

# Candidate 1 evidence

## Science: Interdisciplinary Project

### Proposal



<b>Candidate name</b>	
<b>SCN</b>	
<b>Centre name</b>	
<b>Assessor name</b>	
<b>Project title</b>	The Chemistry of Common Painkillers and the Publics Awareness of their Risks
<b>Project outline</b> <i>(Give a summary of what you propose to do and how will you go about it.)</i> <p>I have decided to focus my research on the most common painkillers in the UK. As a case study I will focus specifically on ibuprofen and paracetamol. My main research focus is to examine the chemistry of ibuprofen and paracetamol, the dangers that they pose not only physically but psychologically on society and how aware we as the public are of these risks. I would also like to see whether the public is overusing these painkillers, unaware of the risks that long-term use can have. I recently saw an article discussing how our over-use of painkillers could lead to a decreased empathy for others pain. This is an incredibly interesting area of research and I really want to find out more. I am hoping to be able to conduct my research not only online but in person. I would like to talk to specialists who make these drugs, provide these drugs and those who take these drugs. I plan to have interviews and do surveys to gain information.</p> <p>I will be completing my presentation and organising my findings into a poster or PowerPoint. I hope that my findings will help the community be more informed about the drugs we take and learn about a part of chemistry/biochemistry I am very fascinated by. I also hope my findings help services, such as chemists and GPs, to inform the way they provide these drugs to the public.</p> <p>Overall, I want to form a conclusion on the long-term impacts of over-the-counter painkiller use, how informed we are of these and how we can be more informed in the future. I hope to learn more about these drugs specifically, drug development and the future of painkillers as whole. Once I properly start my research I may decide to focus only on one of these drugs rather than both ibuprofen and paracetamol.</p>	
<b>Reasons for choosing this project</b>	

*(For example: personal interest, future plans, relevance to society, links to other subjects you are studying/have studied.)*

I have chosen this topic as I am really interested in drug development and chemistry. Recently in advanced higher chemistry we learned about pharmaceutical chemistry. I found this topic interesting and exciting. I loved learning about what a drug actually is and the distinct types of mechanisms of drugs, such as agonists and antagonists. This led me to look into drugs and medicines more. I found a variety of interesting topics, from stereochemistry to the pharmacology of antibiotics. In the future, I can see myself working in a lab to develop drugs which will hopefully make peoples lives better. I decided I wanted to focus specifically on painkillers as they are something which most people use. Thus my research will be accessible to those who don't find the more niche parts of pharmaceuticals as interesting as I do, as well as hopefully be helpful and impactful to peoples lives. Additionally, there is a huge wealth of information about these drugs which will allow me to build a great research foundation and facilitate my questions to the public.

**The broad contexts this project will cover**

*(Explain the ways in which the theme of your project is relevant to one or more of the broad contexts of citizenship, economic development, employability, enterprise, and sustainable development.)*

**Citizenship**

- This is very relevant because the more information we can learn about painkillers, the fewer health implications and danger for society in the future. By finding out how much we use these drugs and how aware we are of the potential dangers of use, I will be able to offer a conclusion on how we can be more informed (or whether we are fully informed) and improve our relationship with painkillers.

**Enterprise**

- I plan to create leaflets or posters or a PowerPoint on my findings (as well as my main presentation) which could be offered to GP services, schools, pharmacies, health centres and other community services to help inform the public.

**Employability**

- I hope that my research on this area of chemistry and pharmaceuticals will help me feel more confident in scientific research which will be attractive to an employer in the future. I believe the skills I learn from this project such as proper research strategies, connecting information from various learning resources, communicating with different types of people and organising information, will help me become more employable and a better scientist in the future.

**Economic development**

- This area of industry (painkillers) is a very successful money maker. For example, the analgesics market worldwide amounted to US\$33.05 billion in 2024. This means it is a huge and growing industry which has huge economic impact. Therefore my research is connected to this broad context.

**Learning environments I will access**

- Online – usage of websites such as NHS, NIH (National institutes of health), RSC education, DrugBank and other relevant sites.
- University of Edinburgh – perhaps contact specialists in pharmaceutical chemistry to interview/meet.
- GP services and pharmacies – see if I can interview a medical professional on their knowledge of the drugs side effects/risks, how well they feel the public is informed and how they make sure to properly inform their patients. I will also hopefully be able to hand out questionnaires to these places for people to complete.
- Morningside library, University of Edinburgh library, and Edinburgh Central Library – to see if there are any medical records or articles regarding the history of the drugs.
- School teachers – I will ask my chemistry and biology teachers if they have any experience or information about the drugs (mechanisms, manufacture, specific facts/chemistry)
- Students, family, friends, general public – to complete surveys and interviews to find out how much of the information I have gathered they are aware of.

**How I will use my knowledge of science/technology**

From my own experience with chemistry and biology, having completed higher and now studying advanced higher in both, I feel I have a good background knowledge to help me fully understand the topic. For example, I know about the process of inflammation and histamine which will be helpful to understand ibuprofen's anti-inflammatory function. Additionally, my knowledge of chemical formulas and structural features will help with learning the chemistry of the painkillers.

I am also confident using computers and iPads to conduct research. I know how to find good websites and am able to make documents with all my resources to keep track of where I'm sourcing information from. This will help me to stay organised throughout the project. I am also confident with creating resources online which will be very helpful when creating my presentation.

**The skills I will develop and/or improve in the course of this project are:**

*(Carry out a short analysis of your current strengths and weaknesses in each of the skills areas below and say how you think your project will allow you to develop and/or improve these skills:*

◆ *application of subject knowledge and understanding*

I already feel confident with understanding molecules and their functional groups. This means that I will be able to apply my knowledge of chemistry well to my research. I am weaker with understanding complex biological processes which will be required to understand the mechanisms of the drugs in the body. I find it hard to memorise lots of different molecules and pathways names, even in biology at school. Because this project will be focused on just

ibuprofen and paracetamol and I will be conducting lots of intense research on them, I will be able to improve my skills of understanding complex processes by focusing just on them.

◆ *research skills — analysis and evaluation*

I am good at finding information online and am confident in reading long passages of text and interpreting diagrams. I have built on this throughout high school and feel I am good at this. However, I often find myself getting overwhelmed with how many things I read and am not very good at critically picking which information is important. I will need to improve my evaluation skills by evaluating what pieces of information are important and necessary for my project and which information is not. My analysis skills are strong and I am good at linking different information together to form conclusions. I am not very good at forming analytical questions to get information. For example, I am not particularly good at expressing what I'm confused about or want to find out when asking teachers questions. Making a survey and interviewing people during this topic will help me improve my skills in analysis as I will have to make skilful questions to get the answers I need.

◆ *interpersonal skills — negotiation and collaboration*

This is probably the skill I feel most confident with. I have always been someone who enjoys speaking to people and I think I am good at keeping conversations going and finding things in common with those I am talking to. I really enjoy talking to different types of people and enjoy explaining things to others to help them see my point of view. Despite this, I do think this project will increase my confidence in speaking to new people even more. I am planning to interview healthcare professionals, potentially scientists and the general public. By organising meetings, whether online or in person, I think I will learn a lot about how to communicate with professionals and adults and collaborate in a way which benefits us both. Hopefully, this will make me less nervous when talking to people who aren't the same age as me and will improve my communication skills even more.

