



# GCSE Applied Science (Double Award)

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## *Student Guide to Assessment*

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The marks for your GCSE Applied Science coursework are worth two-thirds of the total number of marks, so you really need to understand what is required and how to get the best marks. During your course you will complete nine pieces of work (assignments) that will make up your coursework for the qualification.

The course is divided into four units. Your work for units 1, 3 and 4 make up the two-thirds coursework. Unit 2 is tested by an examination, and makes up the other third of the marks.

## Unit 1 – Science in the Workplace

The total number of marks available for Unit 1 is 25.

You must complete **two** assignments for this unit – if you don't, you will miss out on marks.

The first assignment involves investigating workplaces that use scientific skills, describing the work of scientists or people who use scientific skills and showing how science is important in a wide variety of jobs.

In the second assignment you need to investigate working safely in a scientific workplace and compare the health and safety precautions in that workplace with the precautions in your school or college.

### The Workplace Investigation

There are 11 marks available for this investigation. Your work will be assessed using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>produce a simple study on a range of organisations that use science</li> <li>state the products made or services provided</li> <li>identify the jobs of those employed.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>identify the range of organisations as local, national or international</li> <li>describe their location</li> <li>describe the products made or services provided</li> <li>describe the jobs and qualifications of the employees and how they use science</li> <li>describe the types of skills scientists need in addition to their qualifications, and a range of careers that are available in science.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>produce an in-depth study of <b>one</b> particular organisation:</li> <li>explain its location</li> <li>describe the products made or services provided and explain their importance to society</li> <li>give a detailed account of the skills and qualifications needed by scientists who work there</li> <li>describe the effect on the local environment of the organisation.</li> </ul>

To complete **Stage 1** you should produce a report that:

- clearly states the purpose of **at least three** organisations that use science of scientific skills, and
- identifies the jobs of the people employed.

To complete **Stage 2**, and so get higher marks, for **each** of the organisations you have studied you need to:

- describe the organisation as local, national or international (make sure that you include one of each)
- give the location of the organisation
- clearly describe the products that the organisation makes or the services it provides
- clearly describe the jobs of the people working with science or using scientific skills in the organisation, and the qualifications they need to do their jobs, and
- outline the types of careers that are available in science and the types of skills that scientists may need in addition to their qualifications. (This need not necessarily be linked to your chosen organisations but could be, for instance, in a hospital.)

To complete **Stage 3**, and get the highest marks, you must write a more detailed account of **one** of the organisations you have studied. You need to:

- include the reasons why it is located where it is
- describe the products the organisation makes or the services it provides
- explain why these products or services are important to society
- describe the particular skills and qualifications that the people working in the organisation have, and
- describe the effect the organisation has on the local environment.

## Checklist for the Workplace Investigation

Use the checklist to track your progress for your Workplace Investigation. Put a tick in the appropriate box when you complete each task.

The shaded items are part of the detailed study you need to do at Stage 3 for **one** organisation only.

Put a tick against each marking point as you complete it.

	Organisation		
	1	2	3
<b>For each organisation I have:</b>			
Named it			
Described whether it is local, national or international			
Described where it is located			
Made a list of the products it makes or the services it provides			
Described the products or services			
Made a list of the jobs of the people employed			
Described the jobs that people at the organisation do			
Described how these people use science in their jobs			
Described what qualifications these people need			
Described the skills scientists need, as well as their qualifications, to work in science			
I have given a range of careers that are available in science			
<b>For one organisation I have:</b>			
Explained why it is located there			
Explained why the products or services are important to society			
Described the particular skills and qualifications that the people who work at the organisation need to do their jobs			
Described the effect the organisation has on the environment			

## The Health and Safety Investigation

There are 11 marks available for this investigation. Your work will be assessed using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to carry out research into working safely in the school or college laboratory, including:</p> <ul style="list-style-type: none"> <li>• hazards and risks and their assessment</li> <li>• first aid</li> <li>• fire prevention.</li> </ul>	<p>You should be able to carry out research into the issues of working safely in a workplace that uses science or scientific skills, including:</p> <ul style="list-style-type: none"> <li>• hazards and risks and their assessment</li> <li>• first aid</li> <li>• fire prevention.</li> </ul>	<p>You should be able to carry out research into the issues of working safely in a scientific workplace and compare these with the school or college laboratory, including:</p> <ul style="list-style-type: none"> <li>• hazards and risks and their assessment</li> <li>• first aid</li> <li>• fire prevention.</li> </ul>

### Stage 1

In your work on safety in the school or college laboratory you should include sections on:

- hazards and risks
- first aid, and
- fire.

