General advice

This section provides information which may prove useful for those running practical classes for the first time, and which could serve as handouts for students.

The information is organised into four parts:

- General instructions on *health and safety* in the laboratory.
- A summary of the general principles of *good laboratory practice*.
- Guidance on *how to write up exercises* in the form of conventional scientific papers.
- Criteria which may be used in *assessing course work*, together with an example of a form that could be used to provide feedback to the students.

1. Health and safety

PLEASE READ CAREFULLY

The following section relates to aspects of safety during practical classes. By U.K. law, you are obliged to adhere to the regulations outlined and to seek additional advice if you are aware of any special circumstances in which your health or that of others may be at risk during the course of the work.

Listen carefully to the instructions given before the start of, or during, each class

1.1 Laboratory coats must be worn at all times when working in laboratories. If you do not have a laboratory coat you will be requested to leave the class.

1.2 All students must be in possession of safety glasses and you must wear these during any laboratory procedures which risk damage to your eyes.

You should take great care when handling both dead and living animal matter

1.3 Although the parasites which are the subject of study are mostly not infective to humans, you should treat **all** material as potentially hazardous.

1.4 If you contaminate yourself, or any laboratory equipment or bench space you are using, report it immediately to a member of staff.

1.5 **Do not** eat, drink, smoke or apply make-up in the laboratory.

1.6 If you have reason to believe that you are allergic to contact with rodents (mice, hamsters, rats), insects or any other animals (e.g. pets such as dogs, cats), please inform those running the class before undertaking any work. It may be possible for you to continue subject to appropriate advice.

1.7 If you need to wear gloves during practical work, you will be informed at the beginning of the class. **Remember, contaminated gloves must not be used to operate laboratory equipment** and should be removed and appropriately disposed of before leaving the laboratory.

1.8 Always wash your hands thoroughly during a break in the practical class and before you leave the laboratory for any purpose.

1.9 If you have any cuts or abrasions but wish to participate in the class, please ask for advice first and if permitted to continue, wear gloves throughout all laboratory procedures (see 1.7).

1.10 If you cut or in any other way injure yourself in the laboratory, please report at once to one of the laboratory staff.

1.11 If any chemicals employed in the work are hazardous to health you will be given precise instructions about aspects of safety on the day of the class. Please ensure that you follow these carefully. If you think you are allergic to any of the chemicals to be used, please inform those running the practical class concerned.

FIRE PRECAUTIONS

If you hear the fire alarm, leave the laboratory immediately and go to your assembly point as instructed. Make sure that you are familiar with all of the exits from the building.

2. Good laboratory practice

At all times aim to keep your laboratory environment neat and clean, as well as hazard-free for the benefit of others as well as yourself

2.1 Leave your personal belongings outside the laboratory, using the facilities provided. If bags are brought into the laboratory, they should be placed well under the benches or at the ends of the alley-ways between benches in order not to create a hazard.
2.2 Keep your immediate working environment on the benches neat and tidy.
2.3 Keep all fluids well away from electric cables, contacts and plugs. Report any unusual functioning of instruments immediately; there may be an electrical fault.
2.4 If you notice broken glassware, dispose of it safely.
2.5 Do not leave glass slides or any sharp instruments (e.g. scissors, forceps) in places which may cause injury.

Please help to make the work of technicians who set up the classes and clear the laboratories afterwards as hazard-free as possible. In order to minimise the work involved in clearing the laboratories for other classes:

2.6 Please ensure that your work area is tidy before you leave the laboratory.
2.7 Switch off all electric instruments, such as microscopes, bench incubators, lamps, etc.
2.8 Place all dirty glassware in the labelled containers provided.
2.9 Place all animal matter, including tissues, in appropriately-labelled containers.

Take great care with containers containing bleach!
If in doubt
ASK FOR HELP!

3. How to write up your practical work

3.1 You should keep accurate records of your work carried out during a practical, as a matter of routine.
3.2 Work carried out in specific practical classes may be written

up in the form of separate, short scientific papers. No submission should be longer than eight sides of A4 paper, excluding illustrations.

3.3 Simple line drawings can be used to reduce descriptive text; they do not have to be works of art!

3.4 Your report should comprise the following sections:

- *Abstract or summary.* Concise but detailed summary of the experiments, results and main conclusions. Essentially, this should contain information on what you did, how you did it, and what you found.
- *Introduction.* Brief review of the literature, pointing out what contribution to knowledge you hope to make. You should end with a statement of the hypothesis you intend to test.
- *Materials and methods.* Full description of the methods actually employed on the day (a rewritten schedule will not do). You must give sufficient information to enable the experiment to be repeated exactly. Include information on experimental design and statistical analysis employed to evaluate the results, where appropriate.
- *Results.* Written account of the experimental plan and results supplemented by Tables and Figures (graphs and/or histograms as appropriate) showing the data obtained. If relevant, this section should also be supported by statistical analysis. Where there is no experiment, but biological material to describe, provide drawings (all in pencil). Provide a title. Use a full page for each drawing or series of related drawings and label clearly with horizontal indicator lines where possible. Include a scale bar on the drawing; alternatively, include a magnification factor taken from your microscope multiplying the objective lens magnification by the eyepiece magnification. Also indicate the amount of the field of view. Use a sampling technique to draw high power detail of cellular structure in an organism (e.g. a sector from the centre of a microscope slide specimen). On a facing page, provide an explanation of your material, life cycle or interpretation of cytology. Use material provided to you in the class or gleaned from books during the write-up period. A practical write-up in this way may contain several sets of drawings with accompanying pages.