◆ *planning: time, resource and information management*

I am already a very organised person. I like to plan and have things set out clearly through timetables and lists. This will help me with my project when setting out my timeline and creating a chart to keep me on track. A downside of my good organisation skills is that I can become a bit too obsessive with keeping everything in routine and as it is planned. I am not a very 'go with the flow person' and whilst too much of this is also not helpful, during this project I will have to be flexible to changes in plan such as not being able to meet people I wanted to or not receive results I expected. Therefore, I hope that this project will improve my ability to withstand changes in plan and highlight my skills in organisation and time management.

◆ *independent learning — autonomy and challenge in own learning*

One of my weaknesses is that I often feel unconfident in what I am doing unless I have someone else to reassure me that I am on the right track. Of course, I will have my assessor to keep me right and be there for guidance, but most of this project will be done on my own.

This will encourage me to be more confident in myself and feel more at ease doing things independently, rather than relying on other people for permission and acceptance. I think I will be able to challenge myself to go out of my comfort zone.

♦ *problem solving — critical thinking: logical and creative approaches*

I like to think that I am quite good at problem solving and critically thinking to improve situations or find alternative routes. My issue is that as I have said before I tend to get overwhelmed and stressed when things don't go according to plan and this often impairs my ability to think critically on how to solve the issue. There are things which I anticipate going wrong in this project so coming up with creative and sensible ways around this will be essential, thus improving my problem-solving skills and comfort with change.

♦ *presentation skills*

I am always a bit nervous to present in front of people. I am scared I will mess up or won't be able to properly express what I am trying to say. I will try to improve my confidence by presenting my findings to a large group of people. Because I will (hopefully) be very confident in my knowledge of the project, I think I will find it easier to deliver a good presentation and improve my skills.

♦ *self-evaluation — recognition of own skills development and future areas for development)*

Doing this section was quite difficult for me because I don't usually assess my own strengths and weaknesses. We sometimes do it in school but even then I find it hard. I often don't recognise when I have done something well and equally when I need to improve. Throughout this project I plan to continuously evaluate what I am doing. I will keep track of what I am doing well and what I am finding myself improving in, as well as what I am not doing well and how I can improve this. This will lead me to have a better grasp on my strengths, skills and weaknesses and have an idea of how to improve these as I continue my project and further on in my life.

**Assessor feedback to candidate**

Well done [redacted]. This is a good project idea and I am happy to approve your proposal. Please move on to the plan section.

<b>Proposal approved</b>	✓	<b>Further work required</b>	
<b>Candidate signature</b>		<b>Date</b>	10/9/24

<b>Assessor signature</b>		<b>Date</b>	10/9/24

### Science: Interdisciplinary Project

#### Plan

<b>Candidate name</b>	
<b>SCN</b>	
<b>Centre name</b>	
<b>Assessor name</b>	
<b>Project title</b>	The Chemistry of Common Painkillers and the Publics Awareness of their Risks
<b>Is this a group project?</b>	yes <input type="checkbox"/> no <input type="checkbox"/>
<b>If a group project my individual role or responsibilities will be:</b>	
N/A	
<b>Timescales</b> <i>(This should be a detailed timeline showing how you plan to time-manage your project. Any separate spreadsheets or charts should be included as evidence.)</i>	
Refer to Gantt chart for detailed timeline.	
September	
<ul style="list-style-type: none"> <li>- planning</li> <li>- Research</li> <li>- Creating interview questions</li> </ul>	
October	
<ul style="list-style-type: none"> <li>- Contact specialists</li> <li>- Research</li> <li>- Conduct interviews</li> </ul>	
November	
<ul style="list-style-type: none"> <li>- Conduct interviews</li> <li>- Create, send out, analyse and evaluate questionnaire</li> <li>- Research</li> </ul>	
December	
<ul style="list-style-type: none"> <li>- Start making poster and PowerPoints</li> </ul>	
February	
<ul style="list-style-type: none"> <li>- Rehearse and finalise presentation</li> </ul>	

- Draft first and final project

**March**

- Final project draft due in
- Evaluating project for

**Planning**

*(How you are going to meet the agreed objectives of your project as stated in your outline.)*

**Objective 1: find out about the history, biochemistry and action of paracetamol and ibuprofen**

I will begin my research properly on the w/b the 23<sup>rd</sup> of October. To start I will look at the history of both drugs as I believe this is important to have a background and understand its original purpose. For example, what events led to ibuprofen being made? I will use online resources, such as articles from the BBC, pharmaceutical research sites and other relevant websites, to carry out this part of my research. I also plan to visit libraries to see if there are any resources, such as old medical records, to add to my findings.

I am also very interested in how the drugs are actually made. I would like to learn more about this. For example – how easy is it, how quick and how much does it cost the uk? To conduct this research I will continue using online resources as well as emailing pharmaceutical companies such as Reckitt and Flamingo Pharma UK Ltd who manufacture ibuprofen and paracetamol to gain insight into the development process and any issues which may arise. I also plan to visit local chemists to find out which over the counter drugs they sell, where they are from and what drug is most commonly bought. (More specific questions regarding ibuprofen)

Next I will reach the bulk of my research: the chemistry of the drugs and how they interact with the body. I will use online resources, such as articles on the National Library of Medicine and DrugBank, to find out more. I would like to learn about the specific chemical structure of ibuprofen and paracetamol and how this means it can com. I find NSAIDs a very interesting genre of drugs due to their many actions in the body, serving as anti inflammatory agents as well as analgesics. I am also planning to contact some associates of chemistry, pharmacology, and biochemistry from the University of Edinburgh to see if they can give a more detailed insight into the exact biochemical process.

**Objective 2: research the side effects and risks of the painkillers**

Then I will focus on looking into the side effects and associated risks with ibuprofen and common side effects from all types of painkillers. To find this out I will use online resources such as the NHS website and medical journals. Next I will contact gp services and pharmacies near me (boots, Lindsay and Gilmour Pharmacy, Paton & Finlay etc) to find out what the most common side effects or issues patients/customers have with ibuprofen. I anticipate that there is a high degree of confidentiality regarding patient information so this

may be difficult. I would also ask what kind of guidance and information they give to patients/customers on the risks/side effects and general information when providing painkillers such as ibuprofen.

**Objective 3: research the public's awareness of chemistry of painkillers and their side effects.**

Once I have established the main issues and dangers of painkillers I will move onto assessing the general public's awareness of these risks. To do this I plan to create a survey which asks questions about painkillers (specifically ibuprofen), usage of ibuprofen, side effects of ibuprofen, how accessible people feel information about the risks of painkillers is. I'm aiming to have this survey created by the 4<sup>th</sup> of November. I will do an online survey and provide it to my family and friends as well as people in school, perhaps the GP and chemist, to complete. I will then analyse my findings.

**Objective 4: create a detailed and informed presentation of my findings**

Once I have the knowledge about the biochemistry of the drugs, have spoken to specialists it, and have gained a good understanding of how drugs are provided and the public's information on them (through survey and interview), I will start to create an A2 poster and a PowerPoint to help with my presentation. I also plan to give this PowerPoint to school, the GP, chemists and other people I have contacted throughout my research. I hope this will be helpful to them as well.

**Resources**

*(For example: people, materials, places.)*

The internet – I will make use of online resources such as Wikipedia, NHS website, DrugBank and other relevant sites to find the information I need about the chemistry of the painkillers, for example their structural formula.

