1492 Double Award Engineering Unit 3 - 4868

Training Support Materials

Candidate Revision Guide

This material is issued as support for candidates in the above examination for Unit 3, the written paper specifically for the OCR Engineering Specification.

As with the previous revision guides provided by OCR it is written for the candidates and uses the language which appears in the specification and also the written paper.

It is partly based on 8.2 WHAT YOU NEED TO LEARN of the specification and written with the insight gained from OCR's marking experiences of the four papers, June 2004, January 2005, June 2005 and January 2006, for this specification.

It is important for centres to note that from January 2007 Unit 3 will also include specific questions based on other areas of the specification i.e. questions will not solely be based on 8.2 WHAT YOU NEED TO LEARN.

It is not a fully comprehensive document nor is it intended to be nor is the intention that it is the sole teaching material for Unit 3. It has been written as a support for teachers and candidates for preparation for the written paper.

Its design is also to encourage centres to comprehensively address all the areas of specification. Some exercises follow the format of examination questions whilst others are meant to stimulate and provoke appropriate thought and activity for class and homework activities. The Unitised format of the revision guide allows disassembly by centres for this type of approach.

The material should be used throughout the course and is designed to supplement, focus and reinforce the teaching of the full content of the specification.

Preparation of candidates for this Unit should not be left until the end of the course and taught as a final theory preparation for the written paper. It should form the core of candidate activity throughout their GCSE study.

The contents are easily re-orientated to suit individual centres and/or teachers' needs but remain a guide only and relate solely to the OCR specification.

Unit 3 Application of Technology

1. It is a 1½ hours written examination
2. You will sit the examination on . . . . . .
3. You will have the opportunity to re-sit the examination either next January or June but there could be a cost for doing this.
4. You will need to take the following to the exam:
   - ✓ Black or blue pens (you need a spare)
   - ✓ Pencil
   - ✓ Pencil sharpener
   - ✓ Ruler
   - ✓ Eraser
   - ✓ A black fine line pen might also be useful
   - ✗ **BUT** you must not write in red ink
5. When you start the examination:
   - ✓ Relax as much as you can
   - ✓ Read the instructions on the front of the paper
   - ✓ Read the question paper all the way through
6. You have to answer **all** the questions.
7. Check the marks in brackets for each question. e.g. [4].
8. If you find a question difficult, move on and ***return*** to it later.
9. Never leave a question blank. Give a common sense answer if you are not sure.
10. If you make a mistake cross it out with a single line so that the examiner can still read what you first wrote.
11. Try to use sentences if you can.
12. Write as neatly as you can–the examiner has to be able to read it.
13. Use as many ***technical*** words as you can (It is better to use technical words even if you spell them incorrectly – you will **not** lose marks for incorrect spelling!)
14. For **some** questions it might be useful if you mention your industrial visits or work experience. This can help you with your thinking.
15. Towards the end of the examination read the **all** the questions again and **then** read your answers. You can change anything you have written if you feel you need to. Just cross through and write your changes.
16. Relax and wait for the examination results.

State - Give - Explain - Describe - Discuss - Plus 1, 2, 3, 4, 5, 6, 7, & 8!

There some things you should know about the Examination Paper you are going to sit.

All questions have a "command word" in them which triggers **you** into action.

For example a question might say "*Give* **two** examples of….."

Or "*State* **one** use of……."

Another might say describe or "*Explain* the use of….."

More challenging questions might ask you to "*Discuss* the use of……"

Also something you should think about is that each question in the paper gets a little bit more difficult as it goes through the Examination Paper **AND** each question gets a little more difficult through the question.

This means that question 1 is the easiest, question 2 a little more difficult, question 3 is a little more difficult and so on.

This also means the first part of a question (a) will be the easiest part the next part (b) will be a little harder and (c) will be a little harder again.

And before we move on lets us look at a specific issue in some questions.

Let us look at this one first. The question says "Give **two** examples of…"
So how many examples should you give? **Two** is pretty obvious isn't it?
But you would be surprised at how many candidates give just **one.** Also a lot of candidates give three or four! That is **not** what you should do and is **not** to your advantage to do.

So….one means **one, two** means **two** and **three** means……You've got it!

Command words are the triggers which ask you to do things. Watch out for the following:

Complete the table using 1 or 2 words	Use the spaces in the table to guide your answers.
State	One word answers. Possible a short phrase.
Give	Again, one word or short phrase answers
Complete the table using short sentences	Slightly longer written answers, perhaps with two parts to them. An answer and a reason for it.
Use notes and sketches	Please use Notes **and** Sketches to explain things. **You really do need to practice your drawing skills!**
Describe	Much fuller explanations are required. Give several points and reasons why you think the points are important.
Explain	An even fuller answer with reasoning and justifications.
Discuss	An argument *explaining **both*** sides of a situation and why things are important. An example is also required.

You'll find out more as you work through this revision guide.

A question at the beginning of the paper will be on the Engineering SECTORS**.**
Use the WWW to find out what each sector produces. Some are very obvious such as “Computer”. But what other products are made in this sector in addition to computers? Try Google as a search engine. They try a different one of your own.

Find out as much as you can about the sectors and put your findings in “note” form in the column on the right. Try using bullets to “sort” your information.	
automotive	
civil	
computer	
construction	
electrical and electronic	
fluid	
marine	
mechanical	
process control	
telecommunications	

Choose 4 or 5 of the sectors from the list above and learn all you can about them.

In the examination you will have to:

- answer about the Engineering sectors and **not** the Manufacturing sectors **(BUT remember that "Engineering Fabrication" is a *Manufacturing* sector but you will still have to have knowledge of it)**
- understand and talk about different **products** from the sectors;
  talk about of **new technologies** used **in their production** and also technologies used **by** the products.

