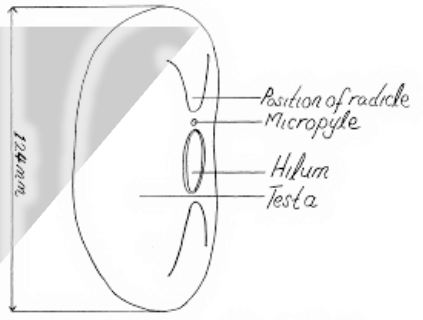
Updated to 2016-18 Syllabus

CIE IGCSE BIOLOGY 0610

ALTERNATIVE TO PRACTICAL NOTES (PAPER 6)

DRAWINGS

- Make sure you use a sharp pencil
- Your outline is clear
- The drawing should be as large as space provided.
- It has definite outlines (no 'sketchy' lines)
- No shading,
- No arrow heads when labelling
- Lines point exactly at the labelled part.



Drawing to show the external features of a bean seed (X12·4)

Magnification : $\frac{\text{Length of Drawing}}{\text{Length of Specimen}}$

$\frac{124\ mm}{10\ mm}$

X12·4

COMPARISONS

- Make sure the points you use to compare diagrams are visible in the diagrams
- Use labels on the diagrams as your guide
- You can compare numbers shape and proportional sizes.
- Don't compare sizes unless you're given a scale.

DRAWING GRAPHS

- Use a sharp pencil
- Label both axes including the units
- Choose an even scale for each axis that uses up as much of the grid as possible.
- The controlled variable is plotted on the x axis
- Dependent variable (i.e. the one that changes as a result in a change of the other) is plotted on the y axis.
- Join your plotted points with ruled lines
- When drawing bar charts, all bars must be of the same width

DESIGNING AN EXPERIMENT

- Find the variable which is to be changed (from the question) and mention how you are going to change it
- List all variables that you have to keep constant throughout the experiment
- Mention how long your experiment will last.
- Say how you will measure experiments‘ results (change in colour for example)
- Write: 'repeat experiment to get more reliable results and minimize error’
- Set a control for your experiment

ENZYME ACTIVITY

- $2H_2O_2 (l) \rightarrow 2H_2O (l) + O_2 (g)$
- This reaction can be catalyzed by an enzyme (catalase) or by a non-biological catalyst (Manganese IV oxide)
- **Method:**
  - Put 3cm2 of hydrogen peroxide in a test tube.
  - Add fresh potato strips and shake gently.
  - Keep your thumb on top of the test tube, or use a stopper, to retain the gas.
  - Do the "glowing splint" test → the splint relights

ENZYME ACTIVITY

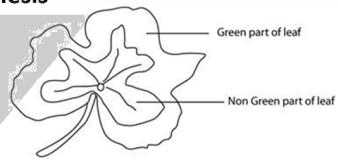
- **Positive control:** repeat original experiment using manganese IV oxide → bubbles of O_2 form
  - Conclusion: Reaction happens because of a catalyst
- **1st negative control:** repeat original experiment using boiled potato strips → nothing happens
  - Conclusion: Enzymes denature when they are at high temperatures
- **2nd negative control:** repeat original experiment using water instead of hydrogen peroxide → nothing happens
  - Conclusion: hydrogen peroxide is the substrate
- **3rd negative control:** repeat in a cold environment, the effervescence should be slower
  - Conclusion: enzymes don't work as well in the cold

CHEMICAL TESTS

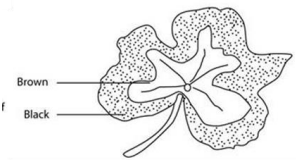
- **Starch:** Add few drops of iodine, +ve result = blue-black color
- **Reducing sugars:** Add Benedict's reagent, then mixture is heated in water bath for 2 to 3 minutes.
  - +ve result (increasing concentration of sugar) = blue → green → yellow → orange → red
  - -ve result = remains blue
- **Proteins:** Add few drops of Biuret reagent, +ve result = mauve color, -ve result = remains blue
- **Fats:** Emulsion test; ethanol is added to mixture, and this is poured into a test tube with an equal amount of distilled water, +ve result = milky-white emulsion

