BTEC Student Handbook
Level 3 Applied Sciences

“Education is not the learning of facts but the training of the mind to think”

Albert Einstein
This booklet is designed to help you understand the requirement of your BTEC National Applied Science course and allow you to be successful in completing it effectively. This is a 2 year course and you will not receive your qualification until you have successfully completed the 2 years.

You will be continually assessed throughout the course so it is important that you maintain good lesson punctuality and attendance.

As a college we recognise that absence happens and encourage you to contact your teachers via email and make use of the Applied Science OneNote notebook to keep up to date on your work.
Unit Submission Schedule (2017 - 2018).

Year 12 National Extended Diploma in Applied Science

• Unit 1: Principles And Applications Of Science I (90 GLH, Mandatory) - This unit will be external assessment through a written paper lasting 1.5 hours. There are 90 marks in total for the paper. The marks are split into 3 sections - 30 marks for Biology/30 marks for Chemistry/30 marks for Physics. The style of questions will be a mix of multiple choice, calculations, short answer & open response. The unit will be delivered from Wed 6th Sept - Fri 6th Oct 2017. Intensive revision sessions will occur from Mon 30th March 2017 to assist you in preparing for the written exam on the morning of Fri 25th May 2017.

• Unit 2: Practical Scientific Procedures And Techniques (90 GLH, Mandatory). The unit will be delivered from Mon 9th Oct - Fri 17th Nov 2017.

• Unit 3: Physiology Of Human Body Systems (60 GLH, Option). The unit will be delivered from Mon 20th Nov - Fri 8th Dec 2017.

• Unit 19: Practical Chemical Analysis (60 GLH, Option). The unit will be delivered from Mon 11th Dec - Mon 22nd Jan 2018.

• Unit 15: Electrical Circuits And Their Applications (60 GLH, Option). The unit will be delivered from Mon 22nd Jan - Mon 26th Feb 2018.

• Unit 4: Laboratory Techniques And Their Applications (90 GLH, Mandatory). The unit will be delivered from Tue 27th Feb - Thu 29th March 2018.

• Unit 3: Science Investigative Skills (120 GLH, Mandatory) - This unit will be externally assessed through a controlled assessment practical task worth 60 marks. The unit delivery will begin Mon 16th April with practice on investigative skills. The examination board will release the practical activity and you will complete the practical task in class time on Thu 10th May 2018. You will then sit the written paper Fri 11th May 2018. The written paper is 2 hours and will assess your ability to process the data recorded in your practical task. All unit 3 assessments must be with the examination board BEFORE Tue 15th May 2018.

• Unit 6: Independent Investigation (90 GLH, Mandatory). The unit will be delivered from Mon 11th June - Tue 17th July 2018.
Year 13 National Extended Diploma In Applied Science (Biomedical Science)

- Unit 17: Microbiology & Microbiological Techniques (Option). The unit will be delivered from Wed 6th Sept - 21st Nov 2017.

- Unit 5: Principles & Applications Of Science II (Mandatory). The unit will be delivered from 22nd Nov 2017. You will sit your 2.5hr written exam 25th Jan 2018 in the morning.

- Unit 13: Applications Of Inorganic Chemistry (Option). The unit will be delivered from 26th Jan - 16th Mar 2018.

- Unit 12: Diseases & Infections (Option). The unit will be delivered from 19th Mar - 4th May 2018.

- Unit 7: Contemporary Issues In Science (Mandatory). The unit will be delivered from 7th May 2018 and you will sit your 2.5hr exam on 22nd May 2018.

Year 13 National Extended Diploma In Applied Science (Analytical And Forensic Science)

- Unit 21: Medical Physics Applications (Option). The unit will be delivered from Wed 6th Sept - 21st Nov 2017.

- Unit 5: Principles & Applications Of Science II (Mandatory). The unit will be delivered from 22nd Nov 2017. You will sit your 2.5hr written exam 25th Jan 2018 in the morning.

- Unit 13: Applications Of Inorganic Chemistry (Option). The unit will be delivered from 26th Jan - 16th Mar 2018.

- Unit 11: Genetics & Genetic Engineering (Option). The unit will be delivered from 19th Mar - 4th May 2018.

- Unit 7: Contemporary Issues In Science (Mandatory). The unit will be delivered from 7th May 2018 and you will sit your 2.5hr exam on 22nd May 2018.
1. What To Expect In Your Lessons

For Yr12 students most of your work will be internally assessed with the exception of 4 units that are externally assessed either through written examination or through a controlled practical assessment. For Yr13 students all of your work will be internally assessed. Prior to starting an assessment you will receive a series of lessons designed to help you gain the knowledge and understanding necessary to successfully complete an assessment. You should expect a mix of theory and practical based work during these lessons. You will be responsible for recording and storing your own learning notes in the format most suited to you. This is your chance to ask as many questions as you need to secure your understanding, so please bombard your teacher with questions.

Practical work may form part of your assessment. If this is the case your teacher will inform you before you begin the practical. Your teacher will observe you whilst conducting the practical and complete a written observation form that summarises the skills you display. You will be asked to sign the observation form at the end of the practical session.

2. What To Expect When You Are Completing An Assessment

You will be assessed by completing individual assignments. There are typically 3-6 assignments in each unit of work that you study. You will be given your assignment in the form of an assignment brief.

Each assignment brief will include:
a. The start date
b. The first submission date (the date you have to hand in your work)
c. The teacher assessment date (the date your teacher will give you feedback on your work)
d. The qualification being studied
e. The unit being covered
f. A vocational scenario for the task (why you might carry out the task in a place of work)
g. A description of the task you must carry out
h. A description of the evidence you must submit for assessment
i. The examination criteria being covered by the task
j. A list of resources you may find useful to help you complete the task

When you are working on an assignment you must work independently. While you are working your teacher must not:

* Provide specific assessment feedback before the work is submitted
* Confirm achievement of specific assessment criteria

Your teacher can provide general feedback and support, particularly around the development of knowledge, skills and understanding. They will not be able to answer specific questions regarding the task so it is your responsibility to make sure you have asked all the questions you need answering during the theory and practical lessons.
3. How Do You Submit Your Evidence For Assessment

Your work should be word processed, unless otherwise stated by your teacher, and you should always retain an electronic copy for your reference.

