbon dioxide emissions from electricity production decreased from 2012 to 2015.

1 _____

2 _____

(2)

- (c) Calculate the percentage of the total carbon dioxide emissions in 2006 that was from electricity production.

Percentage = _____%

(2)

- (d) Explain the possible consequences of a future increase in carbon dioxide emissions.

(6)
(Total 12 marks)

Q3.

Many biotic and abiotic factors can affect the growth of plants.

(a) Are the factors in **Table 1** biotic or abiotic?

Tick **one** box for each factor.

Table 1

Factor	Biotic	Abiotic
Diseases		
Herbivores		
Temperature		
Water		

(2)

Two students investigated the effect of light intensity on the distribution of small plants.

The plants are growing under a tree in a park.

The students made the following hypothesis:

‘As you move outwards from a tree there will be more plant growth.’

(b) Explain why the students thought their hypothesis would be correct.

(3)

(c) The students used two pieces of equipment.

Give the scientific name of each piece of equipment.

A square frame measuring 0.5 m × 0.5 m _____

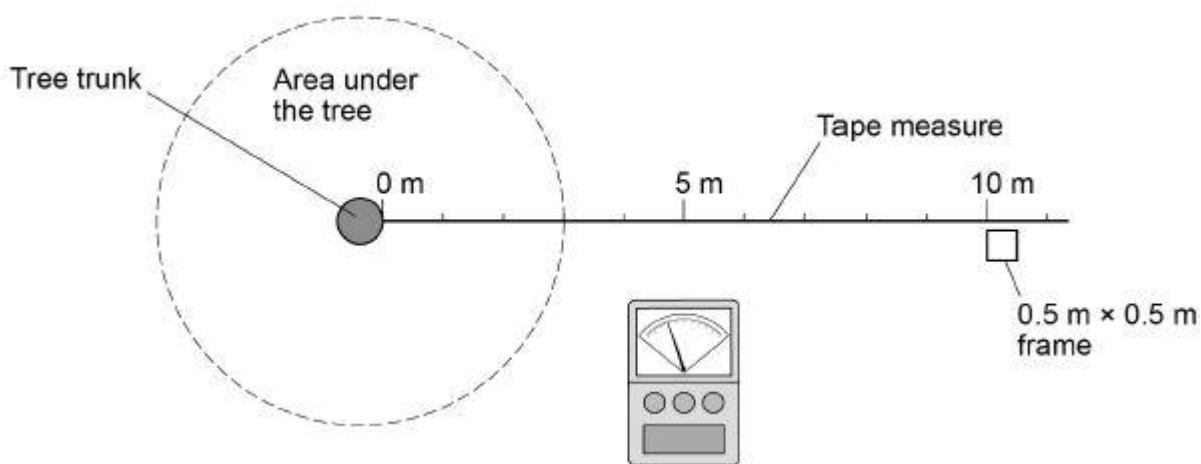
An electronic device to measure light intensity _____

(2)

This is the method used.

1. Fix one end of a tape measure at the base of the tree.
2. Fix the other end of the tape measure 11 metres from the tree.
3. At 0 metres put the square frame on the ground.
4. Identify all the plant species growing inside the frame.
5. Estimate and record the percentage cover of each plant species.
6. Measure the light intensity inside the frame.
7. Put the square frame on the ground every 2 metres along the tape to 10 metres.
8. Repeat steps 4 – 6 in every frame.

The diagram below shows the equipment in this investigation.



(d) Calculate the total area sampled.

Total area sampled = _____ m²

(1)

(e) The whole investigation was done as quickly as possible on the same day.

Suggest **one** reason why.

_____ (1)

(f) Give **one** way the investigation could be improved.

 _____ (1)

Table 2 shows the results.