- *Discussion.* This section should emphasise the results obtained, pointing out any sources of error and any reasons for reservation about the data. You should explain how your work has contributed to available knowledge in the literature. The following questions should also be considered:
  - Are your results as anticipated and do they meet the predictions of relevant hypotheses?
  - How do they compare to similar published data sets?
  - Are there any inconsistencies and, if so, how may these be explained?
  - What do you consider to be the most important finding?
  - How can the work be extended, i.e. what are the next questions which should be tackled?
- *References*. You should give full details of all the papers which you have consulted and used in earlier sections of the text. Only those actually used and referenced in the text should be given.

3.5 General points:
You should use the past tense throughout, as appropriate, and all key statements of knowledge should be supported by references to suitable literature. The mark awarded for your report will be based on an independent assessment of how you contributed to each of the headings given above as well as the overall structure of your report.

REFERENCE

Pechenik, J. & Lamb, B. (1994). *How to Write About Biology.* Harper Collins.

4. Assessment of reports

The following criteria may be taken into consideration in the marking of assessed course work. They may act as guidelines to examiners and students of the skills expected at each level of the degree classification scheme from First Class to Third Class. The final assessment mark will be a synthesis of the scores from the different areas:

4.1 Accuracy and omissions in factual components and principles.
4.2 Conceptual and critical ability.

4.3 Use of material gained from reading beyond lectures.
4.4 Presentation (text and diagrammatic).

The range of normally expected skills within these areas is:

4.1 Accuracy

I: High, with no major omissions or errors.
IIi: Thorough, comprehensive answer, few errors or omissions.
IIii: Satisfactory answer but with some errors or omissions.
III: Basic knowledge with errors and omissions.

4.2 Conceptual and critical ability

I: High, with originality and inter-disciplinary thought.
IIi: Considerable, displaying clear insight and understanding.
IIii: Reasonable appreciation though limited critical ability.
III: Basic ability with little evidence of criticism.

4.3 Evidence of reading beyond lectures

I: Extensive, well selected, researched and interpolated.
IIi: Clear use of additional reading matter.
IIii: Some evidence of additional reading.
III: Very limited or no evidence of additional reading.

4.4 Presentation: text and diagrammatic

I: Excellent concise logic; well chosen diagrams/tables.
IIi: Good clear presentation, well supported by diagrams/tables.
IIii: Adequate structure with some supporting elements.
III: Evidence of training though with limited structure and support.

Example of a feedback form
(Based on the *Hymenolepis* oncosphere hatching – Exercise 3.1)
The scores relate to the major skills to be expected in a good practical write-up. They are offered without prejudice to the final mark provided, which is a synthesis of these elements. A score of 5 indicates a high standard or strong evidence of the skill. A score of 1 indicates that the skill was of a weak standard or lacking.
Note: when assessing quality or style of writing, due consideration must be given to students who are not using their first

language, or who may have a medically recognised condition such as dyslexia.

General

1	Was there good writing style?	5 4 3 2 1
2	Was presentation neat and well ordered?	5 4 3 2 1

Text

3	Were the descriptive elements of a high standard?	5 4 3 2 1
4	Was there sufficient descriptive material?	5 4 3 2 1

Drawings/Results

5	Was there a full range of possible drawings?	5 4 3 2 1
6	Were all drawn elements, graphs, tables or diagrams appropriate/helpful?	5 4 3 2 1
7	Were all drawn elements, graphs, tables or diagrams of a high standard (neat)?	5 4 3 2 1
8	Was labelling complete/accurate with titles to each item?	5 4 3 2 1

Discussion/Conclusions

9	Was there a useful discussion?	5 4 3 2 1
10	Were there specific and adequate conclusions or a critique?	5 4 3 2 1

References

11	Was there evidence that the references provided as background to the practical had been consulted?	5 4 3 2 1
12	Was there evidence that additional references had been found and incorporated in the write-up?	5 4 3 2 1

Other comments:

Section 1
Observational Exercises on Parasites

A. Local wild and domestic hosts as sources of parasites

B. Laboratory maintained species

1.1 Parasites of the earthworm: *Monocystis* (Protozoa) and *Rhabditis* (Nematoda)

D. WAKELIN, D. I. DE POMERAI & J. M. BEHNKE

Aims and objectives

This exercise is designed to demonstrate:

1. The general morphology of the protozoan parasite *Monocystis*.
2. The general morphology of the parasitic and free-living stages of the nematode parasite *Rhabditis*.

Introduction

Earthworms are common terrestrial invertebrates from the phylum Annelida. They are exploited by a number of protozoan and nematode parasites and act as intermediate hosts for many parasites of birds and mammals. Two common parasites are *Monocystis* (Protozoa, Sporozoa) and *Rhabditis* (Nematoda); these infect earthworms only.

Monocystis is the commonest protozoan genus to infect earthworms, but another nine genera have been recorded in Britain. The growing form (trophozoite) and reproductive forms occur in the seminal vesicles of the earthworm; the reproductive forms (sporocysts – contained within larger cysts or spores) also enter the body cavity.

The nematode parasite *Rhabditis* also infects earthworms but only in its larval phase. The parasitic third-stage larvae occur free in nephridia of the earthworm, encysted in the body wall, or encapsulated in the coelom. Adult nematodes develop only when the worm dies, when the larvae begin feeding on the bacteria that break down the tissues. Adult *Rhabditis* is therefore a free-living organism. Several species of *Rhabditis* are involved, of which the most common is *R. maupassi*, but they are difficult to differentiate.

Earthworms have a body cavity (a true coelom), a well-developed blood system and the capacity to defend themselves against some types of invaders. The fluid in the coelom contains