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Practical report: engineering

Synopsis (or Abstract)

The experiment aimed to determine the head loss coefficient K and Le/D ratio for a series of pipe fittings and compare these with published values. The pressure drop across a variety of pipe fittings was measured for a range of flow rates. *Results showed that as the Reynolds number increased from 30,000 to 60,000 the head loss coefficient for all fittings reduced by approximately 20 percent.* Le/D ratios and K valued do not remain constant for varying flow rates. This is contrary to predictions. The inaccuracies within the experiment may be reduced by updating and maintaining pipes and fittings.	**Aim** Method *Results* Discussion Conclusion

Aim and Introduction

The **Aim** of the practical may be part of the Introduction, or it may be required as a separate section. In the Aim you briefly state the purpose and scope of the practical, but you do not include detailed information about the method used.

Example:
The aim for the practical was to determine experimentally the overall heat transfer coefficient of a tube in the tube heat exchanger and to examine the effect of varying fluid velocity on this quantity.

In the **Introduction** you state what you investigated and give background information, including any relevant equations. You may include a brief reference to relevant theory and practice and predict the likely outcome of the practical. You may refer to published material.

Example:
Holman (1992) states that the overall heat transfer coefficient increases with increasing fluid velocity. This experiment was designed to confirm this relationship and to explore the difference between parallel and counter flow heat exchanger arrangements.

Sometimes in the Introduction you include a **hypothesis** which is a prediction about results, using the information available at the time.

Example:
The experiment was to test the hypothesis that the heat transfer coefficient increases with increasing fluid velocity.
or
Theory predicts that if the fluid velocity is increased, the heat transfer coefficient increases.

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Methods: techniques you used

In the Methods you set out the procedure you followed during the practical, specifying the materials and equipment you used and what you did with them. To carry out the practical you were probably given a set of detailed instructions in a laboratory manual or handout. They would have included directions such as:
Using the digital top pan balance, weigh a definite volume (100 mL) of planting mix into weighing boats.

You will be expected to incorporate these directions into the report in one of four ways. Do only **ONE** of the following:

- Attach the instruction sheet to the report **or**
- refer to the instructions
  Example:
  The practical was carried out according to page 12 of the Laboratory Manual.

or

- Rewrite the instructions into a brief account of what you did
  Example:
  100 mL of planting mix was weighed.

or

- Rewrite the instructions into a detailed account which could be used to repeat your investigation
  Example:
  A definite volume (100 mL) of planting mix was weighed out into weighing boats, using the digital top pan balance.

You should always record any variations from a standard procedure.

Example:
The volume of planting mix was halved for smaller samples, then adjusted to 100 mL.

Labelled diagrams may be a useful summary of the Method.
Example:

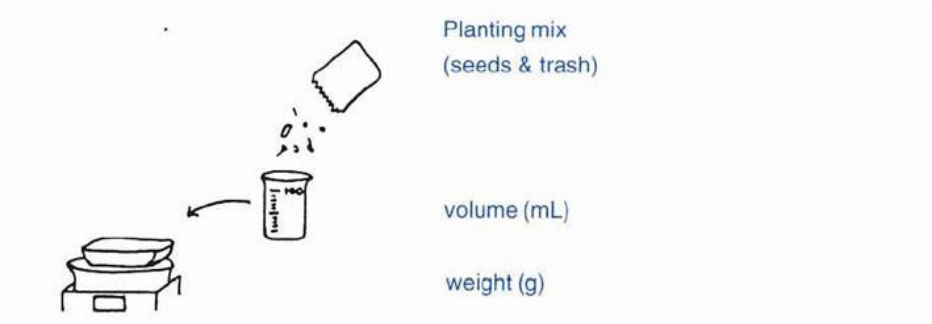

Figure 1 Procedure for weighing (in grams) a known volume (100 mL) of planting mix

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Results

Calculated results

You may be required to include formula(s) and details of calculations to show clearly how you arrived at your final results. Explain the meaning of each symbol.

Example:

Mass flow rate

$M = 0.128 \sqrt{\Delta h_{Hg}} = 0.128\sqrt{35} = 0.757$ kg/s

(Where M is the mass flow rate Δh_{Hg} is change in height of the mercury column.)

Results presented in tables or graphs

Where appropriate, use tables and graphs to present your results.

- Number tables and graphs in order
- Give each a title
- Include headings and units

Example:

Table 1 Derived Flow Velocity in Various Pipes

Volume Flow Rate ($10^{-3}m^3/s$)	Resulting Flow Velocity (m/s) Pipe Type and Size		
	75 Schd 40	50 ID Plast	80 ID Plast
6.26	1.313	3.189	1.245
6.57	1.378	3.347	1.307
7.16	1.504	3.649	1.420
7.32	1.535	3.729	1.456

If graphing results, the choice of graph - e.g. a histogram or line graph - will be determined by the type of data. If you have more than one set of results, plotting them on the same graph allows for comparison. Label axes on graphs and plot clearly, using a set of symbols.

Example:

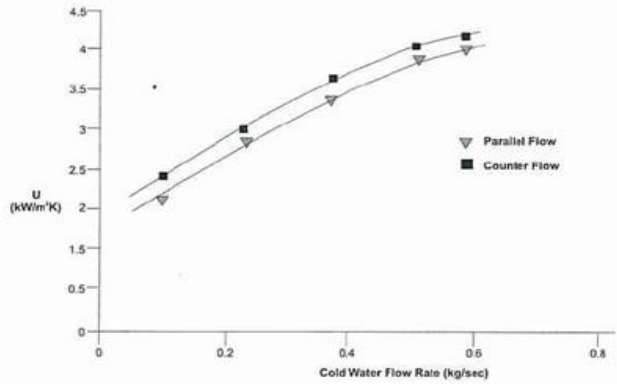

Figure 2 Variation of Overall Heat Transfer Coefficient (U) with increasing cold water mass flow rate

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Written descriptions

If providing written descriptions in your Results section, summarise in words the key findings from your calculations. Where tables and graphs have been used, refer to them and the results they contain.

Example:
As the volume flow rate increases the resulting flow velocity also increases (Table 1).

Discussion and/or Conclusion: what the results mean and how they relate to the theory

Relating your results to knowledge and practice outlined in the Introduction of your report

Example:
The generally accepted value for g is 9.81 ms^{-2}although there are global variations. The values for g_{polar} and $g_{equator}$ are 9.8322 ms^{-2} and 9.7803 ms^{-2}(Tennant 1992). The value calculated from the experimental data is g = 9.85 ms^{-2} which approximates the generally accepted value to within 1%.

Commenting on any unexpected results or outcomes

Example:
This variation seems reasonable given the obvious inconsistencies in the data for t_C and the accuracy of the measuring instruments which were used.

Acknowledging any problems, limitations, inconsistencies or errors in results and suggesting probable reasons

Example:
The large error associated with this value can be attributed to the set of data for t_C which does not show any trend demonstrated by t_B and t_A.

Suggesting further investigations or extensions of your experiment

Example:
Applying this approach and using the formula

$$T = 2\pi\sqrt{l/g}$$

It would be possible to use the relevant value of g to calculate the period of the pendulum at any location, e.g. at the summit of Mt. Kosciusko.

Your **Conclusion**: summarising your findings as they relate to the stated aim of the practical.

Example:
Although the accepted value for the acceleration due to gravity (g) for rigid bodies is 9.8ms^{-2}, variations exist according to the geographical location.

Acknowledgements
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