Table 2

	Distance from tree in metres					
	0	2	4	6	8	10
Percentage cover of grass	15	50	35	16	15	15
Percentage cover of plantain	0	5	10	40	25	30
Percentage cover of daisy	0	0	0	4	20	10
Percentage cover of clover	1	10	25	40	40	45
Total percentage cover of plants	16	65	70	100	100	100
Light intensity in arbitrary units	37	59	150	175	>200	>200

(g) Which plant species in **Table 2** will only grow at high light intensity?

_____ (1)

(h) What conclusion can be made about the relationship between light intensity and the total percentage cover of plants?

Use data from **Table 2** in your answer.

 _____ (2)

(i) Light intensity might **not** be the cause of this pattern of plant distribution.

Suggest **one** different factor that may cause these results.

Give **one** reason for your answer.

Factor _____

Reason _____

(2)

(Total 15 marks)

Q4.

Read the following.

In the 1950s farmers in India could not grow enough rice to feed the rapidly increasing population.
At the International Rice Research Institute (IRRI) scientists began a selective breeding programme with 10 000 different varieties of rice plants.
In 1966 the IRRI produced a new variety called IR8 which gave a yield of up to ten times the traditional varieties. IR8 has short stems and large rice grains.
IR8 was grown by farmers all over India so people had enough to eat.

- (a) The IR8 variety of rice was produced by selective breeding.

Describe the steps the scientists would have taken to produce IR8

(4)

- (b) The IRRI has now developed several new varieties of genetically modified (GM) rice plants.

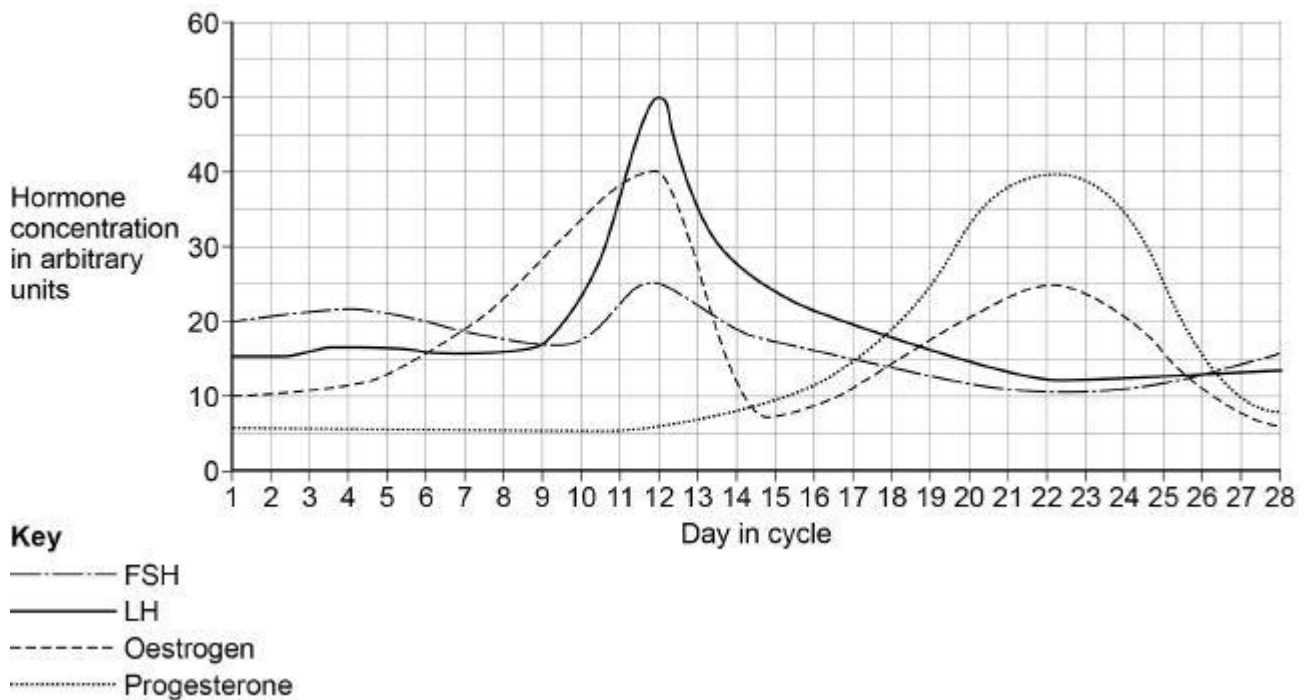
Some people in India agree and some people disagree with GM varieties of rice being grown.