The rule framework allows for one submission of evidence for each assignment. All evidence must be submitted through Onenote and placed on your “Finished Assignments” page. If you need to submit drawing completed by hand it is your responsibility to scan the work and upload it in a readable, digital form.

Prior to submitting your evidence to your teacher, you should check the assignment brief to make sure you have evidence for all tasks and that you have signed and dated the declaration of authenticity (this is found within the assignment brief). This declaration is for you to state that the work you are submitting is your own.

When signing this declaration of authenticity it is important that you understand that work should not be copied from another student, be completed by a student other than yourself or be cut and pasted from articles on the internet or textbooks. This is regarded as plagiarism, cheating and collusion. This is a serious breach of the examining body rules and will result in disciplinary action. It could jeopardise you obtaining your qualification.
4. What To Expect When Receiving Feedback

You will only receive feedback when all assignments for a unit have been completed and assessed. Your teacher will formally record your assessment result and communicate this with you in a feedback session. There are 3 assessment grades (pass, merit and distinction). You must achieve a pass grade in all assignments to be awarded a qualification at the end of your course.

Each assignment contributes to your grade for a complete unit. This means that your lowest assessment grade for an assignment within a unit will determine your overall grade.

For example:
If you achieve 4 distinctions and 1 merit in your assignments for one unit, the award for the unit will be a merit grade.

Alongside grading you will also receive guidance on how to progress in your learning and skills acquisition.

You should regard all results and predicted grades as provisional until you receive your official examination certificate, at the end of the 2 year course, as work is subject to moderation and can be up or downgraded by the examination board.
5. What To Expect If You Are Given A Resubmission

You should always aim to produce your best work and pass each assessment on the first submission. However sometimes your work may just fall short of the examination criteria. In this case your teacher will ask the Lead Internal Verifier (Rachael Verney) to authorise a resubmission of evidence. This is your opportunity to improve your work and your assessment grade.

Only one resubmission opportunity is allowed for each assessment but it is important that you understand that you are **not guaranteed** a resubmission. This is at the discretion of the Lead Internal Verifier and they will assess your work to make sure that **all** the criteria listed below are met;

a. You have met the first submission date or an agreed extension first submission date

b. Your teacher can judge that you will be able to produce improved evidence without any further assistance

c. Your teacher has authenticated the evidence submitted and you have signed and dated your own declaration of authenticity

If you **do not meet these criteria** the Lead Internal Verifier will **not be able to authorise you with a resubmission**.

If you are authorised for a resubmission of evidence you will be given a resubmission date that is within **15 working days** of you receiving feedback.
You must resubmit your improved work, by this date, for the assessment to count towards your BTEC qualification.

6. Illness/Family Bereavement

If the event that you are unable to attend college due to illness or a family bereavement you may wish to apply for an extension to the submission date of an assignment. The Lead Internal Verifier (Rachael Verney) is the only person authorised to issue such an extension. You will need to ask your parent/carer to email the Lead Internal verifier on your behalf at rverney@parksidefereration.org.uk, detailing the reason for the extension request. A decision regarding your request will usually be given on the same day but can take up to 48 hours.

7. Appeals Procedure

If you feel that your work has not been correctly assessed you should approach the Lead Internal Verifier (Rachael Verney) stating your concern. The Lead Internal Verifier will then arrange for reassessment of your work to take place, within 5 working days of receipt of the appeal. The Lead Internal Verifier will meet with you to discuss the outcome of the appeal.

8. How Can I Use My Qualification For Higher Education

The tables over the page are a useful tool to allow you to set personal goals and calculate the grade you need to achieve if you want to progress to a University career. You may need to contact the admissions tutor directly to find out the
grade required for your chosen University course but all UK Universities will recognise the BTEC qualification.
### Table To Convert Final BTEC National Extended Diploma Grade Into UCAS Points

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Table To Illustrate The BTEC Points Required For Each Awarding Grade In The National Extended Diploma In Applied Science Qualification

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9. What To Expect When You Enrol For Your BTEC Course At UTC Cambridge.

When you enrol you will be given a letter that explains our requirement for you to have daily access to your own electronic device that can connect to the Internet and is capable of running the Microsoft office suite. This is necessary, as all your work will be submitted electronically.

You will receive termly reports that will provide you with your current provisional point score and provisional predicted grade so that you can monitor your progress towards your career goals.

Please note that all point scores and predicted final grades act as a guideline only. The examination board will adjust your final grade based upon both your internal assessments and your external assessments if you are in Yr 12 or just your internal assessments if you are in Yr 13.

10. Relevant Prior Learning

If you believe you have relevant prior learning (such as BTEC units taken at another college) that you would like to be accredited with us, please speak to Rachael Verney or Danielle Pacey during the enrolment day.
11. Example Of An Assignment Brief

UTC CAMBRIDGE Centre No: 22231
BTEC LEVEL 3 Diploma / Extended Diploma in Applied Science

UNIT 2 Working In The Science Industry
ASSIGNMENT 1 Communication In The Workplace

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Assessment Criteria Covered

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<tr>
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Start Date
First Submission Date
Learner Actual First Submission Date
Teacher Assessment Due Date

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<td>Resubmission Date - If Authorised</td>
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Aim: The purpose of this assignment is:
- to enable you to understand the organisational structure of a scientific workplace
- to allow you to demonstrate your knowledge and understanding of how effective communication occurs in a scientific workplace
- to allow you to analyse how poor communication in the workplace results in accidents

Scenario: As a senior technician working in a pharmaceutical laboratory you have been asked to produce an introductory leaflet for new technicians to enable them to understand how scientific results are reported and the potential hazards of not following the company guidelines.
Task

When new trainee technicians enter the laboratory it is imperative that they understand the organisational structure of the laboratory and how the results of their work should be communicated to other team members. This is vital to prevent industrial espionage, which hinders the company’s financial stability, as well as keeping everyone safe in the workplace. Your leaflet will be given to all new trainees as a learning and reference document.

