

- 1 (i) What is the name of the process which takes place in living cells in your body and which releases energy from oxygen and glucose?

(1)

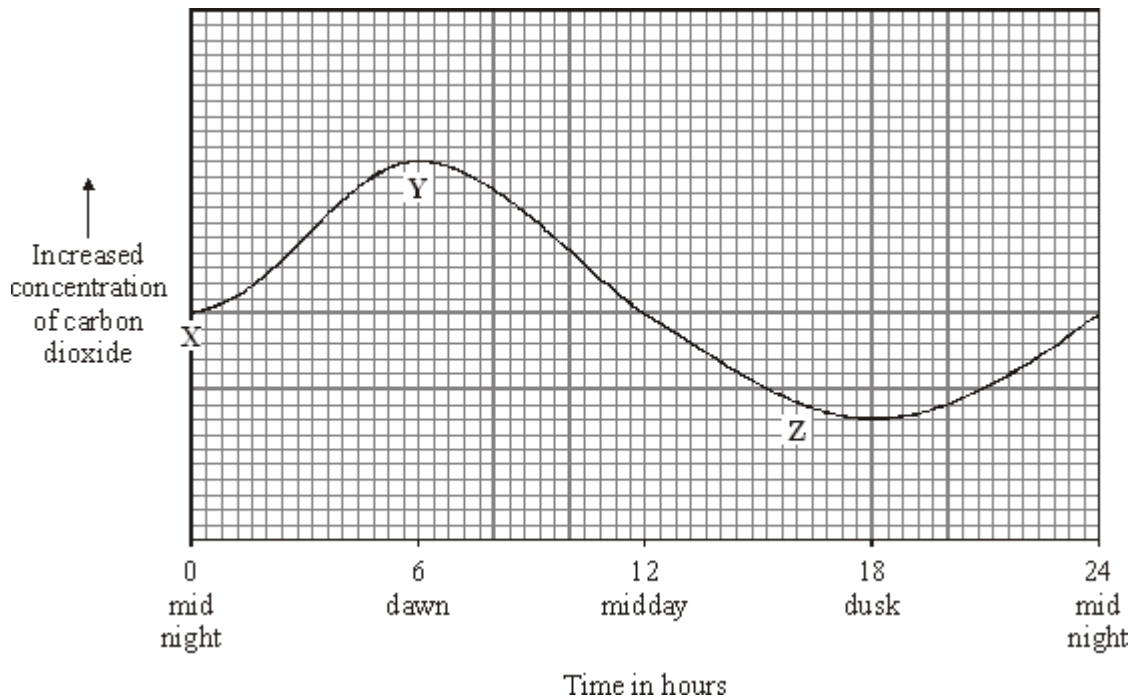
- (ii) Name the **two** products of the process in part (i).

_____ and _____

(1)

(Total 2 marks)

- 2 The graph shows the concentration of carbon dioxide in the air in a greenhouse full of tomato plants, measured over a period of 24 hours.



- (a) Explain why the concentration of carbon dioxide in the air in the greenhouse increased between X and Y.

(2)

- (b) Explain why the concentration of carbon dioxide in the air in the greenhouse decreased between **Y** and **Z**.

(2)

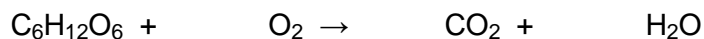
(Total 4 marks)

3

- (a) Respiration is a process which takes place in living cells. What is the purpose of *respiration*?

(1)

- (b) (i) Balance the equation for the process of respiration when oxygen is available.



(1)

- (ii) What is the name of the substance in the equation with the formula $\text{C}_6\text{H}_{12}\text{O}_6$?

(1)

- (c) Oxygen is absorbed through the alveoli in the lungs.

- (i) How are the alveoli adapted for this function?

(2)

- (ii) Name the gas which is excreted through the alveoli.

(1)

- (d) (i) What is the name of the process of respiration when oxygen is **not** available?

(1)

- (ii) Describe the process of respiration which takes place in human beings when oxygen is **not** available and give an effect.

(3)
(Total 10 marks)

4

In an investigation four groups of athletes were studied. The maximum rate of oxygen consumption for each athlete was measured and the mean for each group was calculated. The athletes then ran 10 mile races and the mean of the best times was calculated for each group. The results are shown in the table below.

GROUP OF ATHLETES	MAXIMUM RATE OF OXYGEN CONSUMPTION (cm ³ per kg per min)	BEST TIME IN 10 MILE RACE (minutes)
A	78.6	48.9
B	67.5	55.1
C	63.0	58.7
D	57.4	64.6

- (i) What is the relationship between maximum rate of oxygen consumption and time for a 10 mile race?

