EXEMPLAR

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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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For Supervisor's use only

Level 1 Biology, 2007

90167 Describe plant processes

Credits: Four
9.30 am Tuesday 27 November 2007

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only	Achievement Criteria		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe biological ideas relating to the functioning of plant processes. ✓	Explain biological ideas relating to the functioning of a plant process. ✓	Discuss biological ideas relating to the functioning of a plant process. ✓
Overall Level of Performance E		

You are advised to spend 50 minutes answering the questions in this booklet.

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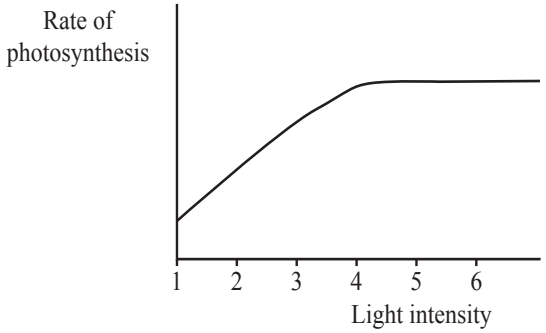
QUESTION ONE

(a) **Describe** the relationship between light intensity and the rate of photosynthesis as shown in the graph below.



As light intensity increases, so does the rate of photosynthesis. It will eventually plateau however due to other limiting factors such as water and CO_2 supply

increases then levels off

A

(b) The leaves of plants normally have a green colour due to the presence of chlorophyll.

Describe the function of chlorophyll in the leaf.

The function of chlorophyll is to absorb light energy from the light source (sun) to provide energy for photosynthesis. Chlorophyll absorbs all colours apart from green, therefore it is a green colour as it reflects green light.

A

In an investigation of photosynthesis, leaves of a destarched plant were treated as shown below, and the plant left in a sunny place for 2 days.

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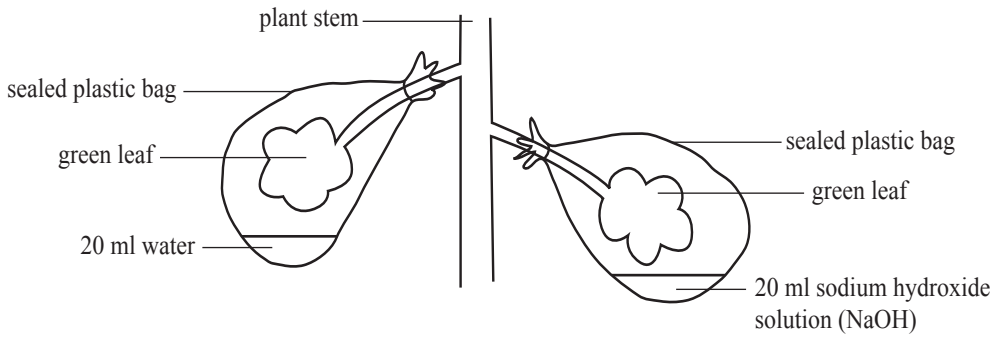

Leaf 1 **Leaf 2**

After two days an iodine test on both leaves gave the following results:

Leaf 1 **Leaf 2**

(c) **Explain** these results in terms of photosynthesis.

Leaf 1 has gone a blue/black colour from the iodine because it has produced starch (when the iodine goes blue/black it indicates the presence of starch) This is because Leaf 1 was able to carry out photosynthesis, it would have used the carbondioxide present and recieved water from the plant stem. Leaf 2 however didn't produce starch because it had no access to Carbon dioxide which is a necessary 'ingredient' for the process of photosynthesis to occur. The NaOH absorbed the CO_2 and therefore it couldn't photosynthesise and therefore didn't produce any starch.

M

- Leaf 1 produces starch, carried out photosynthesis.
- Leaf 2 didn't produce starch.
- no access to CO_2 so **A** *and*
- NaOH absorbed CO_2.
- no photosynthesis so **M**

QUESTION TWO

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The diagram below shows the internal structure of a leaf.

Adapted from V. Slaughter, *Living Things* (London: Hodder & Stoughton, 1980), p 30.

Stomata allow gas exchange, allow CO_2 to diffuse into leaf – essential for photosynthesis.

Explain how TWO features of a leaf allow it to carry out photosynthesis.

Stomata → stomata found on the lower epidermis are small openings held open by turgid gaurd cells and allow gas exchange. This is a feature that allows the leaf to carry out photosynthesis as it enables CO_2 (carbon dioxide) to diffuse into the leaf. CO_2 is ~~an~~ essential in photosynthesis as carbon dioxide + water → glucose + oxygen. Stomata also enable oxygen the waste product of photosynthesis to exit/diffuse out of the leaf.

Palisade cells → Pallisade cells are the sites of photosynthesis and contain chloroplasts which absorb light energy, with out this energy and these cells photosynthesis wouldn't occur so therefor this feature allows the leaf to carry out photosynthesis.