Your leaflet should include:

- An introduction section that identifies 5 ways that information can be communicated within the laboratory.

- A table that expands on the methods of communication you identified in the introduction by explaining, in detail, why each communication is necessary and why the communication must be clear. (It would be helpful to assume that this is a large pharmaceutical laboratory with multiple projects being conducted simultaneously)

- At least 2 case studies (real or imagined) that are analysed in depth to explain why it is important that procedures and practices are communicated clearly and what might/will happen if they are not.

The evidence you need to submit for this task is:

1: A leaflet
Sources of information To Assist You In The Production Of Your Evidence

Textbooks


Journals

*CLEAPSS* publications

*Laboratory News*

*New Scientist*

Websites

[https://sites.google.com/a/utcc.education/rachael-verney-s-applied-science-class/](https://sites.google.com/a/utcc.education/rachael-verney-s-applied-science-class/) - class website containing powerpoints from your lessons, specifications, textbook resources and extra reading.

www.ase.org.uk

www.explorer.bio-rad.com

www.genetics.gsk.com/virtual.htm

www.hhmi.org/biointeractive/vlabs

www.infomat.net/infomat/rd_staffroom/rd1/database/cleapps

www.iob.org.uk

www.iop.org.uk

www.istonline.org.uk

www.mhra.gov.uk

If you use websites or textbooks the work you submit should be in your *own words* and you should include a *reference* section. Please use the Harvard system for referencing.
<table>
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<th>Learner comments</th>
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<td>• The strengths you have identified by completing this assignment activity</td>
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<td>• The areas for development you have identified by completing this assignment activity</td>
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<td>I certify that the evidence submitted for this submission is my own. I have clearly referenced any sources used in the work. I understand that false declaration is a form of malpractice.</td>
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<th>Learner signature</th>
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First Submission - Assessment Feedback Sheet.

BTEC Level 3 Diploma/Extended Diploma In Applied Science.

Unit Code: H/502/5539    Option Or Mandatory Unit: Mandatory

Unit 2: Assignment 1: Communication In The Workplace

Candidate Name:             Assessor Name:

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General comments

Assessor declaration

I certify that the evidence submitted for this assignment is the learner’s own. The learner has clearly referenced any sources used in the work. I understand that false declaration is a form of malpractice.

Assessor signature

Date

COMMENTS ON ENGLISH AND MATHS

English

Maths
Resubmission - Assessment Feedback Sheet.

BTEC Level 3 Diploma/Extended Diploma In Applied Science.

Unit 2: Assignment 1: Communication In The Workplace

Candidate Name:  Assessor Name:

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Communication in a Pharmaceutical Laboratory

Case study 2:
A fire that was caused by calcium carbide, a cupboard with the calcium in was found to be smoking, the technician assistant inductively was called to put the fire out, the assistant was then taken to hospital after inhaling the fumes (Awan, 2016; (online) Available at: http://cdh.edu.kh.edu.net/el/ed/science/la

In a pharmaceutical laboratory safety and communication is important. To remain safe, the hierarchy of the lab has to communicate with everyone below them. It is done through 5 main ways.

5 ways that information is communicated within a laboratory
- Lab Books
- Verbal communication
- Scientific posters
- Procedural steps
- Use of equipment

© Cambridge Academy For Science And Technology
### Lab Book:

The lab books are needed because the experiments and findings that are occurring in the lab can be recorded. It is needed for anyone that is using the lab or the equipment while it is in use.

The lab books are specific to the laboratory; this is because of the theories behind the experiments and the knowledge behind it. The lab books must be clear because if the practical is needed to be put into a different area because of the practical. If these are not done the practical can be failed or the possibility of death from fumes that may be occurred.

The lab books also need to stay in the lab and make sure the confidential information does not leave the lab.

### Verbal communication:

Verbal communications are useful because it can be quicker than any other type of communication, this is due to the quick reactions as the person that is being told things, does not need to read things.

This is for the general public as well as within the lab, this is due to if there are public visits. What is said is needed to be clear because if anyone does not hear what is said, they could be putting themselves and the people around them in danger.

The safeguards is that if anyone says the wrong thing, or it is mistranslated between peers and this will mean the instructions are different from what was intended.

### Procedures (safety and how to use equipment)

The procedures of a lab, training and safety of using the equipment, is needed because the assistants to the lab and the users of the lab can remain safe while using the equipment.

It is specific to the laboratory because the procedures for the equipment is different in different labs. These instructions must be clearly understood, because if they are not it can result in the damage of the equipment as well as the person.

The safeguards that is needed is that people follow the procedures which would include not taking information home, like written content.

### Scientific posters

Scientific posters are needed for giving information to the general public as well as other researchers. The posters usually contain information on safety as well as new discoveries or other understanding on previously found discoveries.

It needs to be clear so people can understand what the posters are suggesting. If it is not clear than the person making the posters that present a new discovery may not get credited.

Safeguards that are needed on the poster is copyright as the ideas on the poster can be credited to other people.

### Lectures:

Lectures are needed for giving information to the general public as well as other researchers. The lectures usually contain information that people in that field of research would understand but the general public can join and try to understand it.

The lectures need to be clear, this is because if it is not the information that the people are listening to could be wrong. This could mean that any research that are being done could be misdirected, if the information was incorrect.

Safeguards that are needed is that the information is correct so that research is not misdirected.

