Design a practical experiment to investigate the effect of light wavelength on the rate of photosynthesis.

Aim: To investigate the effect of light wavelength/ colour of light on the rate of photosynthesis.

Materials: Glass Jar, test tube, cork, pond weed, clamp, small lamp, sticky tape, red, blue, yellow and green filters, Stopwatch, small knife.

Procedure:

- Fill the glass jar nearly to the top with water.
- Take one strand of pondweed and cut the end of the stem with a pair of scissors or razor.
- Fill the test tube with water to the top of the cork. Slide the cut end of the pondweed stem through the hole in the cork so that they are held firmly in place.
- Hold the test tube horizontally and then turn it upside down so that the pondweed enters the jar and attach the test tube to the clamp. Ensure that it is held firmly and that it is steady for safety reasons.
- Take one of the coloured filters and wrap it around the jar. Use sticky tape to keep it in place if necessary.
- Shine the lamp light onto the jar; make sure that it reaches the pondweed, at 10cm distance in each experiment so that the intensity of light will remain the same so that the results obtained are valid.
- Leave the experiment for a minute or so that the plant adjusts to its surroundings and is photosynthesising at a regular pace.
- After this, start the stopwatch and record the amount of bubbles evolved from the end of the plant in the test tube in 5 minutes.
- Repeat this three times so that a fair average can be calculated.
- Once the five minutes end, stop shining the lamp onto the pondweed and remove the coloured filter from around the jar.
- Repeat the above processes, differing the colour of the filter wrapped around the jar each time, using either yellow, green, blue or red, using the same pond weed.

Pictures!?

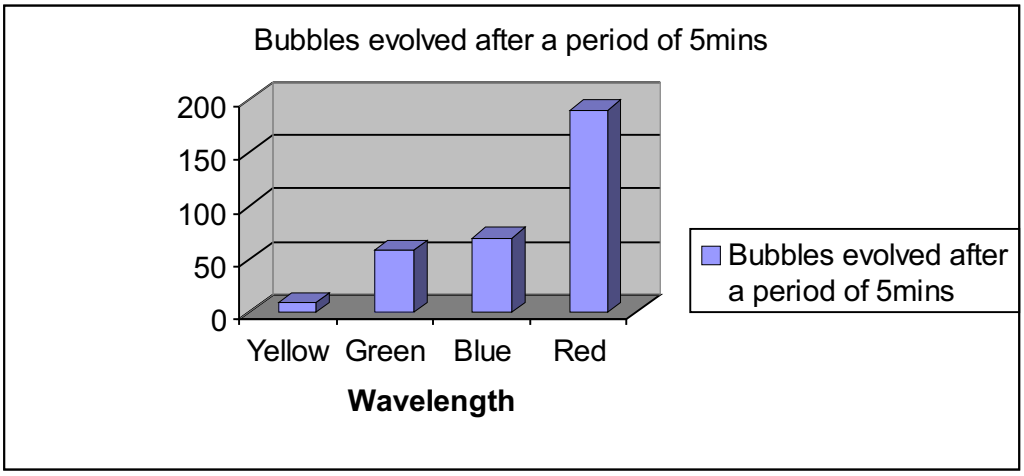
Variables to be controlled in order to improve the validity of results obtained:

- Distance that the light is shone- light intensity
- Temperature- photosynthesis proceeds by a series of chemical reactions controlled by enzymes, which are sensitive to temperature. Around 30. Lower temp, rate slowed ???
- Use the same piece of pond weed- otherwise the size of the pond weed may differ/ surface area may differ
- Stopwatch
- Repeat three times

Measurements
The way in which I will measure the rate of photosynthesis is by recording the amount of oxygen evolved from the plant that I am to use. The more bubbles of oxygen evolved in a set period of time will indicate that a higher rate of photosynthesis is occurring whilst a lower amount of bubbles being produced will mean that a slower rate of photosynthesis is occurring at that time.

Results Table

Coloured Light/ Wavelength	Bubbles evolved after a period of 5mins
Yellow	9
Green	59
Blue	70
Red	190



Explain the Results

Chloroplasts contain several different pigments the majority of which are chlorophyll *a* and chlorophyll *b*. Both of these types of chlorophyll absorb similar wavelengths of light, but chlorophyll *a* absorbs a slightly higher wavelength than chlorophyll *b*. Neither chlorophyll absorbs much light in the green region of the spectrum thus making it appear green. This can be plotted onto a graph (fig 1.1). This graph is called the Absorption Spectrum. The Absorption Spectrum is very similar in shape to the Action Spectrum (fig 1.2). The Action Spectrum is a graph showing rate of photosynthesis with different wavelengths of light. This is evidence that light energy absorbed by the pigments in chlorophyll a and chlorophyll b is used in photosynthesis.

Criticise

- The amount of carbon dioxide surrounding the plant may not have remained the same throughout the experiment.
- The temperature did not remain the same.
- The thickness of the filter
- The wrapping round of the coloured filter
- Reliability of using the human eye to observe the amount of bubbles produced.
- For red- times cos bubbles evolved too quickly
- Other sources of light being shone onto the pond weed from elsewhere
- Not repeated