Aeronautical sector… ***Concord… Altitude meter***
A device for telling the pilot how high the aeroplane is from the ground
Laser welding for pin point accuracy and strength during assembly of the airframe

In the box below identify **three** Engineering sectors and give **two** ***different*** examples of a product from each sector and **two** *different* technologies, **one** technology used in the production of the product and **one** used by the product.

Sector	Product	Technologies

You will be asked to “use sketches and notes” to show how technology is used in the design and manufacture of **one** product.
You will need to think about:

- the technologies used;
- materials and components used; and
- the structure and form of the product.

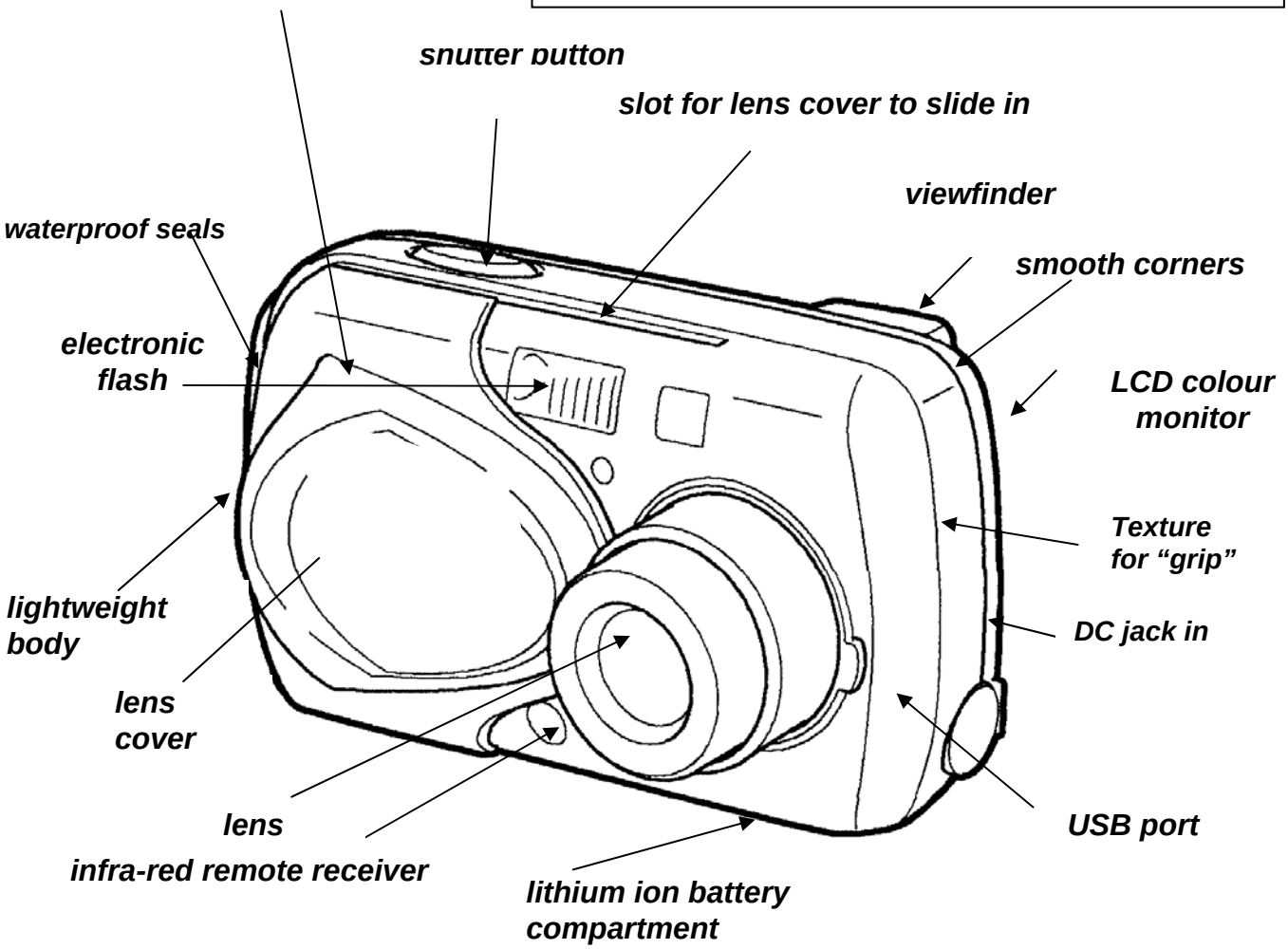
You will choose your own product.
It is **NOT** advisable to try to use the example below as your product.
You should have prepared at least ***two different*** products for the examination

What you choose should:

- be a product that you have investigated in detail;
- be complicated enough so you can “show off what you know”;
- but not be too complicated so that you confuse yourself.

Below is an example of what you are going to be asked to do.