The library – I am planning to go to the library to see if I can find any medical records, textbooks or books with information on painkillers to deepen my research and understanding.

GPs, chemists and researchers – I am planning on first contacting researchers who study chemistry and pharmaceuticals to see if they have any interesting information about the two painkillers (eg. How they're made, interesting facts). I also plan to contact pharmaceutical companies that manufacture paracetamol and ibuprofen. I will also make use of local GPs and chemists to ask how they distribute the drugs and their professional opinion on how it is best to inform the public as well as their view of the side effects and risks.

General public – I will be creating a survey for the public to complete on my findings. This will allow me to discover the public's awareness of the research I have done and will help me form conclusions on my project.

**Research methods**

*(For example: contacting companies, surveys, focus groups, experimentation.)*

**Online resources**

- I will use online resources from the internet such as the NHS website and chemistry sites to find out about the specific action of paracetamol and ibuprofen. I will use chemistry academic sites to look at previous research people have done on it as well as built a profile of each drug and their action in the body.

**Interviews**

- I would like to talk to specialists such as pharmacists and GPs to ask them about their experience with distributing the drugs, their awareness of the risks and how well informed they feel the public is. Additionally I will ask them any of their specialist level knowledge on the chemistry of the drugs to help boost my online research.

**Surveys**

- I will create a survey for the public to complete. It will be a questionnaire on different facts about ibuprofen and paracetamol, focusing on the side effects and risks, and whether people know this, feel informed, how they find out information on the drugs and whether they feel the need for more information in the future.

**Presentation****Who do I think will benefit from listening/reading/looking at my presentation of my project findings/product?**

I think that anyone could benefit from my presentation. It is always necessary to continually assess our knowledge of drugs which we take in order to stay safe and informed. Thus, this topic will be relevant to not only those who enjoy chemistry and biology but the public who can learn more, feel informed and feel confident that they know the facts about what they consume and are able to stay safe. I also hope my findings will be helpful to those who provide these drugs (GPs, chemists) as well as other specialists in this area of pharmaceuticals. Hopefully it will give them a clear idea on whether they need to alter the way they inform the public as well as being something interesting to look into.

**What methods are appropriate to my audience(s)?**

*(For example: demonstration, presentation software, websites, oral, report, piece of theatre, DVD, wiki/blog or any combination.)*

I am going to make a poster or a PowerPoint on my findings. I have chosen this method of presenting as I think it allows me to include great visual explanations as well as written. This means it'll be accessible to all people who learn in different ways. Some people prefer visual learning whilst others learn by listening and reading. Since I will most likely be presenting to students in my school as well as teachers and older people I think a PowerPoint is an effective way to be exciting and accessible for all different types of age groups.

I also feel the most confident presenting with a PowerPoint or poster as they allow me to have something to refer to but also allow me to talk freely and add my own thoughts to my presentation as it happens. This will improve the flow of my presentation and make it a better presentation for those watching.

**Dependencies**

*(What is required for your project to go ahead, ie reliance on other people or resources, steps in plan that must be completed before starting the next step?)*

The main dependency that this project has is in order to evaluate the public's awareness of my research findings not only do I have to successfully research but also I must receive feedback from people through my survey. I must have enough responses to come up with an informed and reliable conclusion. Without this the project won't meet the objective of evaluating the awareness. Other than that, I do think most of the other objectives aren't hugely dependant on other people. For example, I do want to contact specialists and conduct interviews to enhance my research however if this isn't possible I can still research using online resources which will always be available for me. A continuous access to the internet to research is vital to complete the steps of this project. If I follow the general timeline of my Gantt chart and complete the tasks chronologically this should ensure the plan goes smoothly and is easy to follow.

**Contingencies**

**Any anticipated problems**

Not being able to organise interviews with specialists due to not receiving replies, not being able to organise times and other issues.

**My plans for overcoming the anticipated problems**

If I am unable to organise in person interviews I could ask people if online meetings are possible or just sending some questions in an email for people to answer. I will email many people and hope that one person will reply. But if I am unable to interview people I will just have to research more thoroughly using other resources. Interviewing specialists is not KEY to my research as the survey is more important.

<p>Not receiving enough responses to my surveys.</p>	<p>I will first post the survey on teams or some other platform in order for the general public to complete this. If I do not receive enough responses then I will ask my family and friends to do it as I am confident they would do it. However, I do want to avoid my response just being from people I know as I want answers from a wide variety of people.</p>
<p>Not having enough time to juggle my academics (3 AHs) with the science baccalaureate thus not being able to complete objectives.</p>	<p>I have made a Gantt chart with all the tasks I need to do for the project broken down into small steps for each week. This will keep me organised by only having manageable chunks to complete each week alongside my schoolwork. I have also blocked out weeks for prelims and holidays which will give me time to focus on my studies when required. I am going to set some time aside each week to focus only on my project which will allow me to keep on top of both schoolwork and the project.</p>
<p>Researching both painkillers being too much information/work.</p>	<p>I will change my project to focus on just one painkiller (ibuprofen or paracetamol) if I find that this would be better and allow me to properly develop my knowledge of one rather than juggling two.</p>
<p><b>Method for recording my skills development and future areas for improvement</b></p> <p>I plan to keep a word doc to evaluate myself throughout the project. After completing tasks I will record how the task went, what I felt I did strongly, what I did weakly and how it could be improved if I did it again. This will allow me to constantly assess my progress and keep pushing myself to be better. As well as this I will also be evaluating the project as a whole when it is complete. I will use my word doc to look back at the things I did throughout the project and remember what I found tough and how I changed to improve things for myself. This will help me build a really strong assessment of myself throughout the project and means I will be able to easily highlight places I could improve for my future endeavours.</p>	
<p><b>Assessor feedback to candidate</b></p> <p>An excellent section. Very clear and in depth. Very well done!</p>	

### Science: Interdisciplinary Project

#### Presentation of project findings/product

<b>Candidate name</b>			
<b>SCN</b>			
<b>Centre name</b>			
<b>Assessor name</b>			
<b>Project title</b>	The Chemistry of Common Painkillers and the Publics Awareness of their Risks		
<p><b>How I presented my project findings</b>  <i>(Describe in detail how you presented your project findings and explain the choices you have made with regard to your presentation method(s) and audience(s).)</i></p> <p>I have presented my project findings through a poster and a PowerPoint. For the poster, I designed it on Canva and added a simplified version of my total findings to the poster. I tried to keep this relatively simple and easy to read so it would be accessible for people to look at on a quick glance and still learn most of what my project is about. This will also help if the poster is put up on the wall in school as it will be simple to read when walking by, especially for younger years.</p> <p>For my PowerPoint, I made a longer presentation with much more detail and information. I presented this during lunchtime at school to friends and teachers. I knew that the majority of people coming to watch my presentation would be my age so made the presentation slightly more advanced than the poster, which may be read by people younger than me and with less of a pre-existing scientific background. I tried to keep the presentation engaging and give my audience opportunities to ask questions, so people felt it was more interactive. I also thought that presenting a PowerPoint rather than doing a report would be more successful as I could do it during lunchtime, where people are free, instead of giving people a lengthy report to read which they most likely wont have time for.</p>			
<p><b>Assessor feedback to candidate</b></p> <p>Well done on a successful presentation. You spoke well and I found it very informative. You were also very good at answering questions at the end. Well done!</p>			
<b>Candidate signature</b>			<b>Date</b> 12/2/25
<b>Assessor signature</b>			<b>Date</b> 12/2/25

