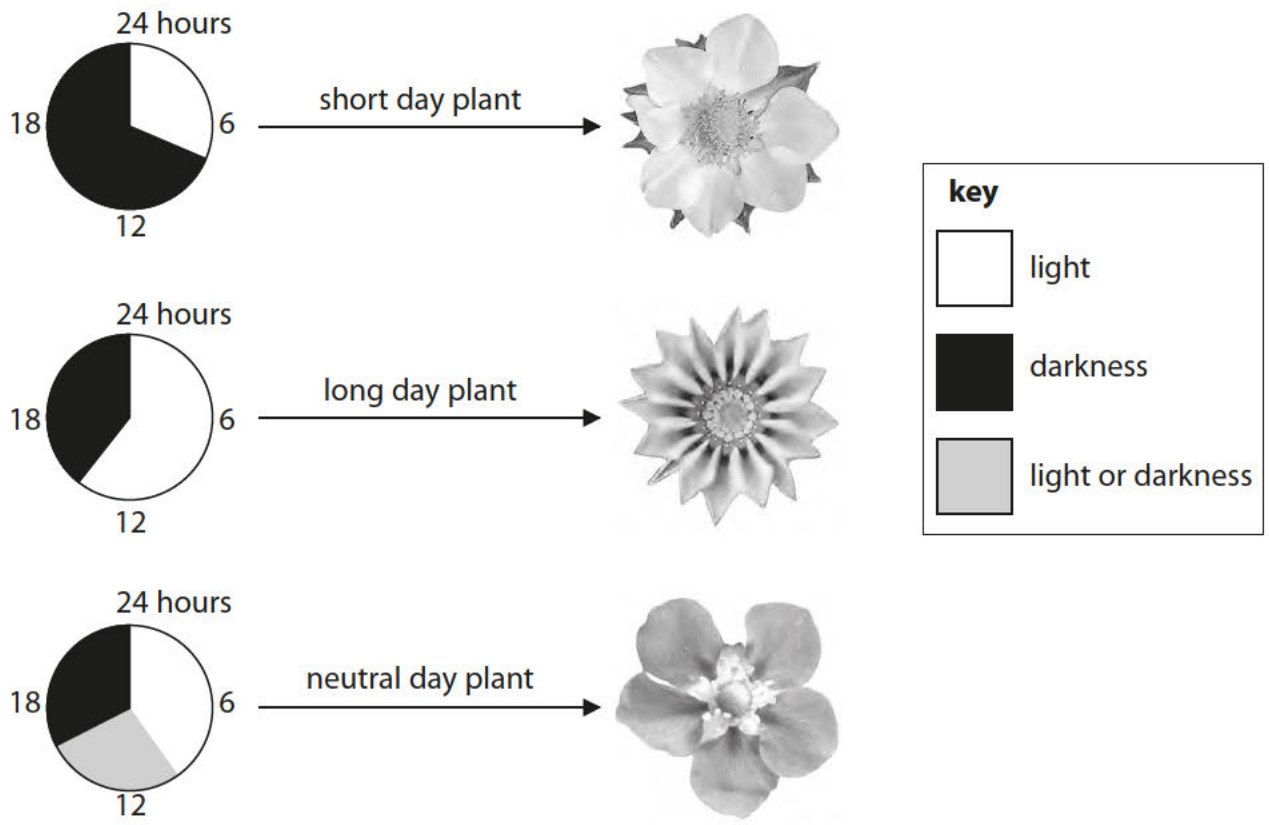
1 The diagram shows the number of hours of darkness and light needed for flowering in three different plant groups.



(a) (i) State the number of hours of darkness needed for a long day plant to flower.

(1)

..... hours

(ii) A gardener has 500 short day plants.

85% of these plants flowered in March.

Calculate the number of plants flowering in March.

(2)

..... plants

(iii) Suggest a benefit to a plant of being day neutral.

(1)

.....

.....

(iv) Complete the sentence by putting a cross (☒) in the box next to your answer.

Plants flowering in response to the number of hours of darkness and light is an example of

(1)

☐ **A** circadian rhythms

☐ **B** germination

☐ **C** photoperiodism

☐ **D** phototropism

(b) (i) The leaves of some species of bamboo plants contain the poison cyanide.