Name of product: ***Digital Camera***



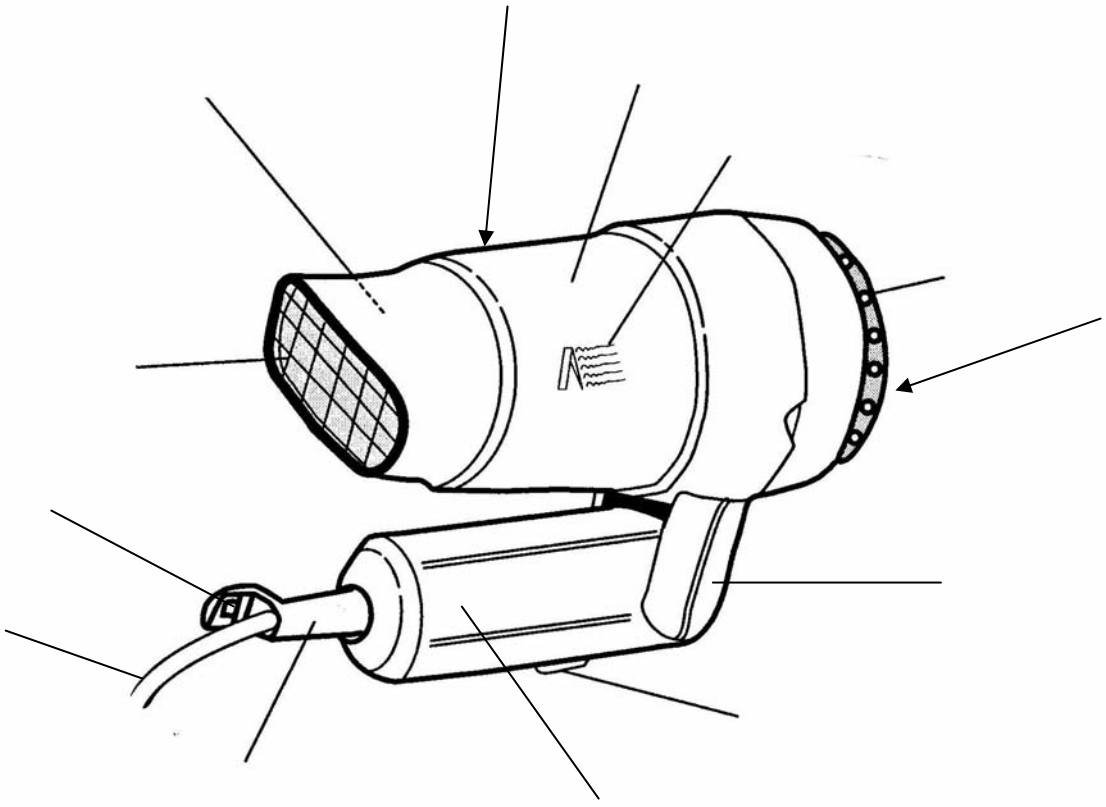
You will probably use previous examination papers to practice before your actual examination. You may even have one of them as your “mock” or “trial” examination.

Have a go at this example from the June 2005 paper.

Use sketches and notes to explain how technology and materials are used in the design and manufacture of a hairdryer.

Your answer must include:

- The technology used; [4]
- How materials/components are used; and [4]
- The structure and form of the product. [4]



The sketch has been done for in this exercise but YOU will have to draw your own in the actual examination.
<u>Warning!! Do not try to use this example in the examination paper</u>

Did you remember to look for the bracketed marks?

Think about the products in the table below and decide if they are good examples or poor examples of products to choose for this question:

	Example	Good or Bad	Reasons for your choice of good or bad
A	A motor cruiser		
B	A paper clip		
C	A mobile telephone		
D	A loaf of bread		
E	A pop-up Christmas card		
F	A coat button		

Choose a product of your own and have a practice in the space below.
Remember you will need to think about:

- the technologies used;
- materials and components used; and
- the structure and form of the product

- Remember neat sketches **and** notes.
- **<u>Notes NOT JUST labels</u>**

Name of product:

There will be questions on the use of various aspects of Digital Technology (ICT) used in industry.

ICT (Digital Technology) is a very important part of **your course** and also all of our **daily lives**. Your visits to factories, visiting speakers and videos etc will have helped you have a clear understanding of how it **is** used and **can be** used in industry.
An example of selling things on "eBay" is a very good use of the Internet but it is not really an industrial application of the use of the WWW. So be careful when you answer.

You **must** know about:

- spreadsheets
- data bases
- the internet

Think about them and for each of them write out an explanation of:

1. **what they are;**
2. **what they do;**
3. **advantages of using them;**
4. **disadvantages using them;**
5. **give at least one example of their use in industry.**

	A SPREADSHEET
1	A spreadsheet is _____
2	A spreadsheet is used to _____
3	The advantages of using a spreadsheet are _____
4	The **dis**advantages of a spreadsheet are _____
5	One example of the use of a spreadsheet is _____

	A DATABASE
1	A database is _____
2	A database is used to _____

3	The advantages of a database are ____
4	The **dis**advantages of a database are ____
5	One example of the use of a database is ____

	The INTERNET
1	The internet is ____
2	The internet is used to ____
3	The advantages of using the WWW are ____
4	The **dis**advantages of using the WWW are ____
5	One example of the use of the WWW is ____

Important!

You **<u>must</u>** read the question carefully to understand what is being asked.

- Quite often candidates give ***advantages*** when the question asks for ***disadvantages;***
- If the question is about Databases do not answer about Spreadsheets
- Remember your Industrial Visits and what you found out
- Remember the things you put in your portfolios about how things would be undertaken in industry for the things you designed and made
- If all else fails use information about your own designing and making activities
- **BUT NOT ABOUT <u>YOU</u> SURFING THE NET!**

During your course you will have undertaken a number of different investigations using products from different Engineering sectors.

In the table below identify **four** different products from each of the sectors you have investigated which you know something about. Then try to explain *exactly* **how you found out** information on the products.

Tip

You cannot just say "I went on the internet". It needs to be specific and more detailed. e.g. I used the internet to go to the manufactures web site and searched for details of the materials used in the manufacture.

Product	Sector	Method of investigation used

Now complete the table below for three different products you have investigated. This is similar to the exercise you did on page 4 but your answers should now be more detailed.

Product	Sector	Technologies used in their production

Can you do a **fourth** product?

Investigating Products

During your course you should have undertaken some simple assessment of the properties of products such as:

- **structure;**
- **heaviness;**
- **colour;**
- **feel of surfaces;**
- **scratch resistance;**
- **wear resistance;**
- **any areas likely to be damaged**.