FACTORS OF PHOTOSYNTHESIS

Chlorophyll Is Necessary for Photosynthesis



(a) variegated leaf before



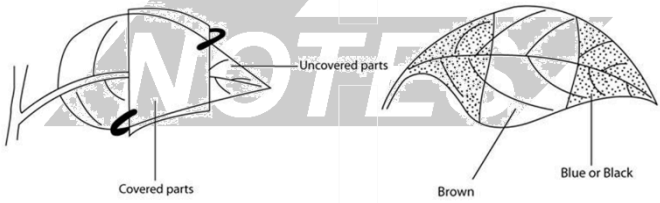
(b) after testing for starch

- Take a potted plant with variegated (green and white) leaves.
- Destarch the plant by keeping it in complete darkness for 48hrs
- Expose the plant to the sunlight for a few days.
- Leaf boiled in water for 2 minutes to break down cell walls, denature enzymes and allow for easier penetration by ethanol.
- Warmed in ethanol until leaf is colorless to extract chlorophyll, which would mask observation
- Dipped in water briefly: to soften leaf and then Leaf is placed on a white tile and iodine is added. If starch is present, color will be blue-black and if absent, it will remain orange

FACTORS OF PHOTOSYNTHESIS

Light Is Necessary for Photosynthesis

- Destarch the plant by keeping it in darkness for 48hrs
- Place a stencil over part of a leaf
- Place the leaf in sunlight for 4-6 hours
- Remove the stencil and test for starch
- +ve result = parts which received light turn black
- -ve result = parts which didn't receive light remain yellow/brown



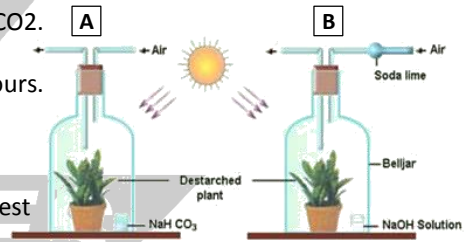
(a) leaf covered with stencil

(b) after testing for starch

FACTORS OF PHOTOSYNTHESIS

Carbon Dioxide Is Necessary for Photosynthesis

- Take two destarched potted plants.
- Cover both the plants with bell jars and label them as A and B.
- Inside A, keep $NaHCO_3$ (sodium bicarbonate). It produces CO2.
- Inside B, keep NaOH (Sodium hydroxide). It absorbs CO2.
- Keep both the set-ups in the sunlight for at least 6 hours.
- Perform the starch test on both of the plants.
- The leaves of Plant A will turn black after the starch test
- The leaves of Plant B will remain orange/brown after starch test



FACTORS OF PHOTOSYNTHESIS

Investigating what happens when varying the factors affecting photosynthesis

- **Light intensity:** First a lamp is placed as close as possible to the apparatus, then the experiment is repeated several times, each times with the lamp further away from the apparatus. Heat from the bulb is prevented by placing a clear glass sheet between the lamp and the apparatus, and the pond weed used is left for several minutes in each new light intensity to allow it to adjust to new conditions before rate is measured.