You may find it easier to complete your work by using the three main headings from the assessment grid (hazards and risks, first aid and fire). You should clearly explain why risk assessments are important when working in the laboratory. You may want to give an example of a risk assessment of your laboratory area.

### Stage 2

To complete Stage 2 you need to investigate the health and safety issues in a workplace (**not** your school or college laboratory) that uses science or scientific skills. Your investigation should ideally be presented under the same headings as you used for the school or college investigation. You may want to include a risk assessment form and perhaps an accident report form obtained from a workplace.

### Stage 3

To complete Stage 3, and get the highest marks, you should compare your two investigations and comment on the similarities and differences between school or college and the workplace. Remember to give examples and to compare all three sections – hazards and risks, first aid and fire. For example:

- the ways that risk assessments are prepared and presented and how accidents are reported could be different
- the types of signs and symbols that you observe in each place will be similar, although they may not necessarily be for the same hazards.

## Checklist for the Health and Safety Investigation

Use the checklist below to track your progress through the work you do for your Health and Safety Investigation for Unit 1.

The shaded item is what you need to do in addition to reach Stage 3.

Put a tick against each marking point as you complete it.

	In School/ College	In a Workplace
I have researched safe working practices		
I have described laboratory hazards and risks and how they are assessed		
I have described the first-aid procedures that are in place		
I have described the procedures and equipment used for fire safety		
I have compared what happens in school or college with what is done in the workplace		

## Communication Skills

There are 3 marks available in Unit 1 for your communications skills, which will be assessed throughout the unit using the three-stage assessment grid below. Marks are awarded for selecting appropriate information and for presenting your reports logically and clearly.

Stage 1	Stage 2	Stage 3
You should be able to use a limited range of sources and information to present findings in your portfolio.	You should be able to use a range of sources and information to present findings clearly in your portfolio.	You should be able to identify and use a wide range of sources and information to present findings clearly and logically throughout your portfolio

- A 'limited range' means less than three.
- A 'range' is three.
- A 'wide range' is more than three. At **Stage 3** you must remember to carefully list the sources of information used.

## Unit 3 – Developing Scientific Skills

There are **three** assignments for this unit, and to obtain high marks you need to complete **all three**. The total number of marks available for Unit 3 is 50.

In this unit you will learn about:

- how **microbiologists** investigate living organisms
- how **analytical chemists** find out about substances
- how **materials scientists** investigate the properties of materials.

You will need to demonstrate that you have developed and used a number of skills that scientists use. These important skills involve:

**A:** planning and following instructions

**B:** obtaining evidence by experimenting

**C:** analysing and considering evidence

**D:** evaluating evidence, and

**E:** recognising the vocational application of your work.

In the coursework you produce for Unit 3 you must include records of **three** practical assignments, to show that you can use scientific skills in three areas:

- Investigating Living Organisms
- Using Chemical Analysis Techniques
- Investigating Properties of Materials

You will need to demonstrate that you have successfully used the five skills A–E in each area, and get the best mark you can for each skill. The best mark for each of these skills will be added together to give your final mark for the unit.

Even though some of the lower marks will not contribute to your final mark, the coursework you hand in must show that you have carried out all three practical activities. If you don't include all the pieces of work required, you will miss out on marks.



## Skill A: Planning and Following Instructions

There are 12 marks available for Skill A. You need to show that you can:

- carry out risk assessments
- follow instructions in standard procedures
- select and use laboratory equipment

for **each** one of the three assignments.