<b>Plan approved</b>	✓	<b>Further work required</b>	
<b>Candidate signature</b>		<b>Date</b>	24/9/24
<b>Assessor signature</b>		<b>Date</b>	24/9/24

## Science: Interdisciplinary Project

### Evaluation of project

<b>Candidate name</b>	
<b>SCN</b>	
<b>Centre name</b>	
<b>Assessor name</b>	
<b>Project title</b>	The Chemistry of Common Painkillers and the Publics Awareness of their Risks
<p><b>How successful has my project been overall?</b>  <i>(Consider the strengths, weaknesses and learning points of your planning, implementation and findings/outcomes giving examples to support your comments.)</i></p> <p>I think my project has been pretty successful overall. I think my planning and time management throughout has been very strong. I have made sure to make time for my research and science bacc activities throughout the year, even when revising for exams. For example, I made a checklist from my Ganit chart for when I needed to have things completed. I have planned meetings with researchers and made sure to complete these before the Christmas break and prelims. However I do think a weakness of my planning was that I forgot to plan when my survey would go out to the public, which left me with less time for people to complete the survey than I wanted. It was only out for a week before I had to start making my poster. A learning point from this planning would be to focus on planning and scheduling all the key points and deadlines, such as completing the poster and uploading the survey for completion, instead of planning every small thing as well, as this means some larger more, important things may get lost along the way. I think to successfully plan and schedule in the future I will focus on making checkpoints to complete rather than breaking down everything into a task with a deadline as this can become overwhelming and mean more important deadlines get forgotten.</p> <p>The implementation of my aims and project was overall successful. I had outlined lots of things I wanted to research and look into for my project. My four objectives were: to find out about the history, biochemistry and action of paracetamol and ibuprofen, to research the side effects and risks of painkillers, to research the publics awareness of chemistry of painkillers and their side effects and to create a detailed and informed presentation of my findings. I believe that I was strong in sticking to these main goals. To research the history of painkillers I made strong use of online resources such as articles from the BBC about the discoverers of the drugs and online medicine information websites. To research the chemistry I was able to speak to researchers at Edinburgh Uni that gave me insight into how paracetamol and ibuprofen are made, backed up by my SQA chemistry knowledge and online research, and how they work in the body. I believe this was a very strong part of the implementation of my objectives and feel I did this strongly. I learned lots about the action of the painkillers in the</p>	

body and feel confident explaining these. One weakness of my research is that I couldn't research either paracetamol or ibuprofen very in depth, as there was just too much information and not enough time to properly focus on both. Whilst I'm glad I did research two drugs, as it gave a point of comparison, I think if I had done one drug I would have had the strength of perhaps more depth and detail. I was also going to contact pharmaceutical companies to ask about how they manufacture the drugs. I wasn't able to do this as I couldn't find appropriate emails to contact. This meant I wasted lots of time trying to find contacts and places to email. This was a weakness as it meant it set me back a week or so. Next time I would make sure to check whether contacting certain companies is possible before setting it as a goal.

I also think my second objective was met well. I looked at lots of interesting case studies and did lots of reading of the NHS website and studies people have done. This made this part of my project strong. A strength of this was that there was lots of information about side effects online for me to look at and use in my project. Additionally, I organised meetings with researchers from the University of Edinburgh to talk about the drugs and their side effects. I found these meetings very helpful and successful. It was great to speak to people interested in the same things that I am and it introduced me to some great topics to look at for my project. For example it really helped direct my focus and research and gave me new ideas to look into, such as the psychological side effects and how our usage of painkillers changes our perceptions of pain. This added another layer to my research and project and allowed me to strengthen it with experts knowledge. I communicated with them mainly through emails which I think was a very good choice as it meant they were able to email me links to resources, such as links to articles on the National Institute for Health and Care Excellence, which meant I was less likely to lose these compared to if I had written it down on paper. This also meant lots of my resources were on one email thread so were easy to find and refer back to when necessary.

The third objective was about researching into whether the public was informed of the risks and side effects of ibuprofen and paracetamol. I found this the hardest objective to meet as it was difficult to decide how to do this. I was going to try to interview people individually as well as my survey however I realised that would take too long and I wouldn't have time with other schoolwork etc. Instead I decided to just do the survey. I sent it to lots of my family and friends and asked them to pass it on. I would have liked to be able to survey more people however the survey was not live for long enough (only a week) to get more responses. I think a weakness of my implementation of my aims was that unfortunately I didn't have a very large sample size for my survey. I tried to get as many people to fill it out as possible however some people weren't doing it even after I had sent it and followed up with them. To overcome this I tried to send it to people who I knew were interested in my project and would actually complete it. Whilst the results I got were very strong in one direction (supporting that the public is not aware of the risks of paracetamol and ibuprofen) it would have increased the reliability of my findings to have a larger sample size. A learning point of this is to make sure I dedicate time for people to respond in my planning and send it to the right kind of audience. The outcome of this survey was very informative. All questions about whether people knew about side effects and risk were answered majority no. This demonstrated to me that overall the public was not aware of the long - term risks or even common side effects. I got a very

decisive result from my survey so I feel that my findings were strong and backed up by good evidence of a lack of awareness.

The fourth objective was to create a detailed and informed presentation of my findings. I decided to make a poster and a PowerPoint. For the poster I decided to make it more simple and javein less information, only sharing the key facts. For the PowerPoint I made it much more detailed and tried to conclude all my relevant findings. I was very nervous about presenting as I find speaking in front of large groups intimidating. I feel that overall I gave a good presentation, however at times I think I could have slowed down a bit and had more audience participation as this would have strengthened my presentation further. I do think that my presentation was detailed as I had lots of information about each drug.

Overall I really enjoyed the project and felt that my knowledge and skills have grown a lot by doing it. I found the topic really interesting and it has made me very excited to continue my studies of chemistry at university. I would recommend the project to anyone considering doing it.

**How effective were my communication methods throughout the project?**

I think my communication methods were all around effective. I communicated with Professor [REDACTED] and Professor [REDACTED] through email. I made sure to always reply swiftly and we were able to quickly set up teams meetings which worked for the both of us. Emailing also worked as neither of us had time to meet in person to talk about logistics of the meeting or the actual meeting. This meant we were able to communicate whilst getting on with other things we had to do.

When I created my survey I tried to include a mixture of questions. I made sure the questions were easy to read and wouldn't take too long to understand, as I didn't want people to get bored or just think it was too complicated and not complete the survey. I tried to have some questions which were multiple choice or one word and some that were longer answer, to make it more varied and not feel like too much work to complete the survey. This also gave people who wanted to speak more on the questions an opportunity to do so, and equally those who didn't an opportunity to give shorter, less detailed answers.

Additionally, I think I communicated my findings well. I was very nervous for the presentation but I tried to remain calm and talk through my findings slowly and clearly. I do think I could have maybe explained some concepts a bit more thoroughly or check that the audience was still following. I think that a PowerPoint was a good way to communicate my findings as it is very visual and allows me to communicate lots of information, without it being overwhelming because I can divide the information into multiple slides.

**Is there any aspect of my project that could be taken further? What might my next steps be?**

I think I could have looked into the psychological effects of painkillers more as this is something I am really interested in. I touched on this briefly in my presentation, however I think I could have done some interesting separate research on this. Such as a survey about whether people do think taking painkillers has subconsciously altered their view on pain. This could be a whole project in itself that I would have liked to have been able to focus on a bit more.

