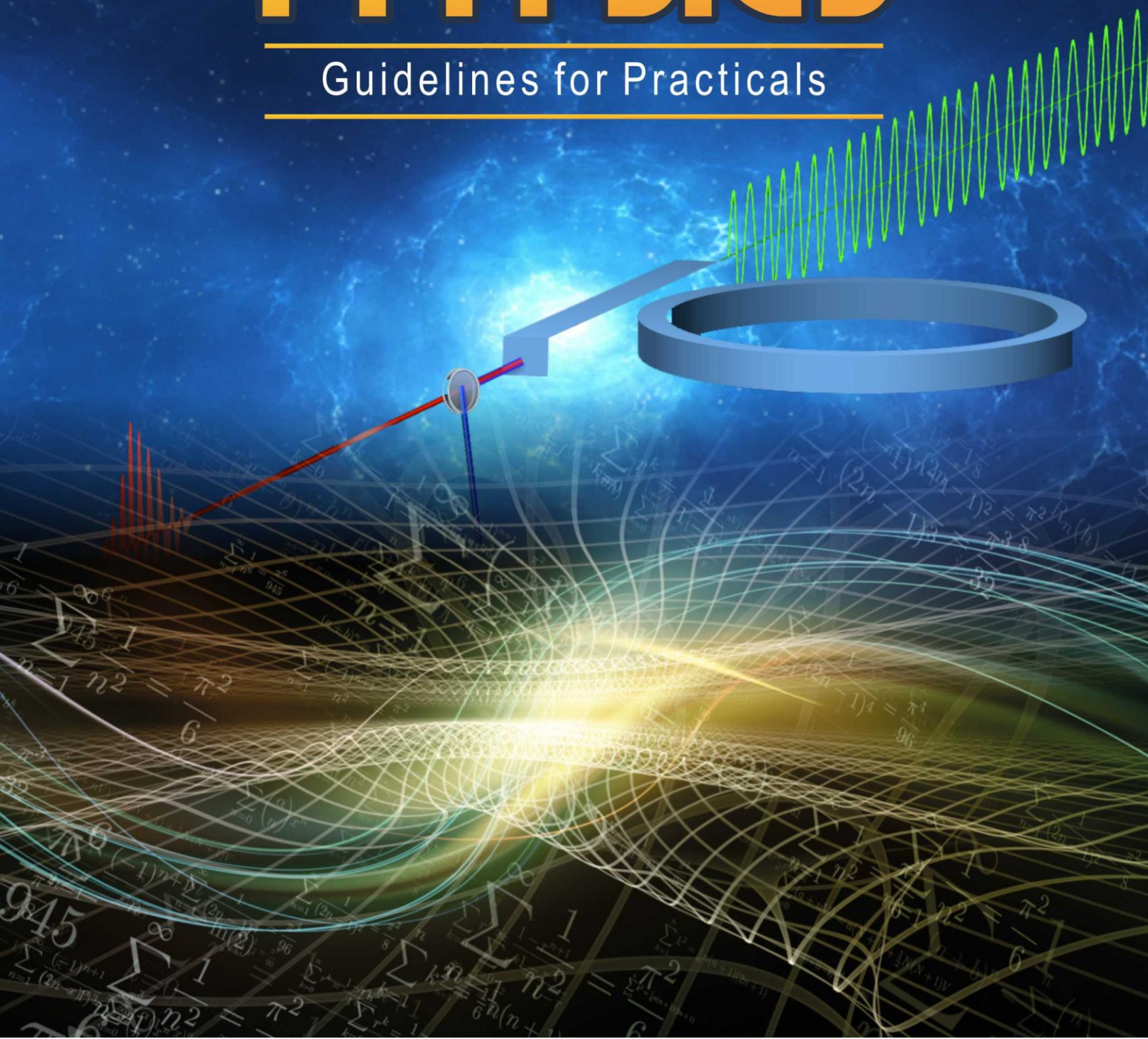
RIPHAH
INTERNATIONAL COLLEGE

# PHYSICS

## Guidelines for Practicals



# Guidelines for Practicals (Physics)

1. **Clarify the importance of keeping a lab book or other records of practical work**

   Explain that students need a record of their achievements to guide their learning. Lab books also can be an opportunity to develop a skill used both by scientists and in business. They allow students to accurately and clearly record information, ideas and thoughts for future reference which is a very useful life skill.

2. **Warn students against plagiarism and copying**

   Explain the meaning of the term plagiarism and that the use of acknowledged sources is an encouraged and acceptable practice, but trying to pass off other people's work as their own is not, and will not help them learn. Show students how sources should be cited.