Complete the boxes below with details of products you have **actually *tested***.
An example has been ***started*** for you.

Product	Method of investigation	Information that you found out
Mobile phone	***Testing the weight by weighing it***	***It weighed 135 grams, which is 22 grams lighter than the average mobile phone in my class.*** ***<u>Why might this be the case?</u>***

For a moment pretend you are an examiner for this examination paper.
How many marks would you give these examples?

Product	Method of investigation	Information that you found out
Space rocket	***My mum flew the rocket to Mars*** [1]	***It went very fast indeed - faster than I can go on my bike*** [2]
Wrist watch	***I compared the accuracy of the watch with three different clocks*** [1]	***Over a period of a week the wrist watch gained a total of four and a half minutes. All of the other watches were accurate to within six seconds*** [2]
Mobile phone	***Testing the case by scratching the inside surface*** [1]	***It did scratch but only with a lot of pressure. The sharper the object I used the deeper the scratches were but surprisingly they did not show up very much even then*** [2]
Digital Camera	***I set fire to it*** [1]	***It burned well and smelt a lot.*** [2]

Abbreviations

You must get used to certain abbreviations, what they stand for **and** understand what they are all about.

Complete this table from memory.		
C	**Aided**	**D**
Computer	**A**	**M**
Computer	**I**	**E**
I	**C**	**Technology**
P	**L**	**Controllers**

Check if you had them correct if not change them now. That was the easy bit now the harder bit.

For each of them write out an explanation of:

1 what they are;
2 what they do;
3 advantages of using them;
4 disadvantages using them;
5 give at least one example of their use in industry.

	C A D
1	CAD is _____ _____ _____ _____
2	CAD is used to _____ _____ _____
3	The advantages of CAD are _____ _____ _____ _____
4	The **dis**advantages of CAD are _____ _____ _____ _____
5	**One** example of the use of CAD is _____ _____ Can you give a 2nd one? _____ _____ _____

	C A M
1	CAM is _____
2	CAM is used to _____
3	The advantages of CAM are _____
4	The **dis**advantages of CAM are _____
5	One example of the use of CAM is _____
	C I E
1	CIE is _____
2	CIE is used to _____
3	The advantages of CIE are _____
4	The **dis**advantages of CIE are _____
5	One example of the use of CIE is _____

	Digital Technology (I C T)
1	ICT is____ ____ ____ ____ ____
2	ICT is used to ____ ____ ____ ____
3	The advantages of ICT are ______________________________ ____ ____ ____ ____
4	The **dis**advantages of ICT are ___________________________ ____ ____ ____ ____
5	One example of the use of ICT is --------------------------------------- ---
	P L C
1	PLC's are ____ ____ ____ ____ ____
2	PLC's are used to_______________________________________ ____ ____ ____
3	The advantages of PLC's are _____________________________ ____ ____ ____ ____
4	The **dis**advantages of PLC's are __________________________ ____ ____ ____ ____
5	One example of the use of PLC's is -------------------------------------- ---

Important!

You **must** read the question carefully to understand what is being asked.

- Quite often candidates give ***advantages*** when the question asks for ***disadvantages;***
- If the question is about CAD do not answer about CAM
- Remember your Industrial Visits and what you saw
- Remember the things you put in your portfolios about how things were done in industry
- Use examples of things you have actually seen in industry
- If all else fails use information about you own designing and making activities

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In the table below make a list of all the other abbreviations, which are relevant to your Technology course.

Complete this table from memory first of all and then look up all the others.			

Make sure you understand what they all mean. Test each other!!

Modern and Smart Materials and Components.

Modern is very difficult to define accurately. However, if you give an answer which is ***"appropriate to the question"***, such things as "**aluminium alloy"** would be accepted as modern.

This is a very diverse subject and you will not be able to learn everything. But you will gain knowledge in the following ways:

- your teachers;
- in every day life – products you may own;
- during your Industrial Visits;
- from any videos you may watch;
- T.V. adverts;
- T.V. documentaries;
- newspaper articles;
- newspaper adverts; and ***even…***
- some from text books.

However there are *some* specific modern materials which you could be asked direct questions on.

Important!

You **must** have knowledge of:

- Polymers, including plastics, adhesives and coatings
- Metals and composites, including shape memory alloys
- Biological, chemical and food products, modified ingredients and methods of preparation and production
- Computer technology including microprocessors and memory devices
- Micro-electric components and parts, including integrated circuits and display devices;
- Textile technology, including liquid crystal coated fabrics and thermocromic dyes

A lot of the information will come from your teachers. It is all important not just for your course but for everyday life. Here are some questions to get you interested and on the trail of knowledge.

- Have you ever wondered how the drawer of your CD player slides out so slowly? Smart Grease (motion Control Gel) is the answer but what is it and how does it work?
- Have you ever thought about how the colour of some display lights change from one colour to another?
- What about things which change colour when they get hot – the strip on an electric kettle for example?
- What does a microchip do and how does it work?
- What is polymorph and how might it be used?
- What is Nitinol and what can it do? How could it be used?
- What is the difference between an alloy and a composite?

There will have been good coverage of these things during your GCSE course by your teachers but **you should take every opportunity to ask questions and read about *anything*, which is mentioned, in the box above.**
Try researching on your own and keeping a sort of diary.

Date	Research topic	What I have discovered

Discuss

The last question on the examination paper is a **"Discuss"** question.
There will be help at the top of the page giving you instructions of how to answer this question and it will read as follows:

- identify **three** relevant issues/points raised by the question;
- explain why you consider **two** of these issues to be relevant; and
- use **one** specific example or piece of evidence to support your answer.

