

Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

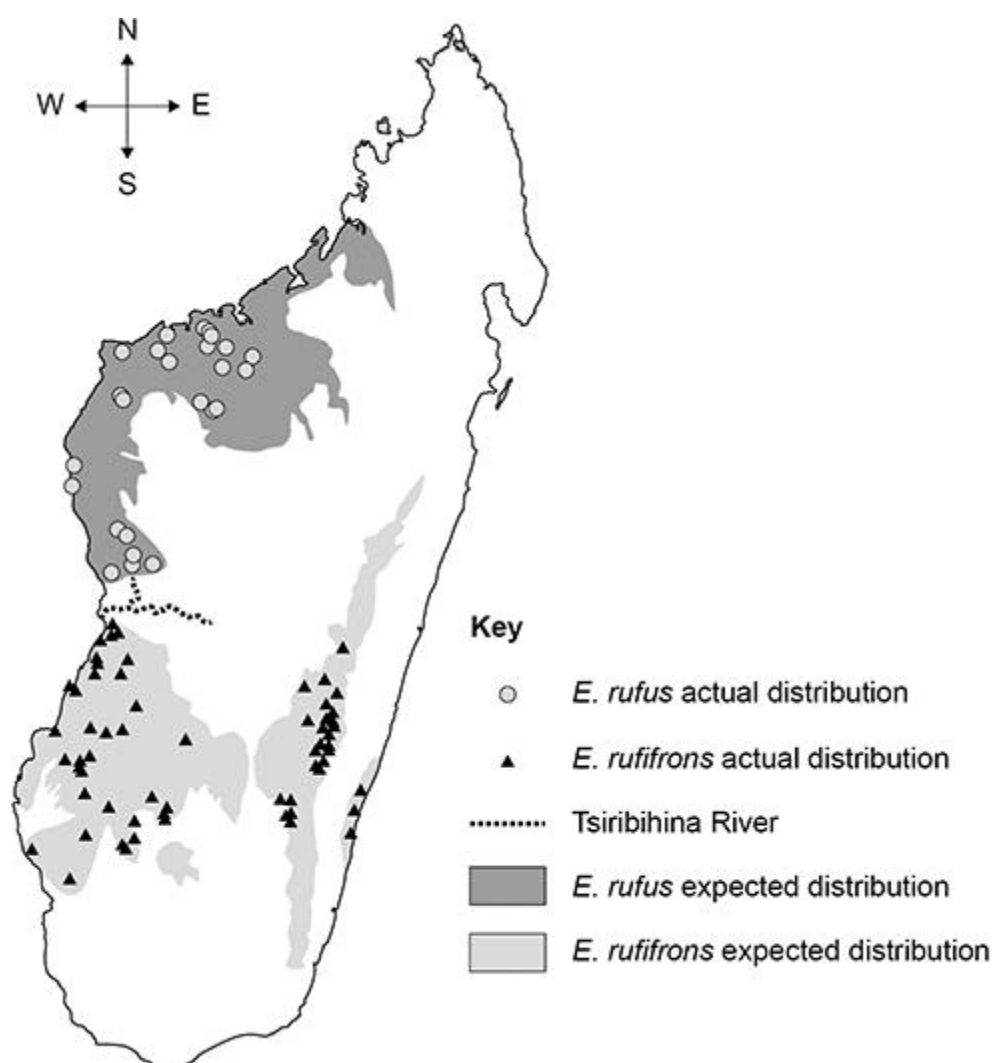
Q1.

Lemurs are small mammals. Lemurs live in trees and feed on leaves and fruit.

Scientists used a computer program to predict the expected distribution of two species of lemur, *Eulemur rufus* and *Eulemur rufifrons*, on the island of Madagascar. These predictions were based on the environmental needs of each species.

Then, the scientists determined the actual distribution of these two species of lemur on the island of Madagascar.

The diagram below shows the scientists' results.



- (a) Using the diagram above, give **three** conclusions you can make about the distribution of these lemur species.

1 _____

2 _____

3

- [illegible]

- (d) Using the information provided, calculate how many lemurs in the second sample were marked.

Answer _____ (1)
(Total 10 marks)

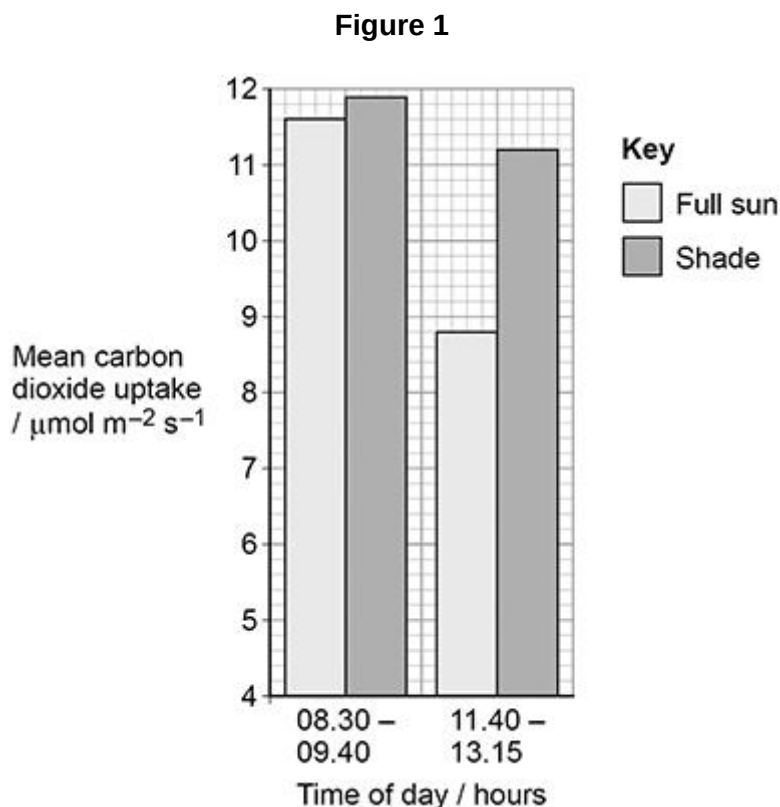
Q2.