3. **Explain the learning criteria for each skill**

   This will help students learn and allow them to know when they have met the criteria. The student lab book contains the criteria, but they own the process and have the responsibility for collecting appropriate evidence of success.

4. **Use clearly defined learning outcomes**

   For example, if you are running a practical session to teach students how to use a microscope and staining techniques safely and efficiently, then make sure they know why they are learning this. This will also make it much easier for them to know when they have met the criteria.

5. **Start with simple tasks initially**

   Students need to become confident with the apparatus and concepts of practical work before they can proceed to more complicated experiments. It may be more effective to start with simple manipulation skills and progress to the higher order skills.

6. **Teach practical work in your preferred order**

   Teach the skills as you see fit and suit your circumstances – the assessment process is aimed to be flexible and help you teach practical work, not to dictate how it should be done.

## 7. Use feedback and peer assessment

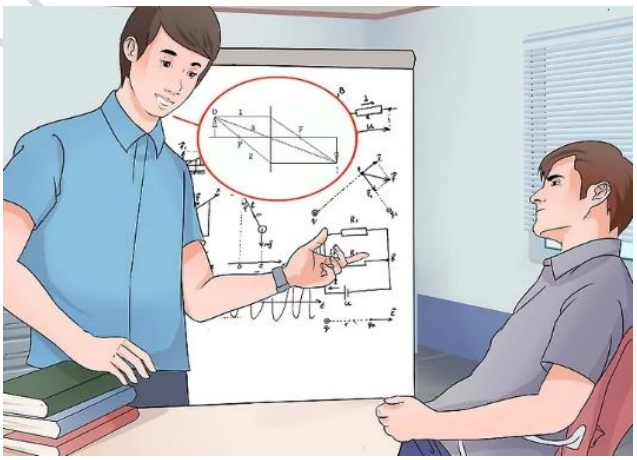
Feedback is essential to help students develop skills effectively. Allowing self and peer review will allow time for quality feedback as well as provide powerful learning tools. However, this is a decision for teachers. The scheme is designed to be flexible while promoting best practice. Research shows that feedback is the best tool for learning in practical skills. Students who normally only receive numerical marks as feedback for work will need to be trained in both giving and receiving comment-based feedback. Provided it is objective, focused on the task and meets learning outcomes, students will quickly value this feedback. Feedback does not need to be lengthy, but it does need to be done while the task is fresh in the students' mind. Not everything needs written feedback but could be discussed with students, either individually or as a class. For example, if a teacher finds that many students cannot calculate percentage change, the start of the next lesson could be used for a group discussion about this. The direct assessment of practical work is designed to allow teachers to integrate student-centered learning (including peer review), into day-to-day teaching and learning. This encourages critical skills. Research indicates these are powerful tools for learning. For example, teachers could ask students to evaluate each other's data objectively. The students could identify why some data may be useful and some not. This can be a very good way of getting students to understand why some conventions are used, and what improves the quality of results. This also frees up marking time to concentrate on teaching.

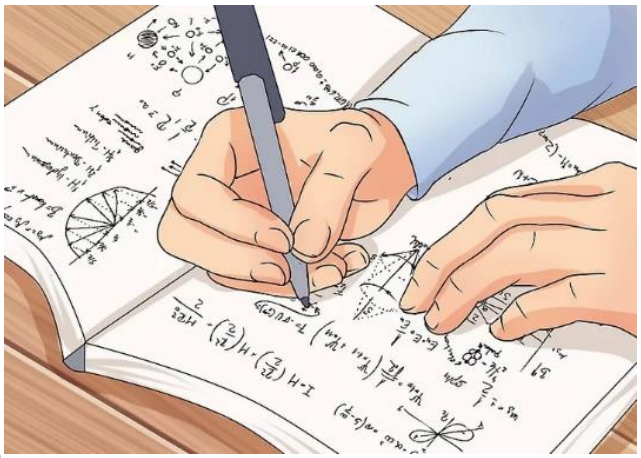
## 8. Use group work

This is a very useful skill, allowing students to build on each other's ideas. For example, planning an experiment can be done as a class discussion. Alternatively, techniques such as snowballing can be used, in which students produce their own plan then sit down in a small group to discuss which are the best collective ideas. From this, they revise their plan which is then discussed to produce a new 'best' plan.