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**Case study 1:**

While a practical of mixing iron and sulphur and gently heating the solution was occurring, the teacher had already instructed the students to use minimal of the chemicals and to only heat the mixture for 5 minutes. One of the students had a reaction to the fumes that was released and struggled to breathe. The teacher had opened the windows but forgot the exhaust fan, and some students put too much chemicals in and heated for more than 5 minutes.

(Anon, 2016)

The communication error that occurred during this practical is the students, they did not follow the teachers instructions or simply did not hear what they were saying. The consequence of this breakdown of communication was the student having difficulty breathing due to the fumes. The communication could have been improved by the teacher checking that everyone understood the instructions.

The people that are responsible for this incident is the teacher and the students, the teacher for not checking whether the students understood the instructions. The students were also at fault for not following the instructions of the teacher. Any communication that is needed to improve is the communication between the teacher and the students.
11.2 Example Of Merit Grade Work For The Assignment

Communication within lab environment

By Camille M Sandal
Introduction

Communication in the workplaces increases safety and progress in the study. There are many different ways of communicating to use periods or other colleagues. There are many different ways that communications can be done in a lab environment. For example, a manager or head of department could use email or letter to convey information about certain issues. Something else that could be used for communication is word-of-mouth people could communicate by talking each other about different lab experiments or safety measures. Another way of communication could be lab notes if experiment is running and lab notes are near the people who do not know anything about experiment could look at the lab notes and realise that they should not turn it off or should not touch specific equipment.

Why communication is important within lab environment

• Email/letter

Emails or letters are important in a work and lab environment to convey different information. This type of communication is usually needed to convey information about how to conduct an experiment to a scientist from another scientist, or perhaps a scientist can email a document about an experiment and another scientist could peer review it, it is usually best to email or write to the scientist since word-of-mouth would not work or meeting or social media. An email or written letter could be used by scientists or managers to communicate with each other. For example, a scientist could write to a manager using email about results about an experiment and progress in the work. It is important to be clear in your letters or emails because an email or letter describing a certain experiment or science is important that it is clear so that the scientist receiving the email understands the experiment completely so there are no accidents. To safeguard and prevent data from getting leaked when using an email, you could encrypt it or use a password to secure it. Emails and written letter, should not be used for the topics that must be discussed with more than one person. Emails are good for one-to-one communication, instead of information that needs to be discussed with more than one person. For example, if it is a scientist needing peer review on an experiment that they are doing they can email the information to another scientist or if there is an issue in the lab they can email their superiors.

You can also have posters communicate different scientific methods and ideas these posters could be safety posters about different equipment or chemicals. Meetings could also happen between co-workers and superiors to discuss different experiments or perhaps an issue with the lab and convey information about certain things. These in the many different ways that communicating in the lab is done, this communication is very important because it increases the safety of different people in the lab and also different scientist can communicate with other scientist to improve their experiments or theories.

• Word of mouth

Word of mouth is a useful tool to convey quick small snippets and information in the lab and work environment, word of mouth could be needed in order to allow you to quickly convey specified amounts of equipment or chemical in an experiment in between scientists. It could be used between two scientists doing an experiment in a lab. This method of communication is use in everyday life not just in a laboratory, it is used to convey large amount information and a small amount of information such as, feelings to general facts, everybody uses this method of communication. This type of communication is also important because it can be very small amounts of information about an experiment or the amount of some solutions while doing an experiment that could help science and decreased safety risks. You must be clear when explaining something in case there is a safety issue, also could be an issue with experiments for example mistake could be made if a scientist does not understand or hear the scientist who knows more about the experiment. There are not many safety guards needed for the communication using word-of-mouth, if there are any safeguards needed all that a person could do was ensure secrecy from someone else not to disclose any information. For example, a scientist could know something secret and essential to the field that he is working in he must make sure that everyone who knows about that secret does not tell anyone else.

This communication is good if you wish to convey information that does not need to be remembered at a later date or information that does not need to be in a lot of detail, for example if a scientist needs to convey or discuss details about how a method is planned it is easy to do it by word of mouth so they can have a discussion rather than write it down, because if they write it down it will take time and may not get the full point across another example could be that two scientists are doing in experiment and one is not 100% sure on which specific volume that he needs for a specific chemical so he would ask his partner to read the method. It is not good if you need to convey large amount of information that needs to be remembered in a lot of detail, for example a scientist should usually write down a method for an experiment and then give it to another scientist to review rather than that scientist explaining it by word of mouth, since the scientist that is listening to the method would most likely not get the important details and be overloaded by information.

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• Meetings
Meetings are a good way of communicating different issues between different people in the company. Meetings can be used to communicate different information between scientists and managers or CEOs. For example, if a scientist has finished an experiment or has trouble with an experiment he can have a meeting regarding the progress that he is made, then the other scientists can comment or assist and the manager or head of Department can see if, any action needs to be taken by others to assist. Meetings are not only used regarding labs they are used by all different companies and workplaces, such as business like banks or development companies, or the army. Meetings are important to be clear so that each scientist can have an updated report on different experiments and successes and information, it is also important to be clear because then the manager CEO or head of Department can understand what progress and what issues have occurred.

• Lab notes
Lab notes are useful way of communicating between scientists and lab technicians. Lab notes could be needed to communicate about an experiment or results for example if the scientists were doing an experiment, and had an assistant, the assistant would need the scientists lab notes to check how the experiment would be properly done. The lab notes could be used by many people, the scientist could add them in the scientific diary. Lab notes are important with communication because if another scientist or a lab assistant find your experiments unattended they can look at the lab notes and see what the experiment is about and then make a decision, on whether to leave the experiment or to tidy it up. It’s important to be clear when writing lab notes, in case someone needs to read them and understand the experiment so they know either to leave it alone or add specific thing to machine or a liquid or for example don't touch equipment because they may be dangerous. You could safeguard your lab notes if it is necessary by putting them in a secure area and if they are on your computer a password on the files or documents, but only if it is necessary. It is only necessary to safeguard your lab notes, if they have important information about an experiment or results that if leaked can damage your company or you as scientist. Lab notes are good for conveying information about experiments and results, but they are not good at conveying large amounts of information for example lab notes should not be used in conveying for details about a scientific theory, is more easy to use a journal to convey that much information.