Of course you can always give **more** than three issues or **more** than one example. You will never loose marks for doing this and could easily gain some!

You **must** read the question carefully to understand what is being asked. Read the question at least **twice** – you could always use a highlighter pen to help you focus on the important words in the question

Try this little exercise.

With a friend, or your brother or sister sit down and talk about something for just 5 minutes.
Talk about anything you know something about. For example:

- Leeds Football Club chances in the FA cup;
- Your mobile phone and the new features;
- Your next holiday;
- The London bid and the Olympic games;
- Your hobby;
- The latest single from Will Young.
- Your Mum and Dad's car.

Keep focused on the topic you are talking about and try to:

- identify **three** relevant issues/points raised by the question;
- explain why you consider **two** of these issues to be relevant; and
- use **one** specific example or piece of evidence to support your answer.

In actual fact you probably do this all the time with your family and friends.
So for example:

Question: Why **didn't** your family enjoy your last holiday?

Our last holiday was to Florida but it was a very long flight and we were all very tired by the time we got there. Also, because we had to travel during school holidays, it was expensive, as the holiday's prices are more expensive then, and also very busy both at the airport and the resort where we stayed. On the aeroplane the seats were very close together and both my father and I had bad cramp in our legs. It was so crowded in the hotel and the restaurant it upset my mother because she really like peace and quite to eat her meals. It was very bad at breakfast on our first day; we were still very tired, when somebody accidentally spilt orange juice over my mother's shorts whilst she was at the buffet.
The stains would not come out and my mother had to buy new clothes. [6]

The parts underlined are **facts** and will gain marks. In fact it is a pretty good response to the question set.

Can you see how easy it is to do? But **you must stay focused** and **not repeat yourself.**
Did you spot how many marks were available for this question? Well done if you did – you remembered this from page 1 of this revision guide.

Have a look at these other examples. Can you see that they do not really stick to the point and hardly answers the actual question at all. How many marks would you give this one?

Our last holiday was to Florida and it was a very long flight but I managed to sleep most of the way. It very busy both at the airport and the resort where we stayed but I don't know why. On the aeroplane the seats were very close together and my dad got cramp, which made me laugh, but I didn't tell him I had it too. It was really sunny in Florida and the pool was smashing. We had all of our meals paid for and because it was busy I kept getting lost on purpose which upset my mum but was great fun.

[6]

How many marks do you think this answer is worth is worth?

My next holiday is going to be to Florida – we have been there before and it was great. The sunshine was super and the pool was excellent. It was ever so busy and I kept getting lost on purpose just to wind my mum up. Food was good too and I met some others kids who were a good laugh.

[6]

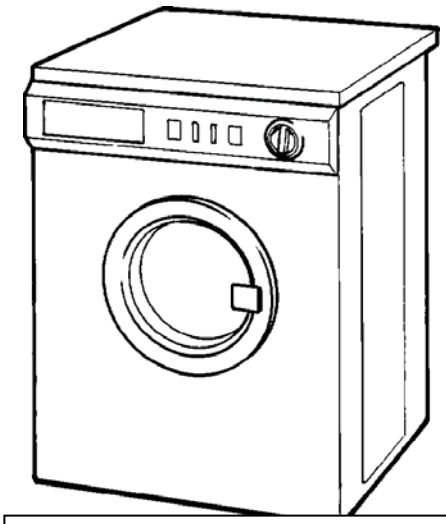
So practice!

If you practice "discussing" things you will find this question quite easy. But always remember:

- Use the instruction given on the paper;
- Stick to the point of the question – don't get side tracked!

We are going to Discuss:	The new features of my mobile phone and how the improvements have come about. What they mean to me and the advantages, disadvantages, materials and how things are made. Also what life was like before mobile phones?
We are going to Discuss:	
We are going to Discuss:	
We are going to Discuss:	

With reference to the product shown here try answering the following questions.



Explain the use of an embedded system in a washing machine.

_____

_____

_____

_____

_____

_____

_____

State the sector that produces washing machines.

_____

Explain how CAD might be used in the design of the washing machine?

_____

_____

_____

_____

State one modern material which might be used in the production of a washing machine?

_____

Explain how it is used in the washing machine

_____

_____

_____

_____

Name one technology which might be used in the production of a washing machine?

_____

Explain how it is used in the production of washing machine

_____

_____

_____

_____

Describe how ICT could be used in the marketing of washing machines.

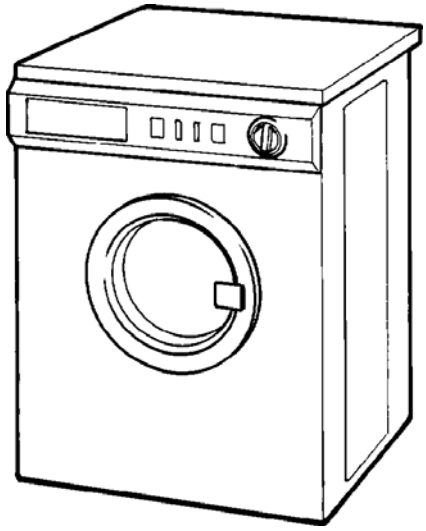
_____

_____

_____

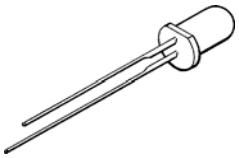
_____

With reference to the product shown try answering the following questions.



Explain how CIE could have been used in the production of the washing machine.

Describe the function of this component when used in a washing machine and give **one** example of when it might operate.



Name the material used for the body panels and describe structure of the washing machine.

Material:

Structure:

State **four** environmental issues related to the production of a washing machine.

1

2

3

4

State **four** environmental issues related to the use of a washing machine.

