Student's document

TESTING TIMES: Taking part in a laboratory proficiency test

Imagine you run an analytical laboratory. How can you persuade potential clients to use your laboratory? They probably have lots to choose from. To start, you would want accreditation from a recognised organisation such as UKAS (the United Kingdom Accreditation Service). This means showing, amongst other things, that you have suitably qualified staff and appropriate equipment. But that may not be enough. It's likely that many laboratories are accredited. So what else can you do? Many laboratories take part in proficiency tests.
You can find out more at
http://www.vam.org.uk/proficiencytesting/proficiency.asp

Your brief
You are a member of the analytical team in a laboratory that carries out routine analyses on pharmaceutical products. The laboratory is already accredited, but now it wants to enhance its reputation by taking part in a proficiency test. It will receive a number of samples for analysis. The team must carry out the analyses and evaluate them against the actual compositions of the test samples.

Your investigation
Planning
You will work in a small group.
The group will be given samples of pharmaceutical ingredients for analysis from this list (how many depends on the number of people in your group):

- Sample A: contains ibuprofen
- Sample B: contains aspirin
- Sample C: contains calcium carbonate
- Sample D: contains iron(II) sulfate
- Sample E: contains paracetamol.

Each sample should be analysed by at least two different analysts. Obtain copies of the standard procedures you need to use. Read them carefully and decide which analysis or analyses each member in the group will do.

Practical activity
Your teacher will tell you when the proficiency test is to be carried out. You will need to set out your work area. Collect apparatus, solutions and chemicals needed and set them out. Remember that a risk assessment must have been carried out before you start work.

If you haven't encountered back-titration before this definition may be helpful:
'A back titration can be used to find out the amount of a substance (A). A measured quantity of A is reacted with an excess of reagent B in a solution of known concentration. The amount of unreacted B is determined by titration against reagent C in a solution of known concentration. From the amount of unreacted B, the amount of A can be calculated'.

Recording and Data sheets
You will be given an '*Analysis recording sheet*' for each analysis you are responsible for. Each member of the group will also be given a '*Summary sheet*' on which the group's analytical results must be written. Complete and hand in

both. Before you start, make sure you have the correct standard procedures and recording sheets.
Once the group has completed all the analyses they will be given a '*Composition of samples'* **datasheet**.

Tips for finding information
You may be given the standard procedures or be asked to find them yourself. If you are asked to find them, here are two possibilities:

- Go to the website http://standardbase.vapronet.nl/ and click on 'View or conduct a StandardBase procedure'. Use a keyword search using the names of the substances being analysed.
- Go to the website http://www.chemsoc.org/networks/learnnet/standprocgcse.htm and search the files listed.

Your teacher may give you other suggestions.

Procedures
Depending on the samples being analysed, the group should select from this list of standard procedures for the determination of:

- ibuprofen using acid/base titration
- aspirin using acid/base titration
- calcium carbonate using complexometric titration
- iron(II) sulfate (ferrous sulfate) using redox titration
- paracetamol using redox titration.

A risk assessment must be carried out before starting practical work.

Your findings
Write your results and conclusions on:

- **Analysis recording sheet**
- **Summary sheet**

Your group's proficiency will be assessed by your teacher. Remember, in a laboratory proficiency test it is not the individual members who are being assessed, it is the team as a whole.

The compositions of the samples will be known by your teacher and, once the analyses are complete, you will be given the Composition of samples datasheet. For each pharmaceutical ingredient, you will analyse a number of samples and record the results of your analyses in a table like this (see Summary sheet):

Purity: percentage by mass (grams of pharmaceutical ingredient per 100 g of sample)			**Actual composition of sample (g/100 g)**	**Comparison of analytical results with actual value**
Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):		

1. Record the values for purity for all samples of the pharmaceutical ingredient tested, writing the name of the analysts and the calculated purity.

2. Write the actual composition of the sample (your teacher will tell you or you can find it from the *Composition of samples* **datasheet**). This composition tells you the actual purity.

3. For each sample, calculate the percentage difference between the value for each sample and the actual value. This will be a positive value if your value it too high or negative value if your result is too low.

4. To pass the laboratory proficiency tests your group must produce analyses that fall within acceptable percentage errors. Your teacher will tell you what these are.

Student self assessment

This activity was about using scientific knowledge and understanding to solve problems and working in teams to solve problems. In 50-100 words say:

- what scientific skills and knowledge you used and how effectively you used them.
- how you worked as a team and give examples of how you supported others in your group or were supported by them. What is the advantage of working in a team?

Student sheet: LABORATORY PROFICIENCY TEST Analysis recording sheet

Pharmaceutical ingredient: _____

Titration of _____ against _____

	1	2	3	4
1st burette reading / cm^3				
2nd burette reading / cm^3				
difference / cm^3				

Calculations:

Pharmaceutical ingredient: _____

Titration of _____ against _____

	1	2	3	4
1st burette reading / cm^3				
2nd burette reading / cm^3				
difference / cm^3				

Calculations:

Student sheet: LABORATORY PROFICIENCY TEST Summary sheet

Pharmaceutical ingredient	Purity: percentage by mass (grams of pharmaceutical ingredient per 100 g of sample)			Actual composition of sample (g/100 g)	Comparison of analytical results with actual value
	Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):		
	Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):		
	Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):	Name of analyst: Purity (g/100 g):		
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