There needs to be scientific safeguards on the information that is usually discussing the meeting because the information can be very important to that company, for example the information could be about results of an experiment that was done in the lab and could affect the company if released to the public. The people who take part in the meeting could make a confidentiality promise to not discuss anything important outside work, and all files that were in the meeting could have a password on them so not just anyone can access it from the computer. Meetings are usually good to discuss large amount of information about an experiment and results or progress of couple experiments. Meetings are not good for small information that does not involve a lot of people, for example if a scientist needs a little bit of help with an experiment and the amounts of quantities in the method he would not have a meeting to decide this. Meetings are important for a lot of people to communicate up through the chain of command and it is also useful for higher management to understand what is going on with their employees.
Case study 1

Case study 1

“...In a university lab, to students were conducting an experiment with dangerous explosive chemicals. The to students used a solvent to keep the explosive chemical, wet and under control. When they poured the solid in the explosive chemical bubbles formed, one of the students decided to use a mortar and pasta to get rid of the bubbles, because he thought that they may have affected the results if they did not get rid of the bubbles. When the students use the personal mortar she ground the explosive chemicals were it was dry within the bubbles and it caused the chemical to explode. The student who had caused the explosion suffered severe burns and damage to his hand, arm, face, chest and lost two fingers. The other student that was only a metre away suffered burns as one.”

Case study 2

Case study 2

A visiting inspector was visiting a lab. He was inspecting the lab, and being shown around by a lab technician. The inspector asked to be shown the condition of a specific machine. The machine hard experiment in it, but the lab technician tendered on anyway, showing the inspector. Then the lab technician showed the visitor around the lab forgetting that he had left the machine turned on. The machine had chemicals in it and because it had been left running chemicals got mixed and affected turning them toxic. The scientist that was running the experiment came back and opened the machine to gather his equipment results. With the machine opened the toxic fumes from the chemicals got released and the scientist inhaled them. This caused him to collapse and he needed to go to A & E.

Case study 2

Case study 2

It's very important to communicate in the workplace. In this case study, the lack of communication regarding the lab technician knowledge of the machine is being lacking. As well as the scientist did not leave a note or anything to indicate that the machine should be left alone. Because of the lack of education of the lab tech, and the scientist negligence to leave a note, it ended in the scientist breathing in toxic fumes and going to the hospital. If the lab tech was more educated in the machines and the chemicals he may not have touched the machine to begin with. Also if the scientist had left a note or his lab notes on the machine saying that machine should not be touched after it had run the experiment, the situation could have been avoided. There are many people who could be counted for this accident, the scientist for not communicating that the machines should not be touched or that the chemicals inside the machine could potentially be toxic. Also the lab technician was at fault for touching a machine with an experiment in it that he knew nothing about. Another person I could be held responsible would be the manager who has responsibility over all the staff and hired both the scientist and the lab tech. To prevent further incidents many things could be done, for example the lab technician could have further training with regards to machines and chemicals in the lab. The scientist also be educated in communicating with other members of the staff about experiments in the lab. Both these things could help prevent something like this again.

References


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11.3 Example Of Distinction Grade Work For The Assignment

Communication within a pharmaceutical laboratory
Introduction

Communication within a scientific workplace, specifically a laboratory environment is absolutely vital in order for the area to remain safe and to try to keep data secure. Examples of these are face to face, lab books, scientific paper, meetings, and recording video to produce evidence of the procedures carried out. All these examples are variations of types of communication that is done within a lab environment, and are vital to the hierarchy of a lab environment. Just one failure in communication within a chain of command could lead to catastrophic and potentially fatal consequences. A pharmaceutical lab is a laboratory that produces medicinal products using chemicals and biological materials.

Methods of Communication

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<thead>
<tr>
<th>Form of communication</th>
<th>Why is this form of communication necessary?</th>
<th>Why must this form of communication be clear?</th>
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<tbody>
<tr>
<td>Face to Face</td>
<td>This form of communication is necessary in a laboratory because without it nothing would be able to be completed as without talking to other people within the lab you would not be able to ask questions about anything. Oral communication is extremely important in order for all the members of the lab to understand what is going on at any given time. When they are talking they have a chance to question any uncertainties that they may have about any information that they have been told in the conversation. This allows the team member to be able to get on with work if that person who they were talking to is not in when they have to do their work. Face to face communication is also necessary in order to discuss any issues that may have occurred in an experiment so that you can work out what went wrong or needs to be done differently. Face to face communication is quite secure as it is just a conversation between either</td>
<td>Face to face communication must be clear to those in the conversation as if it is unclear any instructions could be carried out incorrectly which could lead to an astronomical disaster to occur in the lab, such as an explosion if a chemical was added to a mixture that was not supposed to be added and it reacted very badly. It is also very easy for instructions from one member of staff to accidentally get altered when being passed from person to person. Like in the game Chinese whispers where a message has to be passes along a line of people, in this case along a line within the organisational structure of the lab, it is a similar situation with face to face communication as words and instructions can be misconstrued. When you are talking to anyone regarding what you are doing with your research you must be clear in order to reduce the risk of misinterpretation to occur. This is especially important if you are discussing this information with someone in an external party, you may be required to word things differently depending on who you are talking to.</td>
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colleagues or members of an external party so any information is supposedly safe, unless the conversation is being recorded by an unknown party. Implications of any information being given out to competitors is that depending on what was discussed in the conversation, vital steps of a procedure could be discovered and copied which if the original company wanted to get a patent on the product they have formed and the competitor managed to apply beforehand the first lab may not get the patent despite the information being theirs in the first place.