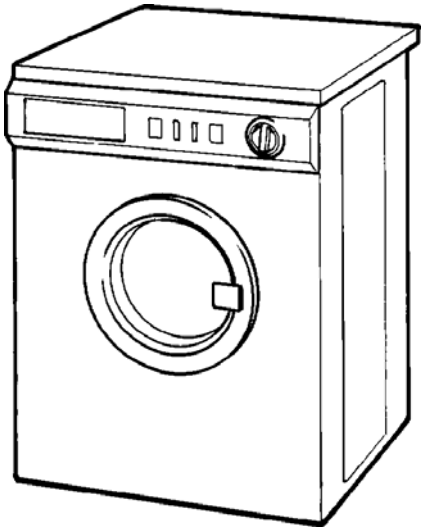
1

2

3

4

With reference to the product shown try answering the following questions.



Discuss the implications of using modern materials in relation to the final disposal of the washing machine.

[6]

Describe how ICT is used in the packaging and dispatch of washing machines.

State **four** simple tests you might carry out on a washing machine.

1

2

3

4

Draw a clear sketch of the washing machine and label the visible components.

Robotics.

Complete the table below to identify **three** different products which are made using robotics **and** the processes which use them. The first one had been done for you.

Tip

You cannot just say “sprays” or “paints” the shell.
Your answer needs to give details to show you understand the use of the robotics.

Product	Sector	Processes Involved
Car Body Shell	Automotive	The shell is spray painted using a moving robotic arm. The arm articulates (moves in a number of different directions) to give a very even coating of paint. The car body shells then move along on a conveyer system bringing the next car body shell to the robotic sprayer.

Tip

Don’t **“guess”.** Think carefully about how products are made there are **LOTS** of things which **do not** use robotics.

Now complete the table below with **two** different products which **do not** use robotics during their manufacture.

Product	Sector	Suggest why robotics are not used

Robotics

Robotics have many advantages when used during manufacture.

Explain **four** different advantages when using robotics during manufacture.

Tip

When a question says “Explain” you must try to make at least **two** points for each of the 2 advantages.
The first one has been done for you to show you what to do and explains ❸ different points.

Advantage	
Can work 24/7	Because the robots are machines they do not need to take comfort breaks or stop for food and so lose production time❶. They do not get sick and so can work all of the time and will not require sick pay ❷ Also can work day and night, day after day without getting tired so do not lose production time❸. [3]
	[3]
	[3]
	[3]

Tip

If you get stuck because you only know, let us say one point of the three asked for, don’t panic.
Answer what you can and move on to the next part of the question.
But you must remember to go back later and have a guess then if needs be.

Complete the table below to identify which products use robotics during their production.

Product	✓ or ×		**Product**	✓ or ×
A motor car engine			An aeroplane engine	
Copper plumbing pipes			A plastic water bottle	
Plastic plumbing pipes			A jet engine	
A printed circuit board			Electrical wires	
A computer			A metal filing cabinet	

Embedded Systems.

Embedded systems have many advantages when used in modern products.

Explain **three** different advantages of embedded systems.

Tip

When a question says “Explain” you must try to make at least **two** points for each of the 2 advantages.
The first one has been done for you to show you what to do and explains ❷different points.

Advantage	Reasons
Size	Because most embedded systems are very small “micro chips” they allow smaller products to be designed❶. This can also mean that products are not as heavy and so could be more portable❷.

Tip

REMEMBER! If you get stuck because you only know, all of the answer “do not panic”
Answer what you can and move on to the next part of the question.
But you must remember to go back later and even have a guess then if needs be.

Complete the table below to identify which products use embedded systems.

Product	✓ or ×		Product	✓ or ×
A motor car engine			A aeroplane engine	
A fridge			A digital camera	
A SLR reflex camera			A hearing aid	
A washing machine			A mobile	
A modern sewing machine			Electrical plugs	
A printed circuit board			A domestic oven	
A mobile phone			A food mixer	

Embedded Systems.

Embedded systems have some disadvantages when used in modern products.

Explain **two** different disadvantages of embedded systems.

Tip

When a question says "Explain" you must try to make at least **two** points for each of the **two** advantages.
If you can "Explain" use any technical word you know which are relevant to the question. One has been done with ❸ points to help

Disadvantage	
They are delicate and sometimes very small.	Because most embedded systems are very small and delicate "micro chips" they can be difficult to replace without specialist tools❶. This means that any repairs might need to be undertaken by a specialist technician❷ and so cost of repair will be higher❸. [3]
	[3]
	[3]

Tip

Question: If you move on from a question and need to come back to it later how do you remember which part of the question to go to?
Answer: Make a note on the front of the examination paper (in very small writing) to remind you. So at the end of the examination when you close the paper you can easily see it.

Complete the table below to identify which products use embedded systems.

Product	✓ or ×	**Product**	✓ or ×
A video camera		A handheld food blender	
A domestic steam iron		A dishwasher	
A wind up musical box		A digital video camera	
A paper shredder		A digital scanner	

For **two** of the products you have ticked above "describe" how the embedded system effects the function of the products.
Product 1.

Product 2.

Remember the sectors?

2 minutes only to complete this table.

Product	Sector	Product	Sector
A video camera		A handheld food blender	
A domestic steam iron		A dishwasher	
A wind up musical box		A digital video camera	
A paper shredder		A digital scanner	

Remember the technologies?
2 minutes only to complete this table.

Product	Technology used in the production	Product	Technology used in the production
A video camera		A handheld food blender	
A domestic steam iron		A dishwasher	
A wind up musical box		A digital video camera	
A paper shredder		A digital scanner	

And another 2 minutes only to complete this table.