Additionally I think I could have gone much further with the history of painkillers. I could have looked at the first painkillers and how these progressed throughout history. It would have also been interesting to look at how the public's relationship with painkillers and medicine has changed, eg. How it changed during and after the thalidomide crisis etc. I could have researched these topics further and added them into my PowerPoint.

I am also looking to make a leaflet which I can give to pharmacies, schools and more public spaces to help inform people about my findings. This was an aim I had at the start of my project however I didn't have enough time to create this before my presentation.

<b>Candidate signature</b>		<b>Date</b>	17/03/25
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## Science: Interdisciplinary Project

### Self-evaluation of generic and cognitive skills development

<b>Candidate name</b>	
<b>SCN</b>	
<b>Centre name</b>	
<b>Assessor name</b>	
<b>Project title</b>	The Chemistry of Common Painkillers and the Publics Awareness of their Risks

*In evaluating your skills consider the skills analysis which you carried out at the proposal stage and how you said you would develop and improve these skills. Now refer to your reflective diary/log/blog and feedback you have received and evaluate how you have developed and/or improved these skills through the work on your interdisciplinary project.*

#### **Application of subject knowledge and understanding**

*(Think about practical uses for the science you have learned. How did you use your knowledge of science/technology effectively to help you carry out various aspects of your project and how did it relate to your chosen broad context(s)?)*

My understanding of chemistry and biology from my school studies was very helpful when researching for my project. Before I started this project I felt confident in my ability to apply knowledge and understand scientific concepts. I used my knowledge of chemistry to make sense of the synthesis of ibuprofen and paracetamol. In advanced higher chemistry we learn about synthesis routes and organic chemistry. Lots of the terms used when talking about the manufacture of the drugs were the ones we use in chemistry. I found my previous knowledge so helpful when trying to make sense of the synthesis, and do not think I would have been able to understand without this. I also think that the science I learned about how the drugs work in the body will help me with advanced higher biology, and it gave me a greater understanding of immune processes and neurobiology.

I also used lots of my technological skills to help me with using forms, excel, PowerPoint and other online apps to create my presentation.

#### **Research skills — analysis and evaluation**

*(Think about the research process. How did you plan, carry out, analyse and evaluate your research? You should evaluate your research methodologies, tools, resources and contacts, data recording and referencing, reliability and usefulness of data.)*

My main research method was online research. I was already confident in finding good resources for research before this project and I feel I was able to apply this to my project. However, because ibuprofen and paracetamol are such well-researched drugs, there was a

lot of information online and this meant I spent a long time looking through these, perhaps wasting time. The information I got from the NHS website was very concise and reliable, but longer research papers were more complicated and sometimes too wordy or abstract for me to actually apply to my project. In the future, I would like to improve my skills of prioritisation when choosing research websites, as I could have saved myself a lot of time. However I do feel that I got much better at analysing and picking out the key information from the websites I did use, and this was a skill I wanted to improve on.

Another skill I wanted to improve on was forming analytical questions. For my interviews with Professor [REDACTED] and Professor [REDACTED] I made a list of questions to ask them. I made sure to take my time when deciding the questions and tried to ask questions that were relevant and would lead to answers I could use for my project. I found this quite challenging as it felt like there was lots to ask and I struggled to narrow it down to fewer, more useful questions. However I think the practice of doing this and creating questions for my survey has improved my skill of questioning and researching through this method. The method of interviews for research was very helpful for my project. Speaking to experts meant they could point me in the right direction of research to look at, as well as introduce me to new topics I hadn't thought about before. For example, the psychological impacts of our usage of ibuprofen and paracetamol. To record the information I tried two different methods. In the first interview I tried to take notes however I think this was a weak way of recording as I found it difficult to multi-task speaking, listening and also taking notes. This meant I missed lots of what Professor [REDACTED] was saying and was also not as engaged as I could have been. I recognised these flaws and for the next interview decided to record it on the voice memo app on my phone. This meant I was more focused and could also listen back to the entire interview and had all the information on hand when I needed it. However a weakness of this recording method was that the recording was very long, and lots of the information was not hugely relevant so it meant I had to shift through lots of irrelevant information before getting to what I was looking for. Nevertheless I still found this an easier recording method than taking notes.

I think that the survey was a very important and useful research method. Initially I had thought that I would interview some people about their experiences with paracetamol and ibuprofen however I evaluated that this would take too long, so opted for a survey. This meant I could gather information from lots more people and it was always set out in a very easy way for me to analyse. It provided me with great insight into peoples usage of the drugs and is definitely a research method I will use in the future.

Overall, I do think that my research skills have improved throughout this project. Before I started the project, I was less confident in trying a variety of research methods and would stick to online resources or textbooks. From organising interviews and leading these I now feel much more confident in this type of research and feel I could do this for other projects.

**Interpersonal skills — negotiate and collaborate**

*(Think about how you considered other peoples' views/feedback, discussed issues of concern, reached a solution where needed, adjusted your approach in response to a situation/environment, showed positive self-belief and had the confidence to offer and ask for support.)*

Although most of this project was completed individually I tried to continually have other peoples views and feedback. One way of this was by my interviews where I heard lots of new opinions and tips on how to improve my project. It was great to speak to the professionals about my project and I felt that I improved my communication skills by having to speak to people of a different age and in a professional level. I also think I did well at adjusting my interview questions and focus depending on the formality of both meetings and their research specialities. For example, the meeting with Professor ██████ felt more formal so I spoke more formally and stuck to a more rigid interview format. I was given lots of advice and feedback about my project from both people I spoke to and tried my best to alter my project in response to this. For example, Professor ██████ advised me to speak about paracetamol poisoning separately rather than with the rest of its side effects so I made a separate section in my PowerPoint for this.

I found the initial research part of my project quite difficult to get started with. I lost some confidence in what I was doing. However I am proud of myself for asking for help from my parents and friends. They were able to help me find a starting point and get back into the swing of things. This was very helpful and the support definitely helped me regain some confidence and self belief.

I also think I communicated well with my assessor and felt comfortable to ask questions and help when I needed it. This was initially daunting as I knew he was going to be assessing the project, but I tried to think of it as more him supporting and helping rather than judging which helped a lot and I think improved my interpersonal skills a lot.

#### **Planning — time, resource and information management**

*(Think about your time management. How did you set targets, monitor/record progress, consider any probable barriers to achievement and take steps to minimise them?)*

The main way I monitored my progress and set targets was through using my Gantt chart. This was a big step out of my comfort zone as I usually like to make lists or my own timetables not in this format. This was challenging at first however I do think it was good to try a new way of planning. I had set out week-by-week targets. I tried to stick to this as much as possible to remain on track. I think that this was overall a good way of monitoring progress, however I do think I missed some things which would need to be done in my timeline, which meant things were often behind schedule (according to my original Gantt chart). For example, it took longer than anticipated to hear back from people I had contacted about interviews. To minimise the impact on this I started to make my survey questions and make my poster whilst waiting for replies, instead of sticking to my Gantt chart and not completing anything further until I had heard back from the researchers. I think this was a good use of time and I'm proud of my time management in this aspect.