For each of your assignments, your teacher will assess Skill A using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• carry out a risk assessment, given clear guidelines</li> <li>• follow instructions, with guidance, in simple standard procedures, one step at a time.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• carry out a risk assessment, given some guidelines</li> <li>• follow instructions in standard procedures, with some guidance for the more complex tasks</li> <li>• select and prepare appropriate laboratory equipment and use it correctly and safely.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• independently carry out a risk assessment</li> <li>• follow instructions in standard procedures with little guidance</li> <li>• select and prepare laboratory equipment of appropriate precision and use it correctly and safely.</li> </ul>

### Risk assessments

**Before you begin** any of the investigations in Unit 3 you should carry out a risk assessment for the activity, and you should include this risk assessment with your write-up. Your teacher might give you some examples of what to write, but if you use these in all your investigations your marks for risk assessments will be limited to Stage 1 or Stage 2. In all cases you should describe the hazards and risks.

To gain **Stage 3** for your risk assessment you must have carried it out with minimum guidance from your teacher and should show that you have thoroughly researched all possible hazards and risks. You also need to show that you understand and describe the difference between a hazard and the risk associated with that hazard. To achieve the highest marks you need to carry out the research for **at least one** risk assessment, and complete it without any help from your teacher.

### Following instructions

To get a high mark at **Stage 3** you must be able to follow instructions with very little guidance from your teacher. Your teacher will observe you carrying out an investigation and make a comment on your work to show whether you have correctly followed the instructions.

### Selecting and using equipment

Before you start an investigation, you need to select the correct equipment to use, and you need to use it safely during your investigation. Your teacher might ask you to prepare a list of the equipment that you want to use, or might give you a list of equipment from which you will choose the most suitable to use.

Your teacher will observe you working and will make a comment on your work to show that you have selected and used equipment correctly.

You will achieve the highest marks at **Stage 3** if you are able to select the correct equipment and use it safely without any help from your teacher.

## Checklist for Skill A: Planning and Following Instructions

Use the checklist below to track your progress in Skill A for each of your three assignments.

Put a tick against each marking point as you complete it.

<b>Title of assignment:</b>			
	<b>Help needed from teacher</b>		
	<b>Some</b>	<b>Little</b>	<b>None</b>
I have completed a risk assessment before starting the assignment			
I have followed instructions when completing the assignment			
I have selected the equipment I needed for the assignment			
I have used the equipment correctly and safely			

## Skill B: Obtaining Evidence by Experimenting

There are 12 marks available for Skill B.

This skill is assessed using the three-stage grid below for each of your three assignments. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• make simple observations and measurements</li> <li>• record them in tables and in charts or graphs with guidance.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• make careful and accurate measurements and observations</li> <li>• recognise with some guidance when it is necessary to repeat measurements and observations</li> <li>• record results accurately in tables and graphs where appropriate and using lines of best fit where appropriate.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• make careful and accurate measurements and observations consistently</li> <li>• repeat measurements and observations when necessary</li> <li>• independently record and present data in an appropriate form.</li> </ul>

### Recording results

When you carry out an investigation you must make sure that you record all the results you have obtained and the observations you have made in an appropriate way.

At **Stage 1** you may be given tables in which to record your results.

At **Stage 2** you should be able to construct and label your own tables before recording your results and observations.

To gain the highest marks at **Stage 3** you need to work independently. You must also ensure that you record results accurately to a consistent number of decimal points and using the correct units.

### Tables and graphs

If you use tables to record results you should make sure that you have used appropriate headings for all the columns and have given the units if appropriate.

If you produce graphs for your investigation, you should hand draw **at least one** graph, to show that you know how to select appropriate scales and plot points accurately. You need to make sure you label the axes correctly, and should draw a line of best fit where appropriate. Remember that in some cases the line of best fit may be a curve.

### Repeats

You should be careful to check your results by repeating tests. If you have not repeated a test or measurement for an investigation you need to explain why you have not done so. At **Stage 3** you should be able to independently recognise when to repeat readings and make a comment.