Explain why.

(4)
(Total 8 marks)

Q5.

The graph below shows how hormone concentrations vary during a normal human menstrual cycle if a woman does not become pregnant.



- (a) Calculate the rate of increase in LH concentration between day 9 and day 12
- Give your answer in arbitrary units per hour.
- Give your answer to 2 significant figures.

(a) Which arrangement of chromosomes will a male oyster have in each body cell?

Tick **one** box.

One X and one Y chromosome and 8 pairs of other chromosomes	<input type="checkbox"/>
Two X and two Y chromosomes and 8 pairs of other chromosomes	<input type="checkbox"/>
One X and one Y chromosome and 9 pairs of other chromosomes	<input type="checkbox"/>
Two X chromosomes and 9 pairs of other chromosomes	<input type="checkbox"/>

(1)

(b) Oyster gametes only contain half the amount of DNA compared to a normal oyster body cell.

Describe the type of cell division that produces gametes.

(3)

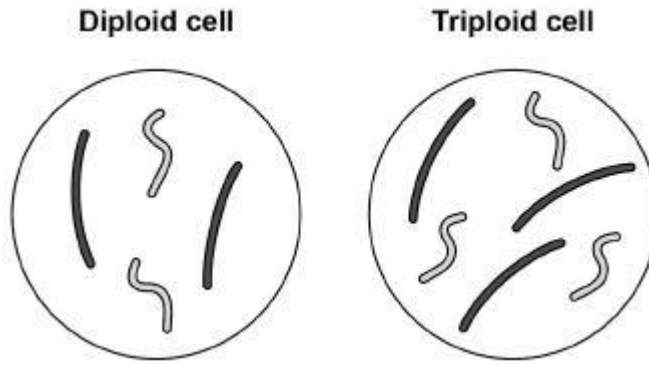
Biologists have discovered a way to produce oysters that have three sets of chromosomes (triploid) instead of the usual two sets (diploid).

The triploid oysters cannot reproduce and so they grow more quickly.

Diploid oysters do not taste good in the reproductive season. Triploid oysters taste good all year.

The diagram below shows the chromosomes in a diploid cell and in a triploid cell.

Only two sets of chromosomes are shown.



(c) Suggest why the triploid oysters are **not** able to reproduce.

(1)

(d) Explain why the triploid oysters grow more quickly than the diploid oysters.

(2)

(e) The population of diploid oysters growing in the wild has reduced by over 80% in the last 20 years.

Suggest **two** environmental factors which may be causing this reduction.

Give a reason why each factor may be causing the reduction in the population.

1. _____

2. _____

(2)

(f) Oyster farmers grow the triploid oysters from young seed oysters.

7	4
8	1
9	1
10	1

- (a) Complete the following calculation to estimate the number of plantain plants in the field.

Use the students' results from the table above.

Total number of plantains in 10 quadrats = _____

Total area of 10 quadrats = _____ m²

Mean number of plantains per m² = _____

Area of field = _____ m²

Therefore estimated number of plantains in field = _____

(3)

- (b) The students' method would **not** give a valid estimate of the number of plantain plants in the field.

Describe **three** improvements you could make to the students' method.

For each improvement, give the reason why your method would produce more valid results than the students' method.

Improvement 1 _____

Reason _____

Improvement 2 _____

Reason _____

Improvement 3 _____

Reason _____

(3)

(Total 6 marks)