Product	Technology used by the product	Product	Technology used by the product
A video camera		A handheld food blender	
A domestic steam iron		A dishwasher	
A wind up musical box		A digital video camera	
A paper shredder		A digital scanner	

Thermochromatic inks and dyes. ***(Thermo = Heat + Chromatic = Colour)***

Thermochromatic inks and dyes are now commonly used in many products.
Complete the table below to show **three** different products which use thermochromatic inks and dyes and explain how each of them works.

Tip 1

It is good to be wrong! Nobody knows everything so……
When you hand in your homework sheets to get them marked do you always ask for an explanation for any answers which you got wrong?

Remember the ❶, ❷, ❸.

Tip 2

Product	How it works in this product

Tip

Question: If you cannot remember the technical word to answer the question what can you do?
Answer: Use your own words to try to explain and/or do a little drawing to help the marker know what you mean.

For **two** of the products you have identified above "state" **two** different possible problems with the application of the thermochromatic inks and dyes on to the product.

Product 1.
Product 2.

Terminology

Explain what the term “consumer” means.

A consumer is…

Explain what is meant by the term “local environment”

Local environment is…

Explain what is meant by the term “the environment”

The environment is…

Explain what is meant by the term “re-use”.

Re-use is…

Explain what is meant by the term “recycling”

Recycling...

Explain what “marketing” means.

Marketing is...

Alloys, Composites and Shape Memory Alloys

State what an “alloy” is.

An alloy is……[1]

Explain what an “alloy” is.

An alloy is……

……

……[2]

These are **two** different questions. The topic is exactly the same but they require a different type of response from you.

There are two clear clues as to how much information you are expected to give for your answer. Can you spot them?

Clue 1. ……..

Clue 2. ……..

So….. State what a “composite” is.

A composite is ……[1]

Explain what a “composite” is.

A composite is ……

……

……

……[3]

REMEMBER: The **[3]** means that you need to give **more** information to gain **all** of the marks.

Remember the ❶, ❷, ❸.

Think of it like this: **one** point or piece of information for **one** mark. So this question needs 3 pieces of information OR two pieces of information **and** an <u>example</u> to emphasise your points. This could be worth full marks if you explain it well.

Shape Memory Alloys

Now we are clear in our minds what “alloys” and “composites” are let us move on a little.

Nitinol is a shape memory alloy. Think about the words “shape memory alloy”.

Even without too much technical knowledge you can make quite a good guess at what “Nitinol” is and possibly does.

Lets try by breaking down the phrase “shape memory alloy”.

Shape means ……

Memory means……

……

An alloy is ……

……

The part that you **might** not know is that when an electrical current passes through “Nitinol” it **shrinks**.
And so when the electrical current is switched off it ……

So: Explain what “Nitinol” is and how it works.
……

……..

……

……

……

……

……..…[4]

Now you are almost an expert in shape memory alloys.
When it shrinks Nitinol exerts considerable force.

Suggest **one** application (use) for Nitinol. …. ……

……

……

……[3]

Microprocessors and Memory devices.

Your own personal knowledge might well be of use to you in this section.
BUT you must remember that the examination paper (unit 3) is called **"The Application of Technology"** and is really about the things you have seen and found out about during your course and your visits into **Industry.**

So: Take care to always try to think in terms of **Industry.** How and why the technologies are **used** in **industry.**

State what a Microprocessor is ……[1]

Explain what a Microprocessor is ……
……
……
……[3]

In terms of Digital Technology (ICT) state what memory is ……
……[1]

In terms of Digital Technology (ICT) explain what memory is. ……
……
……
……[3]

Explain **one** way in which ICT memory could affect the speed of production.
……
……
……
……[3]

Note!

You always need to be careful! On page 30 we were talking about "memory" and also on this page we are talking about "memory". The meanings are basically the same but it is the **application** which differs slightly.

So far this is pretty easy stuff.

Engineering Drawings

Complete the table for the examples of the drawing types.

The table below shows different types of engineering drawings.
You must be able to:

- ✓ Read;
- ✓ Produce;
- ✓ Identify the types; and
- ✓ Know where (and who by) the drawings would be used

Engineering Drawing	Who would use them	Where / When would they be used:
Freehand sketches		
Isometric projection		
Oblique projection		
Perspective drawing		
Block diagrams		
Flow diagrams		
Schematic drawings		
Circuit diagrams		
1st angle orthographic projection		
3rd angle orthographic projection		
Assembly drawings		
Exploded drawings		

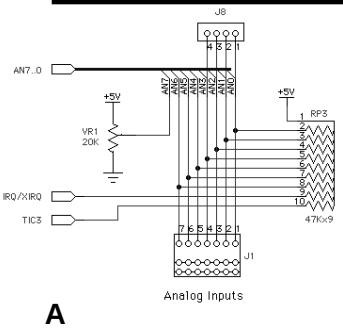
Engineering Drawings

Complete the table by identifying the examples of the drawing types printed below.

The table below shows different types of engineering drawings. You must be able to:

- ✓ Read;
- ✓ Produce;
- ✓ Identify the types; and
- ✓ Know where (and who by) the drawings would be used

Engineering Drawing	Letter
Freehand sketches	
Isometric projection	
Oblique projection	
Perspective drawing	
Block diagrams	
Flow diagrams	
Schematic drawings	
Circuit diagrams	
1st angle orthographic projection	
3rd angle orthographic projection	
Assembly drawings	
Exploded drawings	



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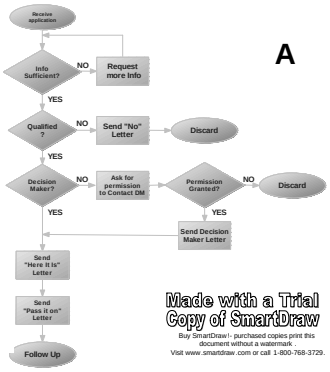