## Checklist for Skill B: Obtaining Evidence by Experimenting

Use the checklist below to track your progress in Skill B for each of your three assignments.

The shaded items are what you need to do in addition to reach Stage 3.

Put a tick against each marking point as you complete it.

<b>Title of Assignment:</b>		
		<b>Tick</b>
I have recorded all observations and/or measurements.		
I have presented my results in tables		
My tables have the correct column headings		
I have used the correct units in my tables		
Where possible I have drawn a graph of my results		
The axes on my graphs are correctly labelled, and I have used a sensible scale and included the correct units		
I have drawn a line of best fit. <i>(Remember that in some cases this may be a curve.)</i>		
I have repeated measurements		
I have independently recorded my observations and results accurately using a consistent number of decimal places throughout		
I have explained why I repeated measurements		
I have not repeated measurements but I have explained why		

## Skill C: Analysing and Considering Evidence

There are 12 marks available for Skill C.

Skill C is assessed for each of your three assignments using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• offer simple explanations for your findings</li> <li>• carry out simple calculations with guidance.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• identify and explain patterns within data</li> <li>• carry out simple calculations</li> <li>• draw conclusions which are consistent with the evidence.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• identify relationships where appropriate</li> <li>• manipulate data using a variety of sophisticated techniques</li> <li>• draw and present well structured and accurate conclusions from the data which illustrate an in-depth understanding.</li> </ul>

To meet all the criteria for Skill C you need to demonstrate that you can make appropriate conclusions from the results of your investigation.

You must identify any patterns in your results and show that you understand what these patterns mean. You might wish to do this by quoting actual results as examples.

To get high marks at **Stage 3** you must be very thorough and include some scientific research or theory as part of your conclusions.

The patterns you see in your results may enable you to identify a formula or specific scientific relationship. To get marks in **Stage 3**, you should be able to describe this.

To reach some of the high marks in this skill area you need to perform calculations and manipulate data, and you will find that some activities will allow you better opportunities than others for this skill. In order to reach **Stage 3** you must be able to correctly rearrange a mathematical equation and demonstrate that you understand what you have done.

## Checklist for Skill C: Analysing and Considering Evidence

Use the checklist below to track your progress in Skill area C for each of your three assignments.

The shaded items are what you need to do in addition to reach Stage 3.

Put a tick against each marking point as you complete it.

<b>Title of Assignment:</b>		
		<b>Tick</b>
I have given a simple explanation of what I saw or found out		
I have carried out some calculations on data, but needed help		
I have carried out calculations on data, but needed a little guidance on what to do		
I have carried out some complex calculations on data, without any help		
I have described the patterns shown in the data		
I have explained the patterns		
I have identified scientific relationships		
I have given conclusions that are consistent with the data obtained		
I have given conclusions in which I have researched and referred to scientific theory		

## Skill D: Evaluating Evidence

There are 7 marks available for Skill D. This skill is assessed for each of your three assignments using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>give a simple evaluation of your practical activity.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>give an evaluation of your practical activity</li> <li>suggest an improvement to your method that would allow the collection of more reliable data.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>review your practical activity by presenting a well structured, logical evaluation of its strengths and weaknesses</li> <li>describe improvements to your method that would allow the collection of more reliable evidence.</li> </ul>

This skill allows you to demonstrate that you can evaluate the outcomes of your practical work in the laboratory.

### Stage 1

A ‘simple evaluation’ means that all you have done is make a comment on the parts of your activity that went well and those that did not and have given reasons why. The type of questions that you should be able to answer include:

- What went well and why?
- What didn’t go well and why didn’t it go well?

### Stage 2

You should suggest ways of improving the activity if you were to do it again. Remember always to give a reason why your improvement would be better.

### Stage 3

Even if your activity went really well there will still be things that you could do to make it even better, and collect more reliable evidence. To get marks in Stage 3 you need to think very carefully about this and do some scientific research to back up your suggestions. You should ask yourself questions like:

- What could I do to get more reliable data?
- What are the strengths and weakness of the technique/method/procedure that I used?