M

- palisade cells – contain chloroplasts, site of photosynthesis.
- chloroplasts absorb light energy; and without this, photosynthesis will not occur

QUESTION THREE

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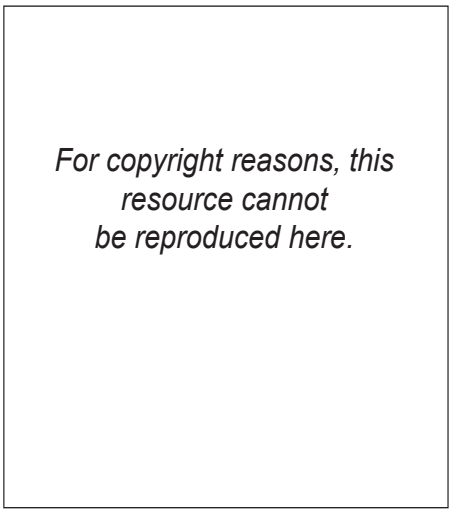
Plants need enough nitrogen for healthy growth. The diagram shows a plant that has grown in soil that did not have enough nitrogen in it.



Rogers and Poletti, *Year 11 Biology Workbook* (Hamilton: ABA Books, 2004), p 20.

Explain how plants use nitrogen for healthy growth.

Nitrogen is essential for healthy growth and is absorbed in the form of nitrates from the soil. It is important for the formation of molecules in the plant and is an important constituent of plant cells. Without it, ~~Leaves are not formed properly~~ chloroplasts aren't formed properly and the leaves aren't the lush green colour they should be, rather they are pale green and then turn yellow.

A

- nitrogen essential for the correct production of chloroplasts, so **A**
- but no reason as to why this effects healthy growth, so no **M**

QUESTION FOUR

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Different plant structures are built from specialised groups of plant cells called tissues. Each plant structure is made up of tissues designed to carry out specialised functions or processes.

The diagram shows the arrangement of plant tissues in a dicotyledon stem.

Don Bramley, *Yates Guide to Horticulture* (Auckland: Heinemann, 1987), p 22.

(a) Each year the stem will grow thicker by secondary thickening.

Explain how the stem grows thicker.

The stem grows thicker via secondary thickening. This is when cambial tissue divides to form secondary phloem vessels and secondary xylem vessels which in turn makes the stem thicker. Having secondary phloem and xylem provides the whole stem with necessary nutrients and growing thicker supports the stem and balances with the growing taller.

A

Cambium tissue divides, makes secondary phloem and xylem, which makes stem thicker. This occurs each year, resulting in thicker stem.

(b) Plant growth at the shoot tips and the root tips shows some similarities and some differences.

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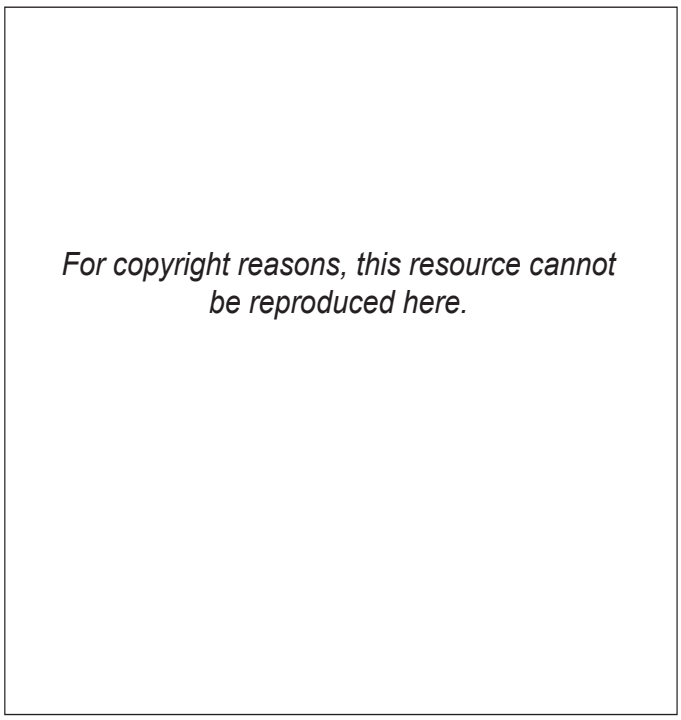
Discuss reasons for the similarities and the differences in the way plants grow at the shoot tips compared with the root tips.



Rogers and Poletti, *Year 11 Biology Workbook* (Hamilton: ABA Books, 2004), p 14.