Suggest how these bamboo plants benefit from having poisonous leaves.

(1)

.....

.....

(ii) The photograph shows a greater bamboo lemur.



The greater bamboo lemur is adapted to tolerate cyanide.

This means that it can eat bamboo leaves containing cyanide.

Explain how the co-evolution of bamboo plants and the greater bamboo lemur could have occurred.

(2)

.....

.....

.....

.....

.....

.....

(c) Two ethologists, Bergey and Patel, studied the call types used in communication between greater bamboo lemurs.

The table is a summary of their findings.

call types	behaviour
agitated calls	aggression
bahh calls	submission
breath out calls	aggression
contact calls	submission and aggression
purr calls	friendship and resting
squeal calls	submission
woof calls	aggression

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The behaviour associated with most call types is

(1)

☐ **A** aggression

☐ **B** friendship

☐ **C** resting

☐ **D** submission

(ii) Explain the benefit of communicating using sound rather than facial expressions.

(2)

.....

.....

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.....

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.....

(Total for Question 1 = 11 marks)

2 A gardener investigated the ability of four types of compost to hold water.

50 cm^3 of water was added to each type of compost.

Figure 6 shows the volume of water retained by four different types of compost.

type of compost	A	B	C	D
mass of compost /g	500	500	1000	1000
volume of water retained / cm^3	15	29	45	34
total mass of compost after water was added /g cm^{-3}	515	529	1045	1034

Figure 6

(a) (i) Calculate the percentage change in mass for compost B.

(2)

.....%

(ii) Explain which compost would be best to use for a pot containing strawberry plants to be grown during a hot summer.

(2)

.....

.....

.....

.....

(iii) State **one** way to improve this investigation in order to compare the results without having to calculate the percentage change in mass.

(1)

.....

.....

(b) One method of preserving strawberries is by using them to make jam.

Figure 7 shows a method for making strawberry jam.

Procedure:

Measure 2 kg of crushed strawberries. Place in a bowl.
Add sugar, mix well, and allow to stand for 10 minutes.
Transfer to a saucepan and heat until boiling.
Stir apple pectin into fruit and continue stirring over a high temperature until the gel point is reached and there is a reduction in the water content.
Pour jam into sterilised jars, leaving 1 cm of space at the top and cover.

Figure 7

(i) Explain why reducing the water content of the strawberries will help to preserve them.

(2)

.....

.....

.....

.....

(ii) Give a reason for sterilising the jars before adding the jam.

(1)

.....

.....

(Total for Question 2 = 8 marks)

3 A scientist investigated the effect of light intensity on the rate of photosynthesis of the aquatic *Cabomba* plant.

A lamp was used as a source of light. The lamp was placed at different distances (d) from the *Cabomba* plant, and the number of bubbles produced in 60 seconds was counted.

The number of bubbles produced in 60 seconds was used to calculate the rate of photosynthesis.

The light intensity was then calculated using the inverse square law $\left(\frac{1}{d^2}\right)$.

Figure 10 shows the scientist's results.

distance (d) of lamp from *Cabomba* (cm)	light intensity (arbitrary units)	bubbles produced in 60 seconds
5	0.0400	79
10	0.0100	21
15	0.0044	12
20	0.0025	7
25		5
30	0.0011	4

Figure 10

(a) (i) Calculate the light intensity when the lamp is 25 cm from the *Cabomba* plant.

(2)

light intensity = ... arbitrary units

(ii) Use information from Figure 10 to describe the effect of light intensity on the rate of photosynthesis.

(2)

.....

.....

.....

.....

(iii) Give another method of measuring light intensity rather than calculating it.

(1)

.....

.....

(iv) The scientist counted the number of bubbles produced by the *Cabomba* plant.

Another scientist stated that this was not the best method of measuring the volume of gas produced.

Explain how you could improve the method to measure the volume of gas released more accurately.

(2)

.....

.....

.....

.....

(b) Explain what would happen to the levels of gas produced if the light intensity decreased to 0.0001 arbitrary units.

(2)

.....

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(Total for Question 3 = 9 marks)