## Checklist for Skill D: Evaluating Evidence

Use the checklist below to track your progress in Skill area D for each of your three assignments.

The shaded items are what you need to do in addition to reach Stage 3.

Put a tick against each marking point as you complete it.

<b>Title of Assignment:</b>		
		<b>Tick</b>
I have described what went well		
I have described the problems that occurred		
I have suggested an improvement and given a reason why the improvement would be better.		
I have stated the strengths and weaknesses of my experiment		
I have described the changes that I would make if I did the experiment again		
I have explained why these changes would improve the data / information that I have obtained		



## Skill E: Vocational Application

There are 7 marks available for Skill E. In each of your assignments this skill is assessed using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
You should be able to: <ul style="list-style-type: none"> <li>give a use for this practical activity in a workplace that uses science.</li> </ul>	You should be able to: <ul style="list-style-type: none"> <li>describe how the practical activity is used in a workplace that uses science.</li> </ul>	You should be able to: <ul style="list-style-type: none"> <li>explain why the practical activity is useful in a workplace that uses science</li> <li>give examples of the types of organisation that use this type of activity.</li> </ul>

This skill gives you the opportunity to demonstrate that you understand how your investigation could be used in a workplace.

You should be able to give an example of the use made in the workplace for each of your investigations.

To reach **Stage 3** you need to be able to describe and explain the use of the investigation by showing some scientific understanding. You should also be able to give very specific examples of the type of organisations that would use similar investigations in their work, and state the purpose for their use.

## Checklist for Skill E: Vocational Application

Use the checklist below to track your progress in Skill area E for each of your three assignments.

The shaded items are what you need to do in addition to reach Stage 3.

Put a tick against each marking point as you complete it.

Title of Assignment:		
		Tick
I have given a use for this activity in a workplace that uses science		
I have described how this activity would be used in that workplace		
I have explained why this activity would be useful in that workplace		
I have explained what the benefits of using this activity would be to society		
I have given some named examples of the types of organisation that would use this activity		

## Unit 4 – Using Scientific Skills for the Benefit of Society

There are **four** assignments for this unit, and you need to complete **all four** – if you don't, you won't be able to get top marks.

The total number of marks available for Unit 4 is 50.

In this unit you will investigate how:

- **biologists** or **medical scientists** monitor living organisms
- **chemists** make useful products
- **engineers** make and test an electronic or electrical device, and how they assess the effectiveness of machines for use in the workplace.

To carry out these investigations you will use some of the skills that you learnt in Unit 3 – and, in particular, **you will need to produce a risk assessment for each investigation you do.**

Your four investigations will involve:

**A:** Monitoring Living Organisms

**B:** Making a Useful Chemical Product

**C:** Assembling Electronic and Electrical Devices

**D:** Using Machines.

## A: Monitoring Living Organisms

There are 17 marks available for this investigation, and your work will be assessed using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• produce a simple safe plan for your investigation with guidance</li> <li>• monitor the growth, development and response, as appropriate, of an organism with guidance</li> <li>• record data obtained</li> <li>• offer simple explanations for your findings</li> <li>• give a simple evaluation of your investigation</li> <li>• suggest an application for your investigation.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• produce a safe plan, with little guidance, which would enable your investigation to be carried out by another person</li> <li>• monitor the growth, development and response, as appropriate, of an organism with little guidance</li> <li>• record data obtained, identify and explain patterns within the data, and carry out calculations</li> <li>• give an evaluation of your investigation and suggest an improvement to your method</li> <li>• describe an application of monitoring organisms in the scientific workplace.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• independently produce a safe plan described in a series of well ordered steps, which would clearly enable your investigation to be carried out by another person</li> <li>• independently monitor the growth, development and response, as appropriate, of an organism</li> <li>• record data obtained, analyse the data, explaining what they show, identifying any shortcomings in your evidence</li> <li>• suggest improvements to your method that would enable more reliable evidence to be collected</li> <li>• use scientific knowledge and understanding to explain why it is important to monitor organisms in the scientific workplace.</li> </ul>

You need to produce a plan for the investigation on a living organism. You should name the organism you're going to study, then monitor the growth, development or response of the organism and record the data obtained. You should explain what your results show, using your scientific knowledge and understanding. You should evaluate your investigation, stating clearly what went well, identifying any problems that you may have encountered and suggesting any improvements you would make if you were to do it again. You should suggest a use for the investigation in a scientific workplace.