I think that my planning was good as I always felt like I had lots to do and knew what to do next. I planned very meticulously, which was good in some ways as it meant I researched in lots of detail but it also meant that I sometimes got caught up with the details rather than focusing on the bigger picture. For example, I spent a lot of time researching online side

effects and creating the perfect questions for my interview, that I was rushed to complete larger deadlines such as the poster deadline. Next time I would make sure to have key larger goals set out and make sure I complete these within good time, then focus on smaller details and goals once I have finished.

Additionally I found the template from the SQA to be very helpful in planning. Whenever I forgot my main objectives or what I was actually trying to communicate with the project, I looked back at my plan and proposal I had made for guidance and next steps.

#### **Independent learning — autonomy and challenge in own learning**

*(Think about how you used your skills to make things happen, took the initiative to establish links with other learning environments/opportunities and looked for challenges rather than taking the easy option.)*

I used my planning skills and communication skills to plan ahead and contact many researchers about interviews. When creating emails to send them I used my communication and adapting skills to alter the emails depending on who it was sent to. For example, when contacting [REDACTED] I spoke more about biology in my email in comparison to when speaking to [REDACTED] where I spoke more about his specific research on toxicology. I thought outside the box to contact people I did not know rather than speaking to my parents contacts in similar fields, so that I could have an objective opinion on my questions and push my communication skills and be more independent. I also tried to organise my survey and creating my poster/powerpoint alone so I would push myself to work independently and not always rely on others.

#### **Problem solving — creative approaches; critical thinking; logical approaches**

*(Think about your problem solving skills. How did you generate and explore ideas, use logical and creative approaches, analyse source materials in order to support findings, reflect on problems and possible contributory factors, and think critically about possible actions/changes?)*

I used my problem solving skills to come up with different ideas to research such as different methods to synthesise paracetamol and ibuprofen. I also used these skills to analyse my survey findings and choose which questions gave me the best supporting material. I decided to create my own diagrams and pie charts to use for my poster as I figured out these were more visually easy to understand on a poster, where I wouldn't be able to explain it how I would for my PowerPoint. I think I thought critically when I was asked questions by people at the end of my presentation. For example, I was asked a question about whether paracetamol or ibuprofen should become prescription drugs and I problem solved on the spot to consider the pros and cons of this outcome and come up with a response. I also tried to practice my presentation to my parents before presenting it properly. They gave me lots of feedback such as that it felt too long and the slides weren't very visual. I problem solved my condensing the information and joining some pieces together to make the presentation sharper and shorter, as well as choosing a cohesive

design theme throughout so the slides would be more visually pleasing and easier to follow.

#### **Presentation skills**

*(Think about how you presented your findings. Evaluate your presentation method(s), choice of audience(s), layout, structure, degree of formality and choice of content. Did your presentation include information/ideas/reflections with supporting detail in a logical order and reach a reasoned conclusion?)*

My presentation method was to use a PowerPoint to present. I think this was a good choice to present as I feel comfortable with this, as it's something that I've done before. I also think having a powerpoint to refer to helps keep me on track with what I'm saying and makes me less nervous. I also think a PowerPoint is a good way of sharing lots of information but not in a too overwhelming way, as it is split into different slides. I thought I designed my PowerPoint well. I tried to split it into logical sections. However I think I could have delivered it with more flow and a little more seamlessly. To prepare for the presentation I practiced it in front of my friends and parents to try to get used to presenting and the flow of the PowerPoint. I chose to present to my friends and classmates, as well as whoever else was interested in coming. I think I chose an appropriate audience as my project was focused mainly on young people and how our relationship with painkillers can be improved. Overall I do think that my presentation was informative, and I tried hard to explain things in detail and clearly however I don't know how well this came across as I was very nervous! I do think I had lots of supporting information, in the form of statistics, my interviews and survey results. Coming to a conclusion was difficult, as there isn't really one clear answer or conclusion to my project. I found that people were not informed of the risks of ibuprofen and paracetamol and they do pose dangers, however it is difficult to know what the solution for this is. I did try to come to a well – balanced conclusion and express this: continue to use painkillers but in moderation and informed perspectives.

I also think I could have been more interactive with my audience whilst presenting but my nerves stopped me from doing this. Next time I would try to slow down my speaking and take more time to stop and interact with the audience as I feel this would enhance my presentation. I will also try to be less nervous when answering questions and take my time to articulate my answers.

#### **Self-evaluation — recognition of own skills development and future areas for development**

*(Think about how you have developed throughout your project. How did you deal with feedback, praise, setbacks and criticism and their impact on your own development of knowledge, skills and understanding? To what extent did you ask for feedback, learn from experiences and how will you use these to inform future progress?)*

I think that overall I have become a lot more confident in myself and my skills throughout this project. I think my confidence to speak to people and ask questions has been improved

hugely. I had never done interviews before, especially not with people I don't know and are specialists. This was very daunting and I tried to reach out for help and tips from my family and friends. With their support I was able to do the interviews and felt they went really well. This has grown my confidence a lot and I feel I have particularly improved my communication skills.

I think that I did try to ask for feedback throughout my project and became a lot better at taking constructive criticism. For example, I practiced my presentation in front of my friends and parents and they told me some changes to make. Such as cutting certain bits out of the PowerPoint. I tried to take this well even if this didn't align with my views of how I wanted the presentation to go. I changed my PowerPoint and then tried it with the new suggestions and found I liked it better so changed it. Overall, I do think I have become better at taking criticism and viewing it in a positive way rather than an insult.

I believe I have learned a lot from this project. I feel like I know my strengths (communication, organisation etc) a lot better and know parts of myself which I can improve such as my public speaking. I have learned that I have a lot more skills than I thought and should be more confident in myself in the future.

This section is not mandatory. It has been included to allow you the opportunity to undertake an overall reflection of your project.

**Reflection on my experiences throughout this project**

*(For example: things you feel you have achieved, things you have done that you feel particularly proud of, anything you would do differently were you to do something similar in future.)*

I am really proud of the work I put into this project and feel like I did a really good job of delivering a well-reasoned, detailed and interesting project. I am particularly proud of pushing myself to do interviews with the Professor as this was something I was really nervous about and normally would never do. This project gave me the chance to push myself and achieve things I never would have before. I have also educated lots of my peers about the risks of ibuprofen and paracetamol and feel proud about potentially changing their usage and making their experiences with these drugs safer and more informed.

I think I have also achieved lots of self confidence in my own skills and what I can offer. When speaking to the Professors they complimented my knowledge about ibuprofen and paracetamol and how I was able to engage in conversation with them about issues beyond my project. This gave me a lot of confidence in my communication skills and I'm very proud of how I used these skills during the project.

I also feel more confident working independently now than before this project. I am glad I was able to work on my own as it allowed to alter my time constraints to suit my schedule and changes in routine especially around prelims. Before I felt I always needed guidance

from peers and teachers to be able to succeed or be confident, and whilst I still really appreciate this I know feel more able to do things on my own which I am very proud about.

**Skills that I have used in this project that I would like to develop further**

*(For example: using skills in even more challenging situations, more working on your own, more team working.)*

I have used lots of organisation skills and planning skills which I would like to continue using in Uni whilst doing other projects and assignments. I am going to do chemistry and maths at Uni so will have heavy workload so I will need to juggle my time well and plan how to be on top of all my work alongside a social life etc. These skills will help me in Uni and I hope to improve them even further.

I would also like to improve my presenting skills even further. I do think that I have improved and become more confident in speaking in front of a crowd but this is a skill I think I should aim to always be improving. I will try to take more opportunities to practice public speaking and presenting, even if this is just sharing my ideas in class.

