IGCSE Biology Paper 6 – Alternative to Practical

Paper: 40 marks Time: 1 hr Weightage: 20%

- Analyze the relationships between variables and readings.
- questions (topics) required from paper 6 are:

1. Take reading from instruments and apparatus (measuring cylinder, stopwatch, burette, gas syringe).
2. Measure length by ruler (take care of required unit cm or mm)
3. Calculate the magnification and the unit times (X)
4. Draw a suitable graph and must include the following:
    - Appropriate scale
    - Axes labeled and their units
    - Plot all points by pencil
    - Types of graph – Line / Bar/ Pie

5. Take readings from graph (Line graphs) by extending line or curve.
6. Explain results: directly or inversely proportion; details from graph to support your answer.
7. To label some parts (palisade, xylem, etc)
8. Purpose of experiment: As control to compare results
9. Apply some formulas given
10. Complete headings of a table (g, cm, s, etc.)
11. Count and make tally tables
12. Calculate percentage increase or decrease
13. Safety precautions (fume cupboard, heat in hot water bath, wear gloves and goggles)
14. Give surface area by counting and completing squares
15. Experimental accuracy improvements:
    - Use electronic balance instead of spatula
    - Use larger number of sample
    - Use lid and polystyrene cup in heating experiment – Use data logger instead of timer and stopwatch
    - keep factors same and constant
    - Use burette instead of measuring cylinder
    - To repeat and take average (mean)
    - Same apparatus and instruments
    - Control temp and pH
16. Classification - name of group, feature

17. Adaptations of animals (ex: camouflage)
18. pH measured by universal indicator and pH meter
20. Hydrogen carbonates indicator and its color.
21. Round results always 2 or 3 significant figures
22. Give ratios in simplest form.
23. Rate is always: volume of gas/time taken.
24. Some observations to be recorded.
25. Leave experiment after heating:
    - To avoid the effect of the previous one
    - To provide time to adapt temperature

26. Make brief comparisons (comprising of number, size, color, presence of some special parts, shape, surface area)
27. Draw certain parts of plant/ animal:
    - Use a sharp HB pencil
    - Draw a clear and similar shape
    - Avoiding shading
    - Make accurate labels (at least 2)
    - Draw according to the magnification asked in the paper

28. Make biological tests:

a) **Emulsion for lipids**.
- 2 cm^3 of ethanol added to the unknown solution, the mixture is gently shaken.
- the mixture is poured into a test tube containing an equal volume of distilled water.
- If a lipid is present, a milky-white emulsion is formed.

b) **Test for vitamin C using DCPIP**.
- Vitamin C takes the color out of a blue dye called DCPIP
  (if it disappears in few drops: strong vitamin C solution; many drops: weak vitamin C solution)

c) A control is needed to make sure that results are valid: To show that the test solutions are not contaminated, each test should be carried out on a sample of water.

Examples:

- **To test for Protein**, a few drops of Biuret reagent are added to 2 cm^3 of the unknown solution (to be tested for containing protein) and the mixture is gently shaken. A MASSIVE/PURPLE color is a positive result (protein is present)
- **To test for starch**, a few drops of iodine solution are added to 2 cm^3 of the unknown solution (to be tested for containing starch) and the mixture is gently shaken. A DEEP BLUE-BLACK color is a positive result (starch is present).

- **To test for glucose** (a reducing sugar), 2 cm^3 of Benedict's reagent are added to 2 cm^3 of the unknown solution and the mixture is heated in a boiling water bath for 2-3 minutes. An ORANGE/BRICK-RED color is a positive result. (glucose is present)

When making comparison between different solutions – for example, to compare the glucose content of different wine samples – it is important to carry out all tests under the same conditions. For example, a series of Benedict's tests should be performed:

- an equal volume of unknown solutions
- Use equal volumes of Benedict's solution
- all mixtures heated to the same temperature
- same length of time

Enzyme experiments involving temperature:

- Same volume and concentrations of same reagents
- Same volume of same enzyme
- Same apparatus used
- Same time intervals
- Control pH
- Apply different temperatures
- Note readings and results
- Plot them and compare
- Repeat and take average

Enzyme experiments involving pH:

- Same volume and concentrations of same reagents
- Same volume of same enzyme
- Same apparatus used
- Same time intervals
- Control temperature
- Apply different pH
- Note readings and results
- Plot them and compare
- Repeat and take average

Germination experiments where pH is a variable:

- Use same seeds due to age and species
- Use same number of seeds
- Same volume of same enzyme
- Use same apparatus

- Keep time intervals the same
- Control temperature
- Conduct experiments over different pHs
- Note readings and results
- Plot them and compare
- Repeat and take average

Experiments where rate needs to be calculated:

- Add 2~3 cm^3 of culture to test tube
- Shake it
- Connect test tube to gas syringe
- Note gas volume
- Control temperature
- Record time taken by stopwatch
- Plot them and compare
- Repeat and take average of results

Variables to be constant in experiments involving cooling:

- Room temperature
- Time interval
- Temperature
- Volume of water

Determine number of stomata:

- View the leaf under microscope at high magnification
- Count the number of stomata
- Determine the area of stomata
- Calculate area of stomata (using a grid)

Determine the rate of uptake of water by plants (transpiration rate)

Conditions to keep constant

- Plant species
- Number of plants
- Volume of water
- Time interval
- Apparatus
- Light intensity

Method

- Control pH and temp
- Note readings
- plot and compare

- Repeats and take average