In order to be able to safeguard any information exchanged in the conversation there would need to be a clause within each employees contract which prevents them from selling or stealing information and giving it to a competitor, and if this clause is breached severe consequences will need to be faced.

Lab notebook

A lab notebook is necessary as it acts as a record of all of the work that you have carried out and any alterations you have made to the task you are performing in the lab. It is also proof of the fact that you have actually carried out what you say you have done as these notebooks usually have to be reviewed by a colleague or a senior member of the lab team.

The lab notebook will contain a step by step method of what you have done, it will also take note of any changes you have made to the practical, as well as giving a detailed explanation of any results you have collected so far. So if a colleagues needs to look at your notebook they can to figure out where you are with your experiment if you are not there and something has gone wrong or the experiment is still running and it is unknown to what is supposed to be done at a certain stage of the practical.

All writing/formatting within the lab notebook must be clear so that others can understand what you have been doing just in case of your absence or for when peer reviewing. If it is unclear when you are not available to be asked for clarification your experiment could be ruined by accident because the method and notes you have written may have looked like something else so the person supervising your experiment may get something wrong.

In a lab notebook you must always update it when a new stage has been carried out or a different material has been used in replacement of one in the method in the notebook. Therefore it must always be clear what has been done or changed so that mistakes aren’t made when you are not around or if someone is using your notebook to try to replicate what you have been doing.

In order to safeguard any information within the lab
The information in this form of communication must be kept properly so it can be as secure as possible so companies can't steal it or use it for their own research. Also dated proof of your work is extremely important for applying for a patent, especially if there is a competitor trying to get the same patent, the dated information may be the only way to prove that the research was completed by you first.

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<tr>
<th>Notebooks</th>
<th>Emails</th>
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<tr>
<td>Notebooks you must not leave it just lying about the lab because it easily be stolen or photocopied. If it is an electronically kept lab notebook you must not leave it open on a computer without supervision incase the fine is saved to memory stick or emailed to an external party that does not have access to the notebook. There should be a clause within each employees contract which prevents them from selling or stealing information and giving it to a competitor, and if this clause is breached severe consequences will need to be faced. Also it is necessary to have good lab security in order to try to protect any of the labs contents.</td>
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<td>Emails are a quick and simple way of communicating information to any colleagues or external parties. It is necessary because of this simplicity as you can transfer almost any form of information whether it is an attached file or info in an actual email. The emails can be accessed as many times as is required so you can reread any information or instructions if need be. Also if you have any questions regarding the information sent to you it is very easy to ask them in a reply. Emails are not limited to just between colleagues, they can be sent to anyone, so if you have written a scientific report n the research that you have done and you wish for others to either proof read or even for it to be published you can send an attachment of your report. Despite them being simple and very easy to use emails can be hacked very easily without</td>
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<td>Emails must be as clear as possible as there is a risk of any instructions or vital information being misinterpreted. So this could have a detrimental affect because this could lead to an accident occurring within the lab because the instructions that you have sent had faulty or unclear information that could have potentially risked a member of the labs life or ruined the practical that they were carrying out. If you are using emails to contact an external party the information within the email must be clear in order for any requests or queries to be correctly answered. Also if the email is being used to request for your scientific report to be published if the initial email is unclear the journal may not want to give you the opportunity to have your work published which could cause a set back in your career. To be able to safeguard any information sent via an email steps need to be taken to legally protect</td>
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Meetings are a good form of communication as it gives the members of the lab an opportunity to discuss and share any information that is important and can be easily presented. It gives them an equal opportunity to discuss with senior members of the lab team what they have done and are currently carrying out for their project. If kept relatively short and not too complex it allows everyone to understand what the rest of the team is doing and why. A team leader or a supervisor can be updated on the progress of the current project so they know what has been happening and know what stage of the project is at. They can alter anything they deem necessary if the project is behind or going ahead quicker then originally planned. If the meeting is for when the project is finished it can be an opportunity to give new roles and assignments the team for the beginning of a new project.

If the meeting is longwinded and complex this could cause mistakes to be made quite easily when tasks and roles are being distributed. For example a task could be forgotten to be carried out, or multiple people could be doing the same task. The minutes of the meeting need to be clearly written out for those who need to recap or those who were unable to attend the meeting. This is vital because if the information regarding a task they need to carry out has been described unclearly it could lead to them doing the wrong task or causing an incident to occur which could potentially be disastrous. To safeguard any information for this there would need to be a clause within each employees contract which prevents them from selling or stealing information and giving it to a competitor, and if this clause is breached severe consequences will need to be faced.
Meetings are secure as only people in that room will know what has been said, unless the meeting is being recorded whether that is just an audio recording or video. The minutes of the meeting can be recorded in either a physical or digital format and put into a database/file to be accessed by a team member if it is needed. Though it would need to have safeguards to protect it.

| Video recordings | Video recordings gives visual representation of what you have carried out for your task and it gives proof that you have actually done what you say you have done. The area is a necessary form of communication because it is good if you do not have time to be able to record a lab notebook at the time so it is useful for being able to watch the video to be able to write up what you have done at a slightly later date. If there is an incident in the lab or in our practical the video gives visual proof of exactly what happened so an incident report can be filled out correctly rather then the potential inaccuracies that could be made with an account of someone in the lab who may not have seen what they say they had saw. Also if part of the experiment has a stage where it has to run overnight there is a record of what was done in the previous stages to know what has been carried out so if you are not there in the morning another member of the team can see what you have done and may know what to do next. | The focus of camera must be good enough to be able to clearly see what is going on in the experiment, especially if the video is being used to replicate the task in another lab. If the focus is not clear it could result in an incorrect chemical or substance being added at the wrong point. Also if the video does not contain any audio the other person is relying on being able to see exactly what is going on to be able to replicate it as accurately as possible. It should be required to have the camera recording at an angle that everything can be seen, so no mistakes can be made when being replicated or if a crucial stage is being done off camera there could potentially be no proof that the stage had been carried out. In order to safeguard the information in this form of communication you should make sure that you have the file saved in multiple places, so in multiple places on your desktop, on an external hard drive, or even in an online storage site such as Google drive or in the iCloud. Also there would need to be a clause within each employees contract which prevents them from selling or
It is relatively secure as it can give lots of visual and physical proof for when applying for a patent. However, the video recording could be stolen by a competitor if it is somehow leaked or downloaded. stealing information and giving it to a competitor, and if this clause is breached severe consequences will need to be faced.