Candidate signature		Date	17/3/25
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### Science: Interdisciplinary Project

#### Assessor report

Candidate name \_\_\_\_\_

Candidate number \_\_\_\_\_

Centre \_\_\_\_\_

Project proposal	Tick as appropriate
<b>Grade C criteria</b>	
The title and aims of the project.	✓
Clear aims and reasoned arguments to support the relevance and practicability of the project.	✓
Identification of opportunities for:	
◆ own skills development	✓
◆ collaborative working	✓
◆ accessing less familiar learning environments	✓
◆ application of science subject knowledge in a broad context	✓
◆ use of knowledge and skills across different disciplines	✓
◆ making connections between subject knowledge and the wider world	✓
Evidence of the ability to communicate clearly and concisely in advocating the proposal.	✓
<b>Grade A criteria, includes all of above plus</b>	
Well conceived proposal which sets creative and challenging goals which are at the same time realistic, achievable and practicable.	✓
Robust and carefully argued justification of the proposal.	✓
Substantial links and understanding of possible connections across disciplines contributing to the project.	✓
<b>Comments</b>	
I am happy to award all of the sections above to ██████. She has put across a good project idea which is interesting. She has explained that she could one day imagine herself working in a lab doing this. She has also explained this may be a sleeping giant of a problem for society and one that maybe	

<p>needs to be tackled early before it becomes a big problem. She has made it clear the topic shall cover Biology and Chemistry which she has good experience of as well as the broad contexts. There is also a psychological aspect about how taking these drugs could change your empathy towards other people which I find interesting.</p>	
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Project plan	Tick as appropriate
<b>Grade C criteria</b>	
Development of clear project objectives in line with the project proposal.	✓
Relevant and detailed planning strands to enable the project to be implemented, monitored, presented and evaluated.	✓
Realistic timescales and achievable milestones for each stage of the project.	✓
Clear identification of resources needed, research methodologies to be used, opportunities for support and feedback.	✓
<b>Grade A criteria, includes all of above plus</b>	
Careful selection and effective use of research/investigation techniques.	✓
Anticipation of probable and possible factors which may impact on the project with realistic and well considered contingencies.	✓
Clear identification of dependencies or reliance on the success of other strands of work and of necessary adjustments to the plan.	✓
Outline the process for achieving own identified development needs.	✓
<b>Comments</b>	
<p>This is one of the best plans I have ever seen. I think this demonstrates very well how [redacted]'s mind works which is in a very organised fashion. She mentioned she likes to work by making lists etc and this very much follows this method. In particular I love how she has set down her objectives for the project in clear sections so that she knows exactly what she want to accomplish. Her dependencies and contingencies are also well thought through and she has explained how she shall keep tabs on her skills development.</p>	

Presentation of project findings/product	Tick as appropriate
<b>Grade C criteria</b>	
Evidence of effective and critical use of — resources, research methodologies, information and time management, prioritisation, problem solving approach to reach objectives, feedback, collaborative approaches, self-monitoring.	✓
Application of specialist and interdisciplinary subject knowledge to establish meaningful connections within the broad context.	✓
Clear presentation of main findings/outcomes.	✓
<b>Grade A criteria, includes all of above plus</b>	
Critical thinking, analysis and reflection used at key stages in the project to construct rigorous arguments, draw convincing, well supported conclusions, identify and resolve issues.	✓
Skilful and creative use of resources, including people, information and learning context to progress the project.	✓
Accurate and deepening of understanding through application of subject knowledge in the chosen context, with meaningful connections well established.	✓
<b>Comments</b>	
I feel that [REDACTED] has hit all of the points above. She presented well to large group at lunch time and spoke naturally with no notes. She had clear sections such as the reason for doing the project, the chemistry behind it and the implications for society and they all had an excellent level of knowledge. She brought together research as well as surveys and interviews with professionals. When answering questions at the end she had an excellent grasp of the subject showing that she had good background knowledge. She has worked well with myself and other adults over the course of the year and brought it all together while referencing different subjects.	

<b>Evaluation of project</b>	<b>Tick as appropriate</b>
<b>Grade C criteria</b>	
A critical and justified evaluation of all stages of the project process — planning, implementation and findings/outcomes in terms of strengths, weaknesses and learning points.	✓
Effective use of chosen communication method(s).	✓
<b>Grade A criteria, includes all of above plus</b>	
Incisive, well balanced evaluation of the project outcome against project aims, supported convincingly by well selected evidence.	✓
Careful choice and skilful use of communication and presentation methods(s).	✓
<b>Comments</b>	
This is another strong section. [REDACTED] again has shown organised she is by going through each objective of her project and talking about how successful it was. She has also been honest enough to say that she had to make changes and the reasons behind this. Or on the other hand talk about things that she would change for the future. She was also honest enough to say that she was planning on creating a leaflet to go into GP surgeries but unfortunately ran out of time which is understandable as I know how busy she was in the months before this project was completed. Generally an honest and well balanced section.	

<b>Self-evaluation of generic/cognitive skills development</b>	<b>Tick as appropriate</b>
<b>Grade C criteria</b>	
A critical evaluation of own skills development against the list of specified generic/cognitive skills.	✓
A reasoned evaluation of own strengths and key goals for development in the specified list of generic/cognitive skills, which takes account of feedback sought and evidenced from others throughout the project.	✓
<b>Grade A criteria, includes all of above plus</b>	
Insightful, balanced and well structured self-evaluation of own development.	✓
Assertive and justified use of feedback from others in evaluation and identification of development areas.	✓