(1)

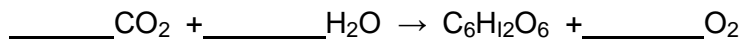
(ii) Suggest an explanation for this relationship.

(3)

(Total 4 marks)

5

(a) Balance the following equation for photosynthesis.



(1)

(b) Give **two** conditions necessary for photosynthesis apart from a suitable temperature range and the availability of water and carbon dioxide.

1. _____
2. _____

(2)

(a) Plants have leaves which contain guard cells and palisade cells. Explain how **each** of these kinds of cell assists photosynthesis.

Guard cells _____

(2)

Palisade cells _____

(2)

(d) Glucose is a product of photosynthesis. Give **three** uses which green plants make of glucose.

1. _____

2. _____

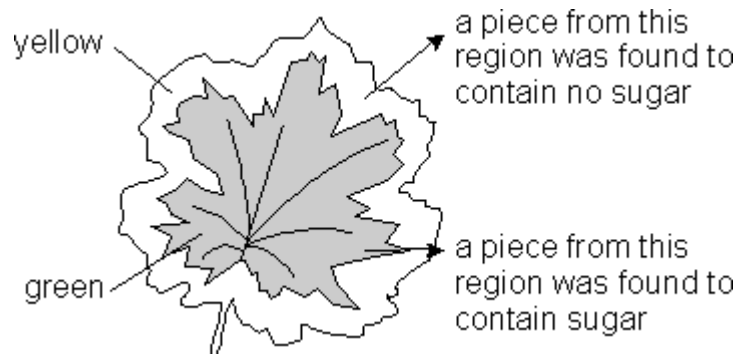
3. _____

(3)

(Total 10 marks)

6

A plant with variegated (two-coloured) leaves was left in sunlight for several hours. Pieces of one of its leaves were then detached (removed) and tested for sugar. The diagram below shows the results.

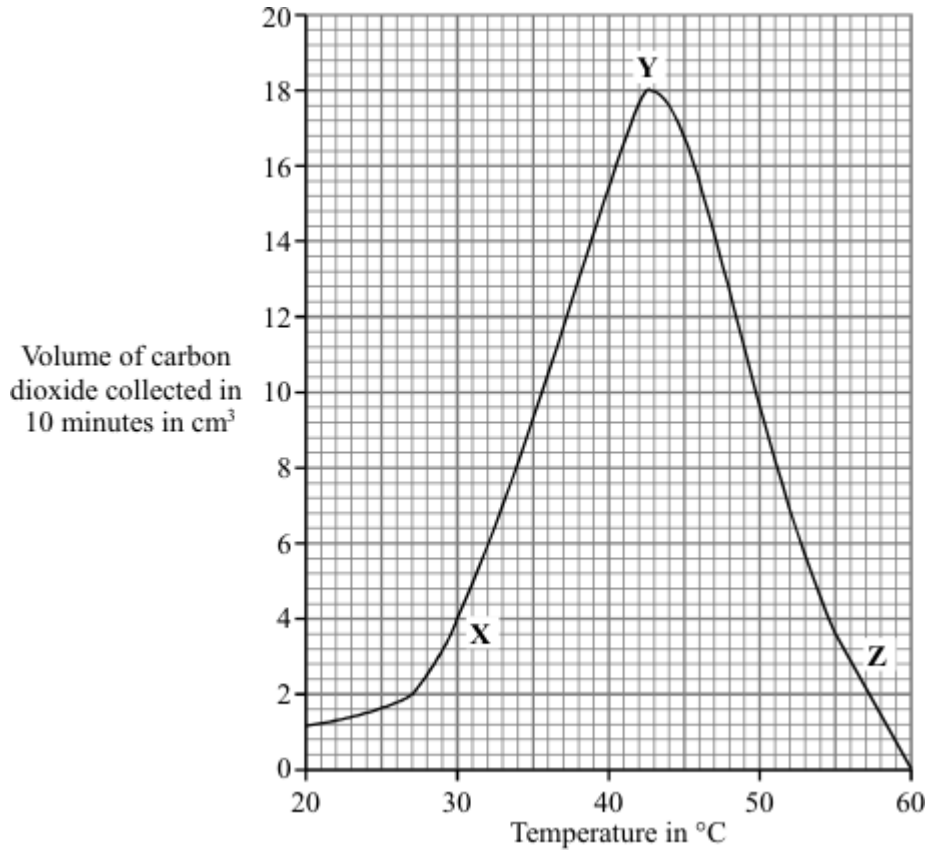


Explain, as fully as you can, why the yellow region of the leaf had not produced sugar.