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<th>Case Studies</th>
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<td>Key:</td>
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<td>Errors in communication</td>
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<td>Additional information</td>
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<td>Case study 1</td>
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<td>&quot;A 48-year-old obese woman with diabetes and sleep apnea (treated with nightly nasal CPAP), needed surgery for a detached retina. Two days prior of surgery, during her preoperative evaluation with a locum tenens physician in her Primary Care Physician’s office, she reported a 3–4 day history of phlegm-producing cough and intermittent shortness of breath. Her EKG was within normal limits with no acute changes. The physician diagnosed her with acute bronchitis and prescribed antibiotics and a bronchodilator. He also sent the patient’s pre-operative report to her surgeon, and discussed all relevant findings. Because the patient’s procedure was scheduled as day surgery, the physician did not order post-op CPAP.</td>
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<td>During the patient’s pre-operative interview, the anaesthesiologist recorded the patient’s acute bronchitis and sleep apnea. No respiratory assessment was documented. Surgery was performed without complications. Given the patient’s history of sleep apnea and the late afternoon surgery, her daughter requested that the patient be admitted overnight for observation. 6:30 p.m. Stable, alert, and oriented, the patient was transferred to the floor. The floor nurse received the patient without a report or any mention of her sleep apnea. 7:00 p.m. Shift change 8:00 p.m. The patient—one of eight the incoming nurse was responsible for—complained of eye pain and was given Demerol (PO). 8:30 p.m. The patient vomited and the nurse assumed that the pain medication had been expelled. Despite a clear order to contact the physician for uncontrolled eye pain, the nurse administered an antiemetic and another dose of Demerol (IM) without notifying the physician. 9:30 p.m. The patient again complained of inadequate pain control. The nurse contacted the physician, who ordered a different antiemetic and pain medication. After receiving both medications and being encouraged to lie down, the patient appeared comfortable and began to fall asleep. 11:45 p.m. Upon checking the patient and finding her to be lethargic with cool, moist skin, the nurse called the lab to draw her blood sugar. While waiting, the nurse gave the patient a glass of orange juice. Her blood sugar was 278 and she seemed more alert.</td>
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12:45 a.m. The patient again appeared lethargic but rousable. The nurse, concerned for her patient, asked the charge nurse to assess her. He felt the pain medications had taken effect and the patient was sleeping comfortably; **the physician was not contacted**.

1:15 a.m. The nurse found the patient without a pulse or respirations and called a code. The patient was resuscitated, but upon transfer to an ICU at a neighbouring hospital, she was declared dead.

The patient’s daughter sued three anaesthesiologists, the attending surgeon, the ophthalmology fellow, the nurse anaesthetist, and the nurse caring for her the evening after her eye surgery, alleging negligence for performing a non-emergent surgical procedure in the presence of an acute respiratory infection and failing to note the patient’s sleep apnea, resulting in her death.

After unfavourable expert reviews, the case was settled for more than $1 million (£600,000), between the two physicians and one nurse.”

**What went wrong?**

First off during the preoperative interview by the anaesthesiologist with the patient there wasn’t a respiratory assessment documented so there was no knowledge that she had been experiencing difficulty breathing. Next when she was transferred to a ward to be able to be observed overnight the nurses on the floor were not informed of any of her other medical conditions such as her history of sleep apnea, the fact that she uses CPAP, and that she was currently suffering form acute bronchitis. When the patient complained of pain in her eye she was administered Demerol, shortly after she vomited and the nurse assumed that she had expelled the narcotic and gave her a second dosage which went against the direct instructions to contact the patients physician if she was experiencing uncontrolled eye pain. While the patient was sleeping she was lethargic and her skin became cool and moist, the nurse called for a blood test to be done and gave the patient some orange juice to raise her glucose levels. A little while later she was found to be in a similar position but could be woken, the nurse called for the charge nurse to assess her and the patients physician was still not called. Half an hour later the patient was found without a pulse and later had passed away after being revived and being transferred to the ICU.

**What were the consequences of the breakdown of communication?**

The consequences of the breakdown of communication was that the patient ultimately died because the most vital information had not been passed onto the nurses who were observing her and the nurses made too many assumptions as well as not following their instructions.

**How would have better communication prevented the incident?**

Better communication would have potentially saved the patients life, because she did not receive the proper care for her conditions. Had the preoperative interview done a respiratory assessment the surgeons would have known about the shortness of breath that she has been experiencing over the past 4 days. Also when the operation was done and the patient had been transferred to the ward non of the nurses were made aware of the fact that she suffered from sleep apnea or that she took CPAP. If they were made aware of this hey could have gotten her the CPAP and kept a better observation of her while she was staying overnight. Another way the incident could have been prevented with better
communication would have been if the patient's physician had been contacted when she had vomited and before a second dosage of Demerol had been administered.

**Who is responsible and why?**

Firstly the physician should have consulted with the daughter or at least the patient to discuss whether it was likely for the patient to be staying in the hospital overnight so he could order her some CPAP for her sleep apnea, so he is partly responsible. Next the anaesthesiologist did not conduct a respiratory assessment, so the surgeon was unaware of her shortness of breath. Also post the operation the nurses on the ward were not given any information regarding her other conditions, because of this they should have at least enquired to make sure that there was no special conditions that they should be considering during the overnight observation. So it is partly the nurses fault because they did not enquire for the information, but also they did not follow the strict instructions set by the patients physician which had detrimental affects as it lead to her passing away.