### **Stage 1**

If your work is in Stage 1 it means that you have produced a plan that is safe and have monitored an organism, but needed some help from your teacher. You have recorded all your data and have explained your results. You have stated what went well and what didn't go so well in your investigation and have suggested how this investigation could be used in a scientific workplace.

### **Stage 2**

To complete Stage 2 your plan should be more detailed and written so that other people could easily carry it out. You will need to identify patterns within the data, explain them (you could do this by quoting some specific examples from your results) and carry out calculations. You will also need to make conclusions from the evidence and use scientific reasoning to explain your conclusions. Your evaluation of the investigation should include a suggestion for improvement to the method (don't forget to give a reason for your improvement). You should be able to describe an application of monitoring living organisms in the scientific workplace.

### **Stage 3**

To complete Stage 3 you should be able to produce your plan with no help from anyone. You will need to analyse your data thoroughly, using your scientific knowledge to explain what it shows, and identifying any weaknesses in the evidence. You should be able to suggest improvements to method you used that would enable you to collect more reliable evidence. You should justify your improvements by stating why they would help you collect more reliable data. You should also use scientific knowledge to explain why it is important to monitor organisms in the scientific workplace.

## Checklist for A: Monitoring Living Organisms

Use the checklist below to track your progress in this assignment.

The shaded items are what you need to do in addition to reach Stage 3.

Put a tick against each point as you complete it.

<b>Title of Assignment:</b>		<b>Tick</b>	
I have completed a risk assessment			
I have named the organism and stated what I am going to monitor			
I have produced a plan for my investigation	<b>Some help:</b>		
	<b>Little help:</b>		
	<b>No help:</b>		
My plan is clear and someone else could easily follow it			
I have recorded the data I obtained	<b>Some help:</b>		
	<b>Little help:</b>		
	<b>No help:</b>		
I have used my data to carry out calculations accurately			
I have identified patterns in my data			
I have explained patterns in my data			
I have used scientific knowledge and information to make some conclusions, which are consistent with the evidence			
I have described what went well			
I have described the problems that occurred			
I have described an improvement that I could make and have given reasons for making it			
I have described what could be done to get more reliable data			
I have suggested a use for my investigation			
I have described how the monitoring of organisms can be used in scientific workplaces			
I have explained why organisms should be monitored in scientific workplaces			

## B: Making a Useful Product

There are 17 marks available for this investigation, and your work will be assessed using the three-stage grid below. As you progress through each stage you will be able to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• given a procedure, obtain a pure chemical product safely, using a named chemical reaction and present it in a labelled sample tube with guidance</li> <li>• write a word equation for your reaction with guidance</li> <li>• measure the actual yield of your product</li> <li>• give a use for your product</li> <li>• state one way that the rate of the reaction could be increased.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• given a procedure, obtain a pure chemical product safely, using a named chemical reaction and present it in a labelled sample tube with little guidance</li> <li>• write a word equation for your reaction</li> <li>• calculate the percentage yield of your product given the theoretical yield and using the actual mass of product obtained</li> <li>• calculate the costs of making a given amount of your product</li> <li>• describe the use of your product</li> <li>• describe two factors that affect the rate of the reaction.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>• independently given a procedure, obtain a pure chemical product safely, using a named chemical reaction and present it in a labelled sample tube</li> <li>• write a balanced chemical equation for your reaction and explain the type of reaction taking place</li> <li>• calculate the percentage yield of your product given the theoretical yield and using the actual mass of product obtained to the appropriate number of significant figures, stating the correct units</li> <li>• calculate the percentage yield of product obtained from a specified amount of reactant</li> <li>• explain the industrial importance of the product and its impact on society</li> <li>• use scientific knowledge and understanding to explain the factors that affect the rate of the reaction.</li> </ul>

To get good marks in this assignment you need to be able to follow instructions to make a pure chemical product safely, record your results, write a balanced equation for the reaction, calculate the yield and use your scientific knowledge and understanding to explain the factors that affect the rate of the reaction.

