

# Practical Skills in A Level Biology

## Module 1: Development of Practical Skills in Biology

### 1.1.1 Planning

*Learners should be able to demonstrate and apply their knowledge and understanding of:*

(a) experimental design, including to solve problems set in a practical context

Including selection of suitable apparatus, equipment and techniques for the proposed experiment.

*Learners should be able to apply scientific knowledge based on the content of the specification to the practical context.*

(b) identification of variables that must be controlled, where appropriate

(c) evaluation that an experimental method is appropriate to meet the expected outcomes.

### 1.1.2 Implementing

*Learners should be able to demonstrate and apply their knowledge and understanding of:*

(a) how to use a wide range of practical apparatus and techniques correctly

(b) appropriate units for measurements

(c) presenting observations and data in an appropriate format.

### 1.1.3 Analysis

*Learners should be able to demonstrate and apply their knowledge and understanding of:*

(a) processing, analysing and interpreting qualitative and quantitative experimental results Including reaching valid conclusions, where appropriate.

(b) use of appropriate mathematical skills for analysis of quantitative data

(c) appropriate use of significant figures **M1.1**

(d) plotting and interpreting suitable graphs from experimental results, including:

(i) selection and labelling of axes with appropriate scales, quantities and units **M3.2**

(ii) measurement of gradients and intercepts. **M3.3, M3.4, M3.5**

### 1.1.4 Evaluation

*Learners should be able to demonstrate and apply their knowledge and understanding of:*

(a) how to evaluate results and draw conclusions

(b) the identification of anomalies in experimental measurements

(c) the limitations in experimental procedures

(d) precision and accuracy of measurements and data, including margins of error, percentage errors and uncertainties in apparatus **M1.11**

(e) the refining of experimental design by suggestion of improvements to the procedures and apparatus.

| Practical Endorsement                  |  |  |                  |
|--|--|--|------------------|
| Practical Activity Group (PAG)         | Techniques and Skills covered  | Specification references   | Activity Covered |
| 1 Microscopy                           | <ul style="list-style-type: none"> <li>- Use of a light microscope at high power and low power, use of a graticule</li> <li>- Production of scientific drawings from observations with annotations</li> </ul>  | 2.1.1(b), 2.1.1(c), 2.1.1(d), 2.1.1(k), 2.1.6(d), 2.1.6(g), 2.1.6(h), 3.1.1(c), 3.1.1(h), 3.1.3(b), 4.1.1(e), 5.1.2(b), 5.1.2(c), 5.1.4(c), 5.1.5(l) |                  |
| 2 Dissection                           | <ul style="list-style-type: none"> <li>- Safe use of instruments for dissection of an animal or plant organ</li> <li>- Use of a light microscope at high power and low power, use of a graticule</li> <li>- Production of scientific drawings from observations with annotations</li> </ul>  | 3.1.1(g), 3.1.2(c), 3.1.2(e), 3.1.3(b), 5.1.2(c), 6.2.1(a)   |                  |
| 3 Sampling techniques                  | <ul style="list-style-type: none"> <li>- Use of sampling techniques in fieldwork</li> <li>- Production of scientific drawings from observations with annotations</li> </ul>  | 4.2.1(b), 6.3.1(e)   |                  |
| 4 Rates of enzyme controlled reactions | <ul style="list-style-type: none"> <li>- Use of appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH)</li> <li>- Use of laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions</li> <li>- Use of ICT such as computer modelling, or data logger to collect data, or use of software to process data</li> </ul> | 2.1.4(d), 2.1.4(e), 2.1.4(f), 5.2.1(g), 5.2.2(i), 5.2.2(l)   |                  |
| 5 Colorimeter or potometer             | <ul style="list-style-type: none"> <li>- Use of appropriate instrumentation to record quantitative measurements, such as a colorimeter</li> <li>- Use of laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions</li> </ul>  | 2.1.2(r), 3.1.3(c)   |                  |
| 6 Chromatography OR electrophoresis    | - Separation of biological compounds using thin layer / paper chromatography or electrophoresis  | 2.1.2(s), 5.2.1(c), 6.1.3(e)   |                  |
| 7 Microbiological techniques           | <ul style="list-style-type: none"> <li>- Use of laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions</li> <li>- Use of microbiological aseptic techniques, including the use of agar plates and broth</li> </ul>  | 6.2.1(g), 6.2.1(h)   |                  |
| 8 Transport in and out of cells        | <ul style="list-style-type: none"> <li>- Use of appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH)</li> <li>- Use of laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions</li> <li>- Use of ICT such as computer modelling, or data logger to collect data, or use of software to process data</li> </ul> | 2.1.5(c), 2.1.5(d), 2.1.5(e)   |                  |
| 9 Qualitative testing                  | <ul style="list-style-type: none"> <li>- Use of laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions</li> <li>- Use of qualitative reagents to identify biological molecules</li> </ul>   | 2.1.2(q), 2.1.3(d), 5.1.2(f)   |                  |

|   |  |  |  |
|---|--|--|--|
| 10 Investigation using a data logger OR computer modelling  | - Use of ICT such as computer modelling, or data logger to collect data, or use of software to process data                                  | 2.1.2(n), 2.1.3(a), 3.1.1(e), 5.1.5(k), 5.1.5(l), 5.2.1(g), 5.2.2(i), 5.2.2(l), 6.1.3(b)           |  |
| 11 Investigation into the measurement of plant or animal responses  | - Safe and ethical use of organisms to measure plant or animal responses and physiological functions   | 3.1.3(c), 5.1.1(d), 5.1.5(a), 5.1.5(e), 5.1.5(i), 5.1.5(k), 5.1.5(l), 5.2.1(g), 5.2.2(i), 5.2.2(l) |  |
| 12 Research skills  | - <i>Apply investigative approaches</i><br>- <i>Use online and offline research skills</i><br>- <i>Correctly cite sources of information</i> |  |  |
| <p>It is expected that the following skills will be developed across all activities, regardless of the exact selection of activities. The ability to:</p> <ul style="list-style-type: none"> <li>•safely and correctly use a range of practical equipment and materials (1.2.1 b)</li> <li>•follow written instructions (1.2.1 c)</li> <li>•keep appropriate records of experimental activities (1.2.1 e)</li> <li>•make and record observations/measurements (1.2.1 d)</li> <li>•present information and data in a scientific way (1.2.1 f)</li> <li>•use a wide range of experimental and practical instruments, equipment and techniques (1.2.1 j).</li> </ul> |  |  |  |