**What additional training is needed to prevent incidents like this happening again?**

The nurses should be trained to at least enquire to see if there is any additional information that they have not been given when the patient is first emitted into that ward. Also it should be a requirement that the physician should check up on a post-op patient, especially if they have other conditions that could affect their initial recovery.

**Case study 2**

Beginning about a month prior to the January 7 incident, the fifth-year graduate student and a first-year graduate student he was mentoring began synthesising a nickel hydrazine perchlorate (NHP) derivative. The amounts of NHP synthesised were on the order of 50-300 milligrams. Typical analytical techniques used in the laboratory to characterise the energetic properties of new compounds included differential scanning calorimetry (DSC), drop hammer tests, and thermal gravimetric analysis (TGA). Due to the amounts of compound needed to run each analytical test, the students synthesising the NHP decided they would need to make several batches of the compound to fully characterise it; additionally, they had concerns of reproducibility between batches. They wanted to synthesise a single batch of NHP that would provide enough compound to complete all the necessary characterising thus, they decided to scale-up the synthesis of NHP to make approximately 10 grams. The PIs of the research were not consulted on the decision to scale up. No written policies or procedures existed at the laboratory, departmental, or university levels which would have required the students to consult with the PIs before making this decision. Based on experience, the two students had discovered that smaller amounts of the compound would not ignite or explode on impact when wet with water or hexane, and they assumed the hazards of larger quantities of NHP would be controlled in a similar manner.

After the scale-up, the more senior student observed clumps in the product, and believed uniform particle size of the sample was important. As a result, he transferred about half of the synthesised NHP into a mortar, added hexane, and then used a pestle to gently break up the clumps. No formal hazard evaluation was conducted to analyse the effectiveness of using either water or hexane to mitigate the potential explosive hazards associated with the quantity of NHP synthesised the day of the incident. At this point, the graduate student working on the clumps was wearing goggles, but removed them and walked away from the
mortar after he finished breaking the clumps. Several individuals from the lab indicated that the decision to wear goggles was a personal choice which they based on how dangerous an activity was perceived to be.

The more senior student working with NHP returned to the mortar but did not replace his goggles while he stirred the NHP “one more time.” At this point, the compound detonated. After the incident, all of the universities who were partners in the ALERT program implemented a voluntary stop-work order in the laboratories working with energetic materials. This stop-work was maintained until safety changes could be implemented and an independent review board made up of energetic materials experts could audit the laboratories’ written standard operating procedures and safety protocols. The stop-work order at Texas Tech lasted approximately 4 months and up to 10 months at the other universities.

What went wrong?
Firstly the two graduates had an order to only make up 50-300 milligrams of the NHP, they went against this order and decided to make up 10 grams of the compound without consulting a superior in the lab. This was mainly because the university had no policies that made it necessary to contact the PI’s they changed the mass of what they were synthesising. Another factor that went wrong because of communication was that there was not a formal hazard evaluation which would analyse the effectiveness of using either water or hexane to mitigate the potential explosive hazards associated with the quantity of NHP synthesised. Also there were no rules or requirements that made it absolutely necessary to wear protective goggles when carrying out a practical, the members of the lab were able to choose if they felt that they were necessary depending on how dangerous they felt the experiment they were doing was.

What were the consequences the breakdown of communication?
The consequences of the breakdown of communication within the lab was that the substance that the graduates detonated and exploded while the 5th year graduate went to stir it while not wearing protective goggles. This resulted in the senior graduate in losing 3 of his fingers and one of his eyes being permanently damaged. The vapour from the substance is also harmful as it forms shock-sensitive perchlorates in exhaust ventilation.

How would have better communication prevented the incident?
Better communication would have prevented this incident as if the graduates had contacted their PI’s they would have been told to not synthesise 10 grams of the NHP because it makes the substance too unpredictable as it could ignite/detonate at any given time when exposed to organic material. Another way the incident could have been prevented is if the university had the appropriate rules and regulations in place, so they would have to contact their PI’s to be able to carry on with their experiment if they wish to alter what they have been tasked to do, they are required to do a formal hazard evaluation of the experiment that they are about to carry out, there should be a rule that all protective clothing and accessories should be worn at all times when working within the lab itself.

Who is responsible and why?
The graduates are both at fault because they had not had the appropriate training in order to fully understand and handle the substances that they were dealing with and did not think it was necessary to contact their PI’s en they decided to increase the mass that they were
synthesising. Also they did not take the appropriate precautions when carrying out the experiment, they should have been wearing goggles, because one graduate had not been wearing them he has now permanently damaged an eye. Though the blame does not only lie on the graduates, senior members of their team should have been in the vicinity to supervise the experiment. There also should have been much stricter rules and regulations regarding their safety and the safety of the others around them that should have been put in place by the actual university.

What additional training is needed to prevent incidents happening again?
Firstly all members of the lab should be trained in handling the substances that they have access to, and not allowed to just have free reign of them to do with them how they wish, especially if they do not know what happens to them when certain things are done to them like adding water or hexane to them. Also training in carrying out proper risk assessments of the substances and equipment should be introduced to make it safer.

References


11.4 Comparison Of The 3 Pieces Of Work

Your work will be positively assessed on the skills you are demonstrating. If you compare the 3 pieces of work you will notice that the distinction grade work has some grammatical/typing errors but it is clear that the level of
detail overall is greater than that demonstrated in the merit and pass grade work.

Specifically the analysis of the case studies, within the distinction grade work, meets the standard required by the assessment criteria. The learner has used a key to visually identify different types of communication breakdown and split the analysis down into specific focus areas. Sources have been correctly referenced within the text and cited at the end of the assignment. Overall the distinction grade learner is demonstrating a higher skill level.

12. Archive Of Learner Work

Digital files of all learner work are archived when the learner completes the course. These files are kept for 3 years. After this time all learner work will be permanently deleted, as recommended by the examination board.