(Total 2 marks)

7 Fermentation of sugar by yeast produces carbon dioxide.

The graph shows the effect of temperature on the production of carbon dioxide by fermentation.



- (a) By how much did the volume of carbon dioxide collected change when the temperature was raised from 30°C to 40°C?

_____ cm³

(1)

- (b) Complete the sentences to explain the shape of the curve between X and Y.

Raising the temperature _____ the speed of the reacting particles.

These particles collide more _____ and more _____.

(3)

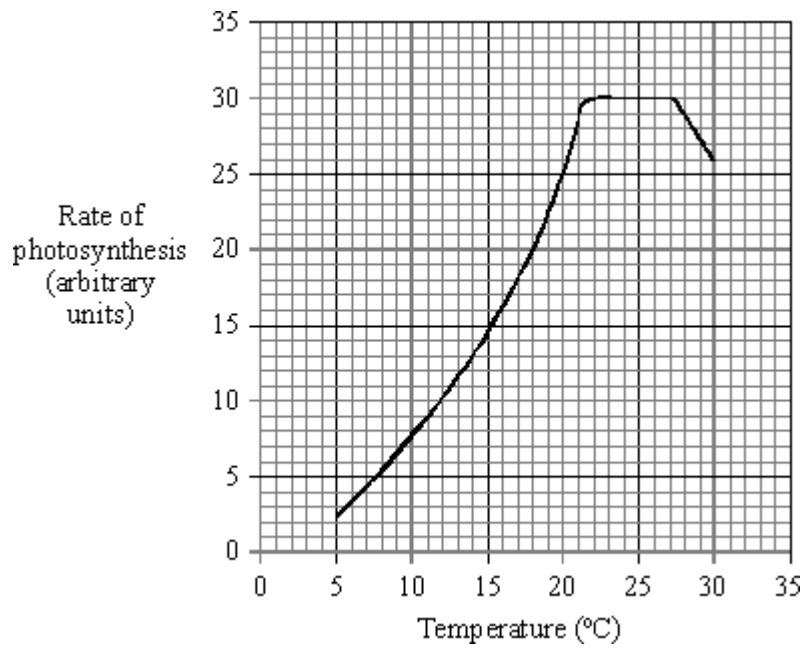
(Total 4 marks)

8 Green plants make food in their leaves.

- (a) From where do the leaves get the energy that they need to make food?

(1)

(b) The graph shows the effect of temperature on the rate of photosynthesis.



(i) Between which temperatures is the rate of photosynthesis fastest?

_____ and _____ °C

(1)

(ii) Suggest why the rate of photosynthesis stays the same between these two temperatures.

(2)

- (iii) A greenhouse owner wants to grow lettuces as quickly and cheaply as possible in winter.

At what temperature should he keep his greenhouse in order to grow the lettuces as quickly and cheaply as possible?

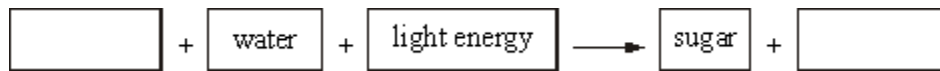
_____ °C

Explain your answer.

(3)

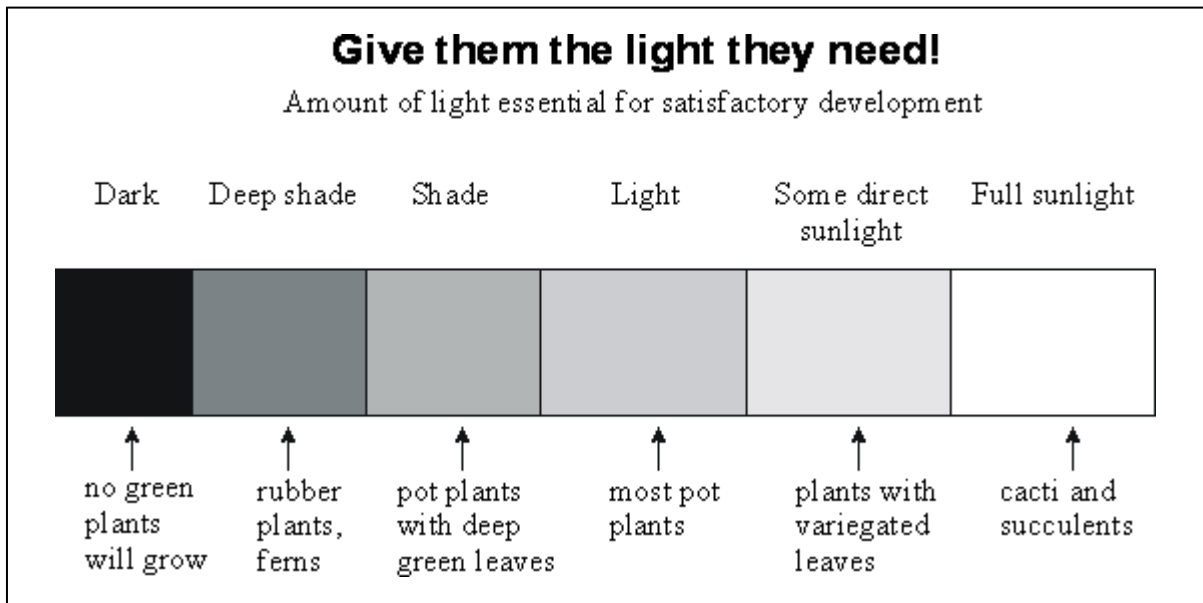
(Total 7 marks)