Scientists investigated the effect of full sun and shade on the rate of photosynthesis in a species of shade-tolerant tree.

To estimate the rate of photosynthesis, the scientists measured uptake of carbon dioxide by trees in a forest. They measured uptake of carbon dioxide during two parts of the day:

- 08.30 – 09.40 hours
- 11.40 – 13.15 hours.

Figure 1 shows the scientists' results.



- (a) Calculate the total uptake of carbon dioxide between 11.40 and 13.15 hours in trees exposed to full sun in a forest that is 12 000 m^2 in area.

Give your answer in standard form. Show your working.

Answer _____ μmol

(3)

- (b) **Figure 1** shows there is a small difference in the mean uptake of carbon dioxide between 08.30 and 09.40 hours by trees in full sun and by trees in the shade. When the scientists performed a statistical test on these data, they calculated $P > 0.5$

State what this P value tells you about this difference.

Explain your answer using the words **probability** and **chance**.

(2)

- (c) In this species of tree, very high light intensities can inhibit the release of electrons from chlorophyll.

Suggest how this could explain the results shown in **Figure 1** for 11.40 to 13.15 hours.

(4)

Tomato plants grow best in high light intensities. To increase the yield of tomato plants, a farmer uses LED lightbulbs to provide additional light.

The increase in dry mass (D) produced when using additional light can be calculated using this equation.

$$D = \frac{L}{0.4F}$$

Where

L = light used in photosynthesis

F = GPP to NPP conversion factor for tomato plants

The table below shows some of these values for LED lightbulbs.

L / MJ m ⁻² h ⁻¹	F / MJ kg ⁻¹
2.87 × 10 ⁻²	20

- (d) Use the equation and the table to calculate the increase in dry mass produced when using LED lightbulbs.

Give your answer in standard form **and** give the units.

Answer _____ Units _____

(2)

- (e) Mature leaves from slow-growing, shade-tolerant plants produce poisonous chemicals that are a defence against being eaten by herbivores.

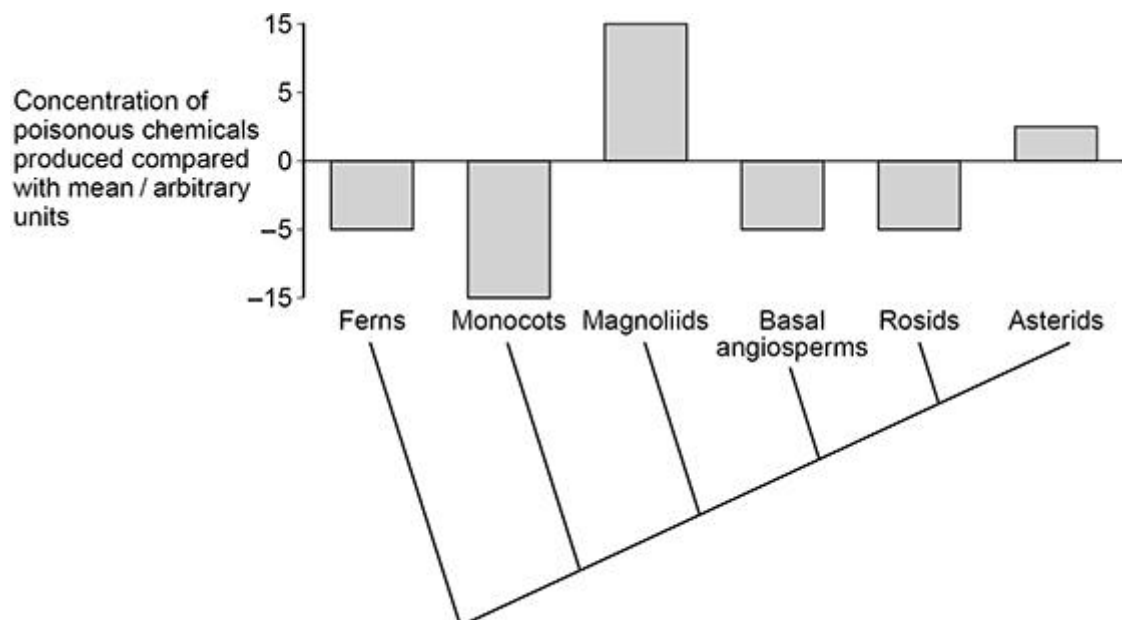
Suggest how this benefits slow-growing, shade-tolerant plants.

(2)

Scientists measured the concentration of poisonous chemicals produced by shade-tolerant plant species in six taxa. They compared this with the mean concentration of poisonous chemicals produced by all plants and the phylogenetic relationships between the six taxa.

Figure 2 shows the scientists' results.

Figure 2



(f) A journalist published the following summary of these results.

‘The more recently a shade-tolerant plant species evolved, the greater the concentration of poisonous chemicals it produces.’

Do the data in **Figure 2** support this summary? Justify your answer.

(2)
(Total 15 marks)