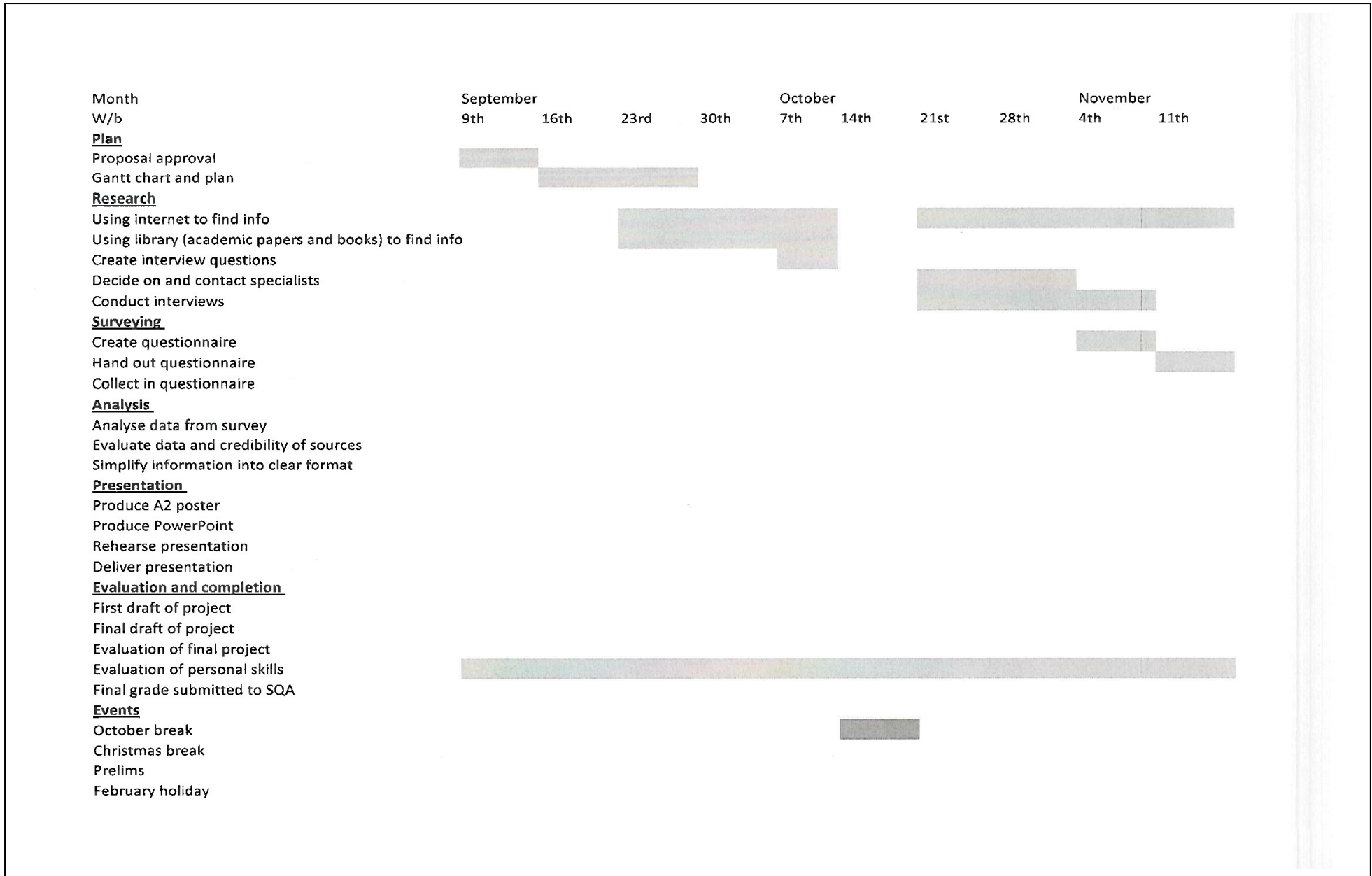
Comments	
<p>Another excellent section. There are lots of detailed examples here explaining what happened during her project and how they have impacted her skills either now or how she could use this in the future. ██████ is a strong pupil who is capable, mature and organised. She has improved on her presentation and interpersonal skills as well using feedback to her advantage. She mentioned she was reluctant to speak to me as she thought I would interpret this as a weakness which I found interesting. I am glad she overcame this and embraced the fact that I was there to help and that any dialogue we had was always going to be a positive.</p>	

The overall grade will be:

- A indicative of a highly competent performance which meets the additional Grade A criteria and consistently demonstrates a high degree of autonomy, initiative and effective information management across the five pieces
- B indicative of a competent Grade C performance across the five pieces, but with some aspects of work meeting the criteria for highly competent performance (as outlined by the Grade A criteria)
- C indicative of a competent performance across the five pieces, with all aspects of the work meeting the criteria identified for Grade C performance


Overall grade awarded	A B C	Unsuccessful
<b>Additional comments/overview</b>		
<p>██████ has achieved a Grade A for her project. She has been very organised and methodical and this has been shown in her write up. She has also delivered this topic to a very high standard with good use of professionals as well as delivering her presentation with an excellent level of knowledge. I feel that she was a strong candidate at the start of the project but has still managed to end the year even stronger. This is because she has been good at reflecting on successes as well as looking at areas that didn't work out as well and how she would react to these in the future.</p>		

Assessor signature \_\_\_\_\_ Date 17/3/25  
 Internal verifier signature \_\_\_\_\_ Date 17/3/25





March 3rd    10th    17th    24th    31st    April 7th    14th    21st    28th

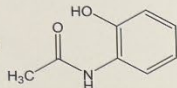


# THE CHEMISTRY OF COMMON PAINKILLERS AND THE PUBLICS AWARENESS OF THEIR RISKS



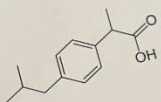
## Paracetamol

Paracetamol is a non-opioid medication that treats mild to moderate pain and fever, such as headaches and sore throats. It can be made by acetylation of para-aminophenol with acetic acid or acetic anhydride.



## Ibuprofen

Ibuprofen is a non steroidal anti-inflammatory drug (NSAID) that, unlike paracetamol, treats inflammation. The simplest way to synthesise ibuprofen is by the acylation of iso-butylbenzol by acetyl chloride.



## Mechanisms in the body

**Ibuprofen** works on the body's ability to make prostaglandins (chemicals in the body which trigger the feeling of pain and produce inflammation). The main mechanism is the non-selective, reversible inhibition of the cyclooxygenase enzymes COX-1 and COX-2, which are required for prostaglandin production. Hence, with fewer prostaglandins in your body, your pain, fever and inflammation decreases.

The exact mechanism of **paracetamol** is unknown however it seems to work by blocking the chemical messengers in the brain that tell your body that you have pain. It also reduces a high temperature by affecting the chemical messengers in the hypothalamus.



## Side effects and long – term risks

### Side effects

Paracetamol side effects can include:

- Low blood pressure
- Fast heartbeat
- Flushing
- Blood disorders

Ibuprofen side effects can include:

- Headaches
- Feeling dizzy and sick
- Vomiting
- Indigestion
- Abdominal pain

Both ibuprofen and paracetamol can cause rebound headaches when taken too frequently.

### Long – term risks

Long term use of paracetamol can cause: tiredness, breathlessness, anaemia, liver and kidney damage, heart disease and stroke if you have high blood pressure. Of those surveyed 85% did not know any side effects of paracetamol.

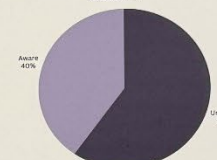
Paracetamol poisoning is the foremost cause of liver damage in the western world. Liver damage results from paracetamol's metabolite N-acetyl-p-benzoquinone imine which damages liver cells.

Regular use of ibuprofen may eventually cause

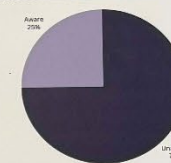
- Anaemia due to bleeding in the stomach (stomach or gut ulcers)
- Impaired hearing
- Kidney and liver damage
- Bleeding in the stomach and bowels
- Increased risk of heart attack or stroke

## Publics awareness of risks

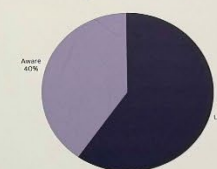
Regular use of ibuprofen could lead to anaemia:



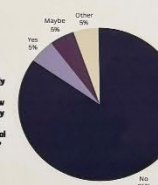
Regular use of ibuprofen could lead to increased risk of heart attack or stroke:



Regular use of ibuprofen could lead to kidney and liver damage:



Do you feel, in general, the public is properly and fully informed on how to appropriately use ibuprofen and paracetamol in a safe way?



## Conclusion

To conclude, my study suggests the public is not fully aware of the potential risks of common painkillers. Of those surveyed, many felt that more information about side effects on the packaging of drugs, increased education in schools and public campaigns would encourage open conversations about our use of painkillers and increase awareness of risks.

A conversation with Professor [redacted] of the UoE about the future of painkillers, opened my eyes to the potential long-term adverse effects of the over-use of painkillers. Such as the damage to doctor-patient relationships due to the use of painkillers as a bandaid solution whilst the NHS struggles to see and treat all patients as they would like to.