- 9 (a) Complete the equation for photosynthesis.



(2)

- (b) The diagram below is printed in a plant care manual.



Use information from the diagram to answer the following questions.

- (i) Name **one** type of plant which could live on the floor of a dense forest in the middle of summer.

(1)

(ii) Explain the reason for your answer to (i) above.

(1)

(iii) The drawing shows one type of plant with variegated leaves.

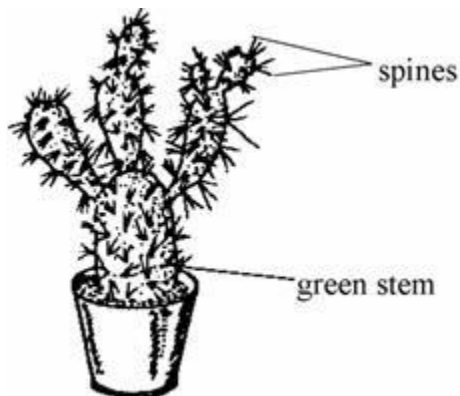


The manual says that these plants need direct sunlight.

Suggest and explain why this plant needs 'some direct sunlight' in order to develop satisfactorily.

(2)

(iv) The drawing shows a cactus.



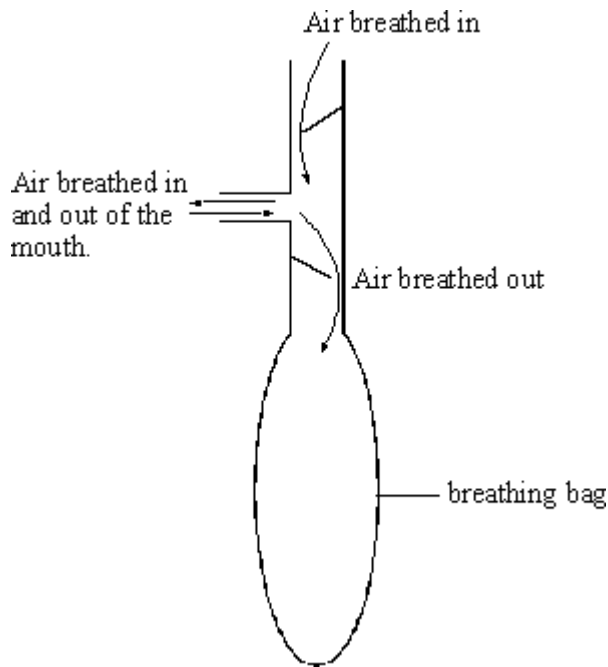
Suggest and explain why cacti can only develop satisfactorily if they receive full sunlight.

(2)

(Total 8 marks)

10

A student breathed out into an empty breathing bag five times.



After breathing out five times the volume of air in the bag was measured.
The volume was 3000 cm^3 .

(a) Complete the following sentences.

The air the student breathed in would contain more _____ than the air the student breathed out.

The air the student breathed out would contain more _____ than the air the student breathed in.

(2)

- (b) The student then did some exercise for two minutes. The volume breathed out in five breaths was again measured. This time there was 9000 cm³ of air in the bag.

What does this tell you about the effect of exercise on breathing?

(1)

- (c) (i) Name the chemical process that releases energy when it takes place in the cells of the body.

(1)

- (ii) Name the substances produced by this process.

_____ and _____

(2)

- (iii) Explain as fully as you can why this process has to take place more rapidly during exercise.