# General Guidelines to Perform Practicals

| | |
|---|---|
| **Experiment** | Students are provided with equipment and possibly instructions to perform the practical. |
| **Data Collection** | Students must record data while using the equipment. |
| **Data Analysis** | Students must analyze the data. Often this involves graphing it (so as to produce a straight line graph to find slope or gradient). |
| **Calculations** | Students must use the data (from graph) and use the relevant equations to find the unknown. |
| **Analysis of Method and Results** | Students must be able to assess the method and results of the experiment in terms of accuracy and suggest the improvements. |

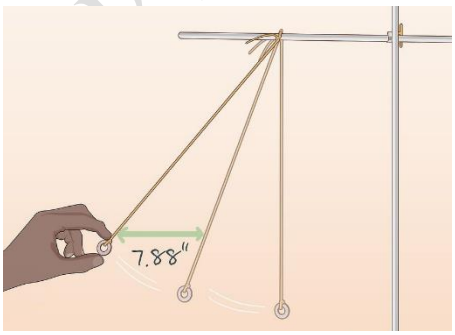


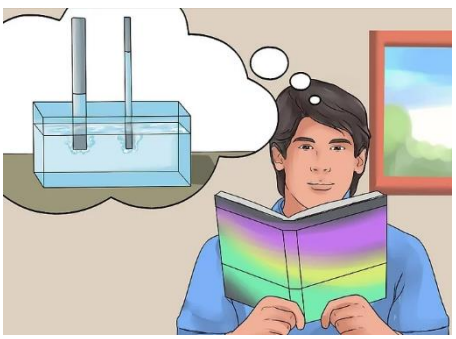



## Physics (Lab I)
## Proposed Practicals

| No. | Title of Practical | Apparatus | Learning Outcomes |
|---|---|---|---|
| **1** | Introduction to Lab courses | Practical Notebook | To develop the interest in students |
| **2** | Drawing and interpretation of graphs | Graph paper, pencil, ruler | To make students capable of drawing graphs in the upcoming practicals. |
| **3** | Graphical techniques for the calculation of Slopes / Gradients and Tangents | Graph paper, pencil, ruler | To make students capable of interpreting graphs in upcoming practicals. |
| **4** | Measuring techniques and use of various instruments<br>• To find the length and diameter of cylinder using Vernier calipers<br>• To find the diameter of wire with a micrometer screw gauge. | Solid Cylinder, Vernier calipers, half meter rod, screw gauge and wires | To determine the quantitative properties of small objects such as cylinders, wires etc. |
| **5** | Determination of the acceleration due to gravity 'g' by means of a compound pendulum. | Compound pendulum with two knife edges, support, beam compass, stop watch, sharp wedge, telescope, spirit level and meter rod. | To determine the value of gravity. |
| **6** | Calculation of Radius of Gyration and moment of inertia of Compound Pendulum | Compound pendulum with two knife edges, support, beam compass, stop watch, sharp wedge, telescope, spirit level and meter rod. | To determine the value of radius of gyration and moment of inertia. |
| **7** | Determination of spring constant of a given spiral loaded with weights | Spiral spring, hanger with loaded weights, heavy retort stand, stop watch, screw gauge and Vernier calipers | To determine the spring constant of spiral |
| **8** | Determination of spring constant of a given spiral loaded with metal bar. | A flat spiral spring, rectangular metal bar, heavy retort stand, stop watch, screw gauge, Vernier calipers and spring balance | To determine the spring constant of spiral |

| | | | |
|---|---|---|---|
| **9** | Determination of modulus of rigidity of the material of a given wire by Static Method | Barton's apparatus, a set of gm- weights, screw gauge, Vernier calipers, meter rod and experimental wire. | To determine the of modulus of rigidity of the material of a given wire in static condition |
| **10** | Determination of modulus of rigidity of the material of a given wire by Dynamic Method | An oscillating rod of some metallic solid cylinder fitted with a mirror in the center, a rigid support with torsion head, meter road, telescope, Vernier calipers, stop watch, wire of suitable length and radius, screw gauge and spring balance | To determine the of modulus of rigidity of the material of a given wire in dynamic condition |
| **11** | Determination of modulus of rigidity of the material of a given wire by Maxwell's needle | Maxwell's needle, a wire of suitable length and diameter, stop watch, support with torsion head, telescope, knitting needle fitted vertically on a stand, screw gauge, spring balance and meter rod. | To determine modulus of rigidity of wire by using Maxwell's needle. |
| **12** | To determine the surface tension of water by capillary rise method | Three capillary tubes of uniform bore and different diameters, glass strip, wax or rubber bands, beaker or small glass trough, needle, iron stand with clamps, blocks of wood, thermometer and travelling microscope. | To determine the surface tension of water |



## Example

## Measuring techniques and use of various instruments

**Experiment: To find the volume of cylinder using Vernier Caliper.**

**Apparatus:**

Solid Cylinder, Vernier Calipers and half meter rod.