### **Stage 1**

To complete Stage 1 you must prepare a chemical product and present it a labelled sample tube. You may need some help from your teacher. You don't get any marks for writing the method but your teacher will observe you carrying out the assignment and make a comment on your work to show whether you successfully made the product. You must work out how much of the product you made and write down your result. You should be able to write a word equation for the reaction, although you might need some help to complete it. You should measure and record how much of the product you obtained. You should also state at least one way of speeding up the reaction, and give a use for the product.

### **Stage 2**

To complete Stage 2 you should be able to prepare the product and record your results with only a little help from your teacher. You will need to calculate the percentage yield of the product and calculate the cost of making it (your teacher will give you some information to allow you to calculate the percentage yield and the cost). You will need to carefully describe how your product can be used. You should also be able to describe two ways of speeding up the reaction.

### **Stage 3**

To complete Stage 3 you need to be able to prepare the product and record your results without any help from your teacher. You will need to write a balanced symbol equation for the reaction and explain the chemistry involved in making your product. You should accurately calculate the percentage yield of the product from a specified amount of starting material, using the correct units and number of decimal points (your teacher may give you some information to help you do this). You should also use your scientific knowledge to choose at least two methods of speeding up the reaction and to explain clearly why your chosen methods of speeding up the reaction work. Finally, you should carefully explain why the product is important to society in terms of its use.

## Checklist for B: Making a Useful Product

Use the checklist below to track your progress in this assignment.

The shaded items are what you need to do in addition to reach Stage 3.

Put a tick against each point as you complete it.

<b>Title of Assignment:</b>		<b>Tick</b>	
I have completed a risk assessment			
I have followed the procedure and safely produced a chemical product	<b>Some help:</b>		
	<b>Little help:</b>		
	<b>No help:</b>		
I have measured the amount of product obtained			
I have written a word equation for the reaction	<b>Some help:</b>		
	<b>Little help:</b>		
I have written a balanced chemical equation for the reaction			
I have calculated the percentage yield of product			
I have used the correct units and the appropriate accuracy in my calculations			
I have calculated the costs of making a specified amount of product			
I have stated a use for the product			
I have described the use of the product			
I have explained the industrial importance of the product and have given a benefit to society of its use			
I have stated one way of increasing the rate of the reaction given			
I have described two factors that affect the rate of the reaction			
I have explained the factors that affect the rate of the reaction using some simple chemical kinetics			



## C: Assembling an Electronic/Electrical Device

There are 9 marks available for this investigation, and your work will be assessed using the three-stage grid below. Each stage you complete will allow you to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>safely assemble a useful electrical or electronic device with guidance</li> <li>test your electrical or electronic device with guidance.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>safely assemble a useful electrical or electronic device with little guidance</li> <li>test your electrical or electronic device</li> <li>explain the function of the components used in your device</li> <li>evaluate the effectiveness of your device when used.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>independently and safely assemble a useful electrical or electronic device</li> <li>independently test your electrical or electronic device and suggest alternative tests that could be carried out</li> <li>give a detailed evaluation of the effectiveness of your device and suggest improvements that could be made to make it more useful.</li> </ul>

You need to be able to safely assemble a useful electrical or electronic device and explain the function of all the components you have used to make it. You should test the device to make sure it does what it is supposed to do, and suggest other tests that could be carried out. You should evaluate how effective the device you have made is, and suggest improvements to it that would make it more useful.

### Stage 1

To obtain maximum marks at Stage 1 you should be able to assemble a useful electronic or electrical device and test it. You may need some help from your teacher to do this. You don't get any marks for writing a method but your teacher will observe you carrying out the assignment and make a comment on your work to show whether you successfully assembled the electronic or electrical device. You need to test your device to ensure that it works and produce some written evidence stating how you carried out the test.