Plants grow both at the root tips and the shoot tips. ~~Plan~~ Both of these locations grow due to mitosis, which is the division of cells resulting in indistinct cells. This occurs at the special meristems. Then further back, these cells specialise ~~into~~ for particular functions, this is where it differs in the shoots and roots. Roots ~~&~~ cells specialise for the absorbtion of water and nutrients via osmosis and for eg the outer cells develop root hairs for this. Cells growing in the shoot tips specialise for photosynthesis, eg form chloroplasts for the absorption of light energy. ~~for example.~~ The reasons for these different specialisations in the roots and shoots is because different processes are carried out in the shoots and roots and cells need to have certain structures and perform certain functions specific to these processes. Photosynthesis in the shoots, and water and nutrients absorbtion.

discusses

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Biology 90167, 2007

QUESTION FIVE

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Some plants can reproduce both sexually and asexually.

(a) **Describe** an advantage **to a plant** of sexual reproduction.

variation

An advantage of sexual reproduction is that all the offspring are genetically unique. This means there is more chance of survival as if conditions change for the worse, some plants will survive.

A

(b) **Describe** THREE ways that seeds are dispersed.

three methods, two mechanisms

Seeds can be dispersed by water, carried along currents in the ocean or rivers or streams. Seeds can be dispearsed by animals eating them e.g birds, then the seeds are excreted and land somewhere away from the parent. Seeds can also be dispersed by the wind, carried on wind currents etc.

A

(c) **Explain** how the dispersal of seeds can increase plant survival.

no mechanism eg light, wings, etc

dispersal of seeds can increase plant survival as it spreads the seeds out, transporting them to different locations. This means that the new plants won't have to compete with parent plants for nutrients, will be more spread out and if conditions are bad by the parent plant, there will be more chance of good conditions if the seeds are dispersed. Therefore because of these reasons, dispersal can increase plant survival

M

In sexual reproduction in flowering plants, some flowers are pollinated by insects and some are pollinated by the wind. Below are diagrams of an insect-pollinated flower and a wind-pollinated flower.

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insect-pollinated flower	wind-pollinated flower

V. Slaughter, *Living Things* (London: Hodder & Stoughton, 1980), p 150.

(d) **Discuss** how the features of the flower allow pollination to occur in wind-pollinated flowers compared to insect-pollinated flowers.

Both wind and insect pollinated flowers reproduce sexually which results in variated offspring. It involves a male sperm (found in the pollen grain) being combined with a female egg (ovule) to form a zygote. This process involves two key things, ferdilisation and pollination. ferdilisation ~~is~~ comes after pollination and is the fusing of the male and female gamete. to form a zygote. Pollination is transporting the male pollen grain to the female stigma so that the pollen grain can grow a pollen tube and safely escort the sperm to the egg (ovule) in the ovaries. In this case there is an insect-pollinated flower and a wind pollinated flower. Each flower has specific features to allow this pollination to occur.

Please turn over.

- none of this needed
- need to read the question

Extra paper for continuation of answers if required.
Clearly number the question.

Annotation Key
I = Insect
W = Wind
see assessment schedule

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Question number

continuation of Question Five (d)

An insect-pollinated flower is colourful which attracts insects, it also produces nectar which has an enticing smell which also attracts the insects and acts as a reward for the insects. Wind pollinated flowers don't bother with either of these as it doesn't need to attract insects. The petals of an insect-pollinated flower are usually reasonably large and significant, to make the flower visable to the insect and provide sufficient landing space for the insect. Wind pollinated flowers have insignificant petals which are usually small as they are not necessary for attracting insects. Insect pollinated flowers have small filaments (short filaments) which hold reasonably small anthers and also have reasonably small stigmas and all of these are very close together. This means that the pollen grains produced by the pollen sacs within the anthers and that are situated on the anthers surface, are able to rub off on the insect when the insect lands on the flower and searches for the nectar. These pollen grains can then be easily transferred onto the female stigma as the insect rubs against the stigma as well, transferring the pollen grains onto it. Wind pollinated flowers however have very long filaments with large anthers and long, large feathery stigmas all of which are exposed which gives maximum contact with the wind making it more likely for the pollen grains to

why I

why W

feature I

why I

feature W

Answer continues on following page.

be caught by the wind current. The stigma is feathery which gives it more surface area and ~~makes it~~ more likely to catch pollen grains. Being feathery also makes it sticky which also increases the likelihood of catching pollen grains

Insect-pollenated flowers, produce large reasonably heavy pollen grains which makes it more likely that they will stick to the insects. Wind pollinated flowers produce small and very light pollen grains which makes it more likely ~~for the wind~~ and ~~easier for~~ them to be carried by the wind.

Wind pollinated flowers produce a larger quantity of pollen grains compared to insect-pollinated flowers so that it is more likely that the pollen grains will land on/reach the stigmas. Insect Pollinated flowers don't produce as many pollen grains as the transport is more specific, the insect carried the pollen ~~to be to~~ grains directly to the flowers and stigmas whereas the wind simply blows, it doesn't aim the pollen grains at the stigmas.

E

why **W**

feature why **I**

feature why **I**

feature why **W**

Annotation Key
I = Insect
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