**Construction:**

Vernier Calipers consists of a steel bar of two scales. A fixed scale called main scale and a movable scale called Vernier scale, Usually Vernier scale has 10 divisions equal to 9 small divisions of main scale. Lower jaws are for measuring the length or diameter and upper jaws are for measuring internal diameter. Backside strip is for measuring depth of an object.

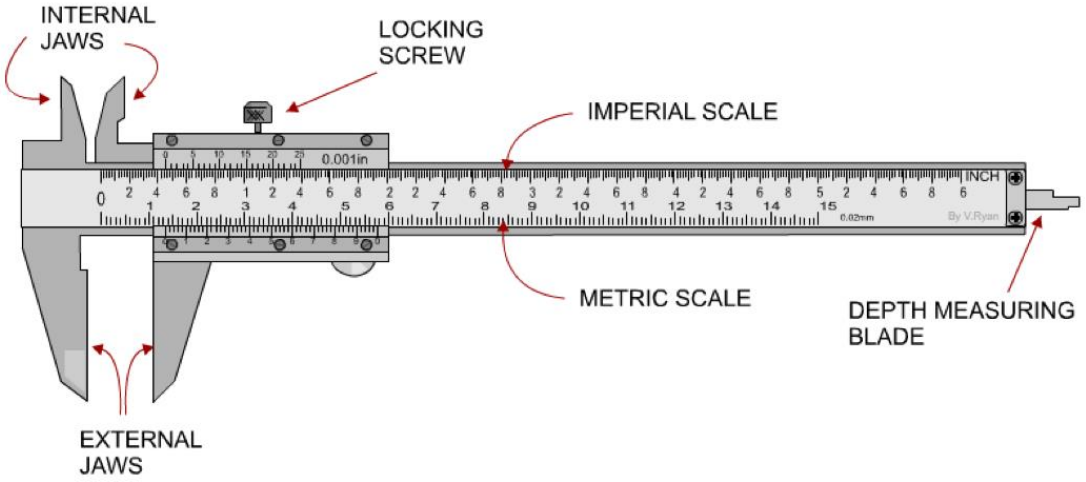
**Procedure:**

1. Find the vernier constant of the given vernier calipers
2. Determine its zero error if any.
3. Place the cylinder length-wise between the two jaws. Read the main scale division just to the left of the zero of the vernier.
4. Locate the number of Vernier divisions coinciding with any main scale division. Note these readings thrice.
5. Complete table up-to the last column.
6. In the same way find the diameter of the cylinder from the different positions. Taking two readings at right angles on each positions.
7. Calculate the mean values of the length and diameter and find the radius of the cylinder.
8. Find out the volume of the cylinder from the formula.

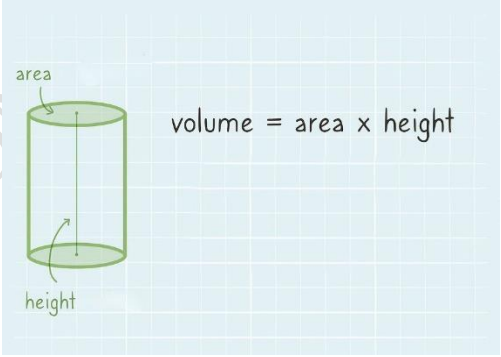
**Precautions:**

1. Take at-least three readings for each measurement.
2. The jaws of the Vernier should not be pressed too hard.
3. Vernier divisions should be read clearly.

**Vernier Calipers**




**Observations and Calculations:**




Value of the smallest scale division = x = 0.1 cm

No. of divisions on Vernier scale = y = 10

Vernier constant (V.C) = x/y = 0.1 /10 =0.01 cm

Zero error = i) ± zero, ii) ± zero, iii) ± zero

Mean zero error = nill

Zero correction = nill

| No. of obs | Quantity | Main Scale reading | Vernier Divisions coinciding | Fraction | Total reading |
|---|---|---|---|---|---|
| | | $x_1$ | $N$ | $\Delta x = nx \times V.C$ | $x = x_1 \times \Delta x$ |
| | | Cm | | Cm | Cm |
| 1 | Length | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 1 | Diameter | | | | |
| 2 | | | | | |
| 3 | | | | | |

Mean Length of the cylinder =

Mean Diameter of the Cylinder =

Radius of Cylinder = R = D/2

Volume of Cylinder =V = $\pi\ R^2 L$ =

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# Plagiarism Policy

Plagiarism is the practice of taking someone else's work or ideas and passing them off as one's own. It's good to learn from someone else and take help from the internet, especially for analyzing gaps in the current state of the art, but the proper citation is required. Teachers are required to look into the plagiarism possibilities in term projects. In the case of Plagiarism, students will be assigned an "F" grade in the relevant course and their names might be displayed over notice boards based upon the severity of the plagiarism and strength of evidence.