### Stage 2

To complete Stage 2 you should be able to assemble the electronic or electrical device and test it with little help from your teacher. You should be able to identify the components used and carefully explain what each does. You also need to evaluate how effective your device is – be very careful to remember that it is the effectiveness of **the device** you are testing, and **not** the techniques used in building it.

### Stage 3

To complete Stage 3 you should be able to assemble and test your electronic or electrical device with no help. You should extend your evaluation of the device to include improvements that would make your device more useful. You will gain more marks if you say why the improvements you have suggested would make the device more useful.

## Checklist for C: Assembling an Electronic/Electrical Device

Use the checklist below to track your progress in this assignment.

Put a tick against each point as you complete it.

The items in the shaded boxes are what you need to do extra to be getting Stage 3 marks.

<b>Title of Assignment:</b>		<b>Tick</b>	
I have completed a risk assessment			
I have assembled the device safely	<b>Some help:</b>		
	<b>Little help</b>		
	<b>No help</b>		
I have successfully tested my device	<b>Some help:</b>		
	<b>Little help</b>		
	<b>No help</b>		
I have suggested some alternative tests			
I have given a list of the components I have used			
I have explained the function of each of the components used			
I have evaluated the effectiveness of my device			
I have suggested improvements to my device and given reasons for the improvements			

## D: Using Machines

There are 7 marks available for this investigation, and your work will be assessed using the three-stage grid below. Each stage you complete will allow you to gain more marks.

Stage 1	Stage 2	Stage 3
<p>You should be able to:</p> <ul style="list-style-type: none"> <li>give and describe an example of how mechanical machines may be used in the workplace</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>describe how mechanical machines used in the workplace act as force multipliers</li> <li>describe why the effects of friction are important in mechanical machines.</li> </ul>	<p>You should be able to:</p> <ul style="list-style-type: none"> <li>measure the applied force and the force produced by a machine</li> <li>calculate: <ul style="list-style-type: none"> <li>the amount the machine multiplies force</li> <li>the work done by the machine</li> <li>the efficiency of the machine.</li> </ul> </li> </ul>

In this investigation you need to be able to describe how mechanical machines may be used in the workplace and describe why the effects of friction are important in machines. You also need to understand about force multipliers and should be able to calculate work and efficiency.

### Stage 1

To complete Stage 1 you need to find an example of a mechanical machine being used in a workplace and describe how the machine is used in the workplace. You should also say why it is being used. You will find this easier if you can use an example that you have actually seen – perhaps on work experience or a Saturday/holiday job.

### Stage 2

To complete Stage 2 you should use your scientific knowledge to describe how the machine helps to minimise effort and act as a force multiplier. It is better if you can link this to the example in Stage 1, although it's not essential to do this. You also need to be able to explain clearly why friction in machines wastes a lot of energy and describe the types of energy that friction produces.

### Stage 3

To get the best marks for this investigation you will need to make some measurements in order to calculate the work done by a machine, the amount by which the machine multiplies force and its efficiency. You don't have to carry out these measurements on the machine described in Stage 1 and Stage 2, although you might find it helpful.

## Checklist for D: Using Machines

Use the checklist below to track your progress in this assignment.

Put a tick against each point as you complete it.

The items in the shaded boxes are what you need to do extra to be getting Stage 3 marks.

<b>Title of Assignment:</b>	
	<b>Tick</b>
I have completed a risk assessment for the experimental part of the assignment	<input type="checkbox"/>
I have given an example of a machine being used in workplace and have described its use	<input type="checkbox"/>
I have described how mechanical machines can act as force multipliers described. <i>(You may want to refer to the example used above.)</i>	<input type="checkbox"/>
I have described why the effects of friction are important in machines	<input type="checkbox"/>
I have measured the applied force and the force produced by a machine	<input type="checkbox"/>
I have calculated the amount by which the machine multiplies force	<input type="checkbox"/>
I have calculated the work done by the machine	<input type="checkbox"/>
I have calculated the efficiency of the machine	<input type="checkbox"/>