(2)

(Total 8 marks)

Mark schemes

- 1** (i) (aerobic) respiration
do not credit anaerobic respiration
accept cellular respiration 1
- (ii) carbon dioxide and water (vapour)
both required
do not credit heat 1
- 2** (a) respiration
reject start respiring / respire only at night 1
- no photosynthesis because no light 1
- (b) photosynthesis rate greater than respiration rate 1
- reject no respiration / photosynthesis only*
- photosynthesis since light 1
- 3** (a) to transfer / provide / give release energy
or production of ATP / adenosine triphosphate (molecules)
accept to give heat 1
- (b) (i) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
accept any other
n : 6n : 6n : 6n ratio
do not credit if any other changes have been made 1
- (ii) glucose
do not credit sugar / sucrose 1
- [2]
- [4]

- (c) (i) any **two** from
 large surface
 thin (surface)
 moist (surface)
 (with a good) blood supply 2
- (ii) carbon dioxide
accept water vapour
do not credit just water 1
- (d) (i) anaerobic (respiration) 1
- (ii) any **three** from
 in mitochondria
 glucose decomposes / breaks down / reacts
or glucose → lactic acid for (2) marks
 to give lactic acid
or breathing hard
or lactic acid → CO₂ + water
 causing pain
 (leaving an) oxygen debt
 (quick) source of energy
 (but) less efficient than aerobic respiration
accept less efficient than with oxygen 3

[10]

- 4** (i) the higher the rate of oxygen consumption, the shorter the
 time taken to complete
for 1 mark 1
- (ii) the faster oxygen is taken into the blood,
 the faster energy can be released in the muscles,
 and the faster the athlete can run
for 1 mark each 3

[4]

5

(a) 6 6 6

all required

accept a '6n 6 n n 6n' version of the balanced equation provided it is correct in every detail

1

(b) any **two** of

- (presence of) chlorophyll **or** (amount of) chloroplasts
accept green leaves (or other green parts)
- (sufficient) light (intensity)
- (light) of **a** suitable wavelength
any light other than green light
do not credit Sun's energy or sunshine or Sun

2

(c) **guard cells**

any **two** of

- * control by osmosis
- * the movement of gases
*accept movement of carbon dioxide **or** oxygen **or** water vapour*
beware movement of CO₂ out
accept a diagram or description
- * through the stoma

2

palisade cells

any **two** of

- * near the upper surface
- * contain (a great) many **or** more chloroplasts
- * (so) contain the most chlorophyll

2

(d) any three of

* for respiration

* conversion to (insoluble) starch

or to food store **or** to (other) carbohydrates

* (conversion to) sucrose **or** to food store **or** to (other) carbohydrates

or polysaccharides

*do not credit just to grow **or** live*

***or** survive*

accept conversion to food store

***or** to (other) carbohydrates once only*

* (conversion to) lipids **or** fats **or** oils

* (conversion to) amino acids **or** (plant) proteins **or** auxins **or** (plant) hormones **or** enzymes

3

[10]

6 Does not contain chlorophyll which is needed to absorb light **or** energy
each for 1 mark

[2]

7 (a) 11
accept 10.5 – 11.5

1

(b) ideas of

increase / rises

1

frequently / often

1

energetically / violently

1

[4]

8 (a) Sun / sunlight / light
for 1 mark

1

(b) (i) 21.5 – 22 **and** 27 – 27.5
for 1 mark

1

	(ii)	ideas of limiting factor / shortage of e.g. light / carbon dioxide / water /chlorophyll <i>each for 1 mark</i> <i>(allow 1 for 'maximum' rate of enzyme activity if no reference to limiting factors)</i> <i>(ignore reference to dematuring)</i>	2	
	(iii)	21.5 – 22° C <i>(allow first figure from answer to (i) so that no 'double-penalty' <u>but</u> not below 20)</i> maximum rate of photosynthesis <i>(can relate to any number on 'flat')</i> most economical heating (must relate to left end of 'flat') <i>each for 1 mark</i>	3	[7]
9	(a)	carbon dioxide oxygen	2	
	(b)	(i) e.g. rubber plant/fern	1	
		(ii) because can tolerate low light levels	1	
		(iii) yellow parts of leaf do not contain chlorophyll therefore more light needed for photosynthesis	2	
		(iv) no leaves/only have stem only have small area which can photosynthesise	2	[8]
10	(a)	oxygen, carbon dioxide or water (vapour) <i>for 1 mark each</i>	2	
	(b)	idea of more air per breath/deeper breaths <i>for 1 mark</i>	1	

- (c) (i) respiration
for 1 mark 1
- (ii) carbon dioxide,
water
for 1 mark each 2
- (iii) more energy required,
for increased muscular activity
for 1 mark each 2

[8]