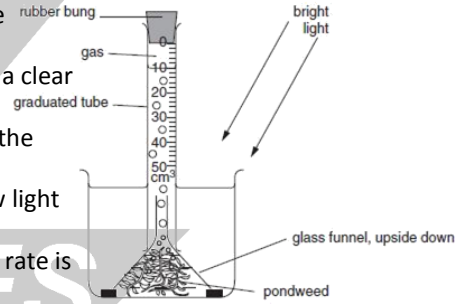


Fig. 4.1

FACTORS OF PHOTOSYNTHESIS

Investigating what happens when varying the factors affecting photosynthesis

- **Carbon dioxide:** vary the amount of hydrogen carbonate in the solution, this supplies the plant with carbon dioxide for photosynthesis
- **Temperature:** set up the apparatus in several different-temperature environments

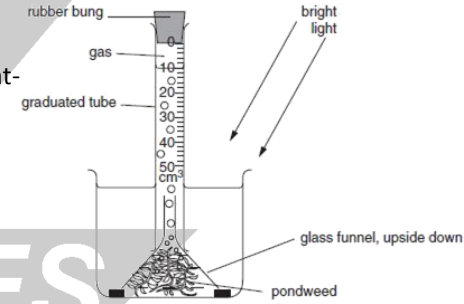
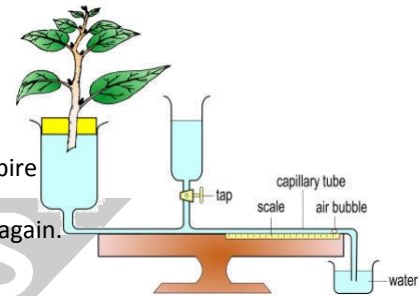


Fig. 4.1

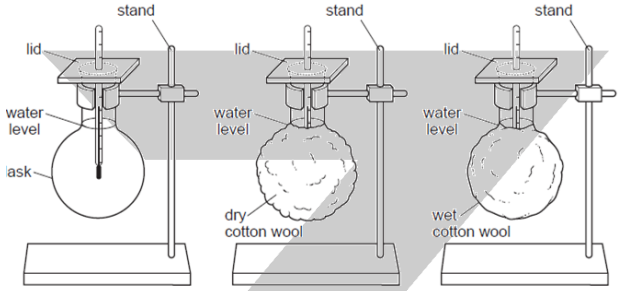
INVESTIGATING TRANSPIRATION

- Use a sharp razor blade to cut a leafy shoot under water.
- Insert the leafy shoot through the hole of the stopper provided with the potometer.
- Fill the potometer with water and fit the stopper holding the leafy shoot to the apparatus.
- Trap an air bubble in the capillary tube by the following procedures:
  - dip the end of the capillary tube into a beaker of water,
  - close the tap of the reservoir,
  - take away beaker of water and allow the plant to transpire
  - re-immerse the capillary tube into the beaker of water again.



- Estimate rate of transpiration by measuring distance moved by the air bubble per unit time.

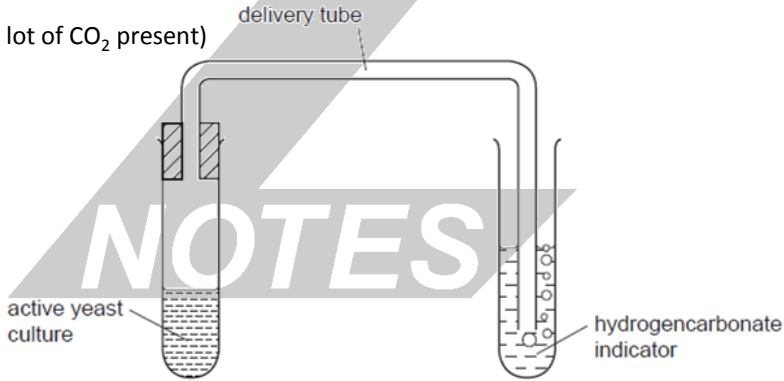
INVESTIGATING INSULATION



- Flask A represents a hairless mammal, B represents a mammal with dry fur and C represents a mammal with wet fur
- Equal amounts of hot water are added to the flask and temperature change after a set period of time is measured using a submerged thermometer.
- Lowest temperature change means best insulated.

RESPIRATION

- Demonstrating that respiration uses oxygen and produces CO2
- An active yeast culture is placed in a test tube and connected to a second test tube containing hydrogencarbonate indicator which changes to purple in alkine and yellow in acidic conditions
- At the start of the experiment, the indicator is red however, after 15 minutes, the indicator becomes yellow (a lot of CO_2 present)

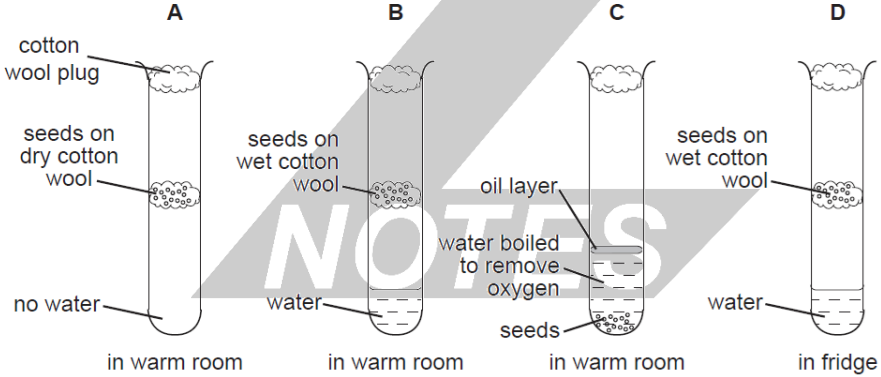


GOOD PROCEDURES

- Repeat readings to spot anomalous errors or to calculate an average
- Avoid making parallax errors, {the line of sight should be perpendicular to the reading on the scale}
- Look carefully at any scale that is used
- Notice the unit in which the scale is calibrated - always give the unit of any measurement
- Notice the maximum reading that can be obtained
- Notice the smallest change in value that can be obtained
- Aim to use quantities that have magnitudes that are towards the upper values of the scale

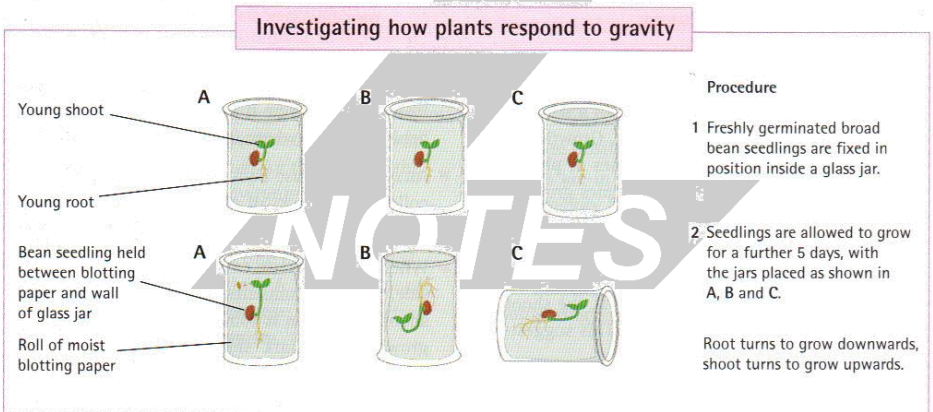
GERMINATION

- B will germinate fastest because it has access to water, oxygen and is at a warm temperature
- A does not have access to water
- C does not have access to oxygen
- D has a very cold temperature even thought all other factors are present



GEOTROPISM

- Freshly germinate seedlings inside a glass jar, the seed is held by a roll of moist clotting paper.
- Seedlings are allowed to grow for a further five days, with the jars placed a) the right way up b) upside down and c) on its side.
- In each case the roots will turn to go downwards, and the shoot turns to grow upwards,



PHOTOTROPISM

- There are three groups of oat shoots:
  - A) Has its tips removed, B) tips are covered and C) are untreated.
- The coleoptiles are measured, and lengths recorded.
- They are put in light proof boxes with one gap which only allow light to enter laterally
- They are measured 2-3 days later, and new lengths are recorded.
- Untreated coleoptiles will grow the most as they would bend towards the light