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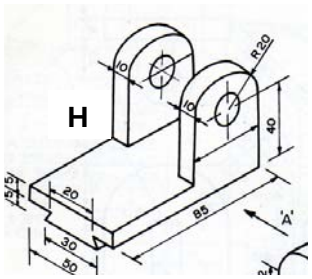

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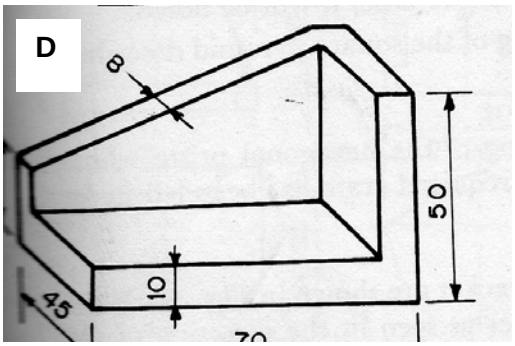

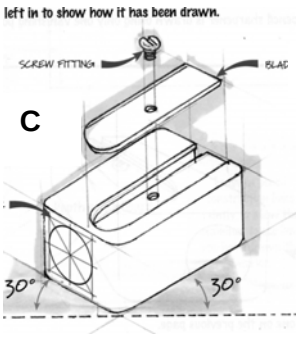

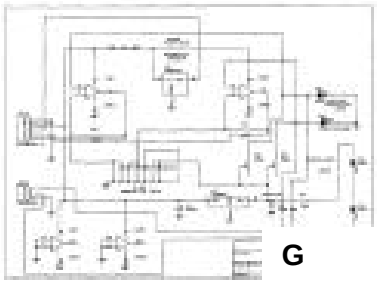

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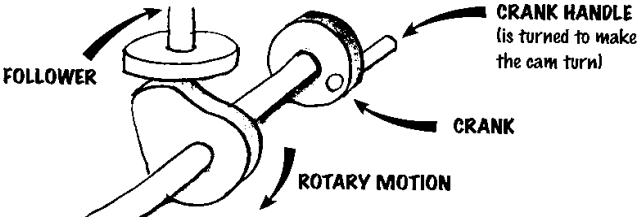

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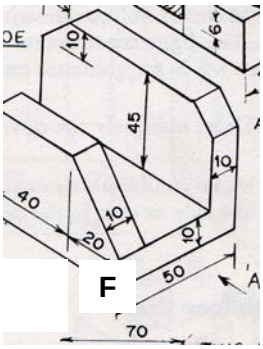

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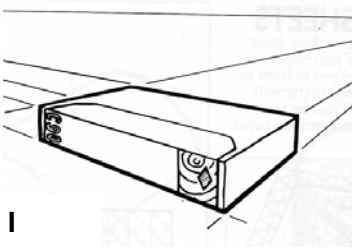

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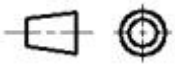

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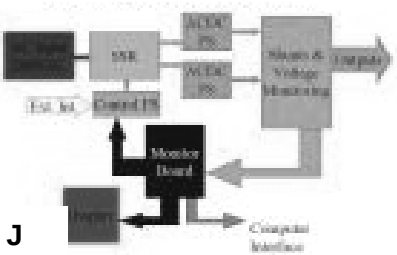

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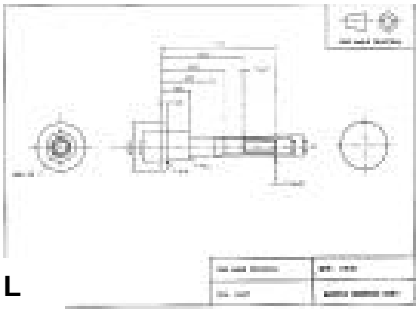

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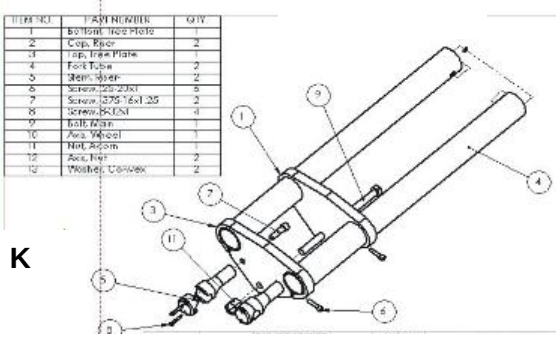


K

Complete the table below to identify where and when the engineering drawings might be used.

Engineering Drawing	Would be used to:
Freehand sketches	
Isometric projection	
Oblique projection	
Perspective drawing	
Block diagrams	
Flow diagrams	
Schematic drawings	
Circuit diagrams	
1st angle orthographic projection	
3rd angle orthographic projection	
Assembly drawings	
Exploded drawings	

Standard Symbols

You must be able to both recognise and draw **standards symbols** for the following:

Electrical/electronic componants such as:	**Pneumatic/hydraulic components including:**
Resistors	Valves
Thermistors	Cylinders
Capacitors	Reservoirs
Bulbs	Pipework
Batteries	Filters
Motors	
Buzzers	
Variable resistors	
Diodes	
	Dimensions including:
Mechanical features including:	Tolerance dimensioning
Holes	Radii
Internal screw threads	Centres
External screw threads	Springs

Firstly some testing of what you already know and secondly some research.

Complete the table below explaining the function and use of each of the components listed. Do this from your own knowledge first of all. Then using textbooks, the internet and information from your teacher complete the remaining boxes. Use a different colour ink to show what you "knew" and what you have "learnt".
Do the same exercise with this table.

Components	**The function and use is…**
Valves	
Cylinders	
Reservoirs	
Pipework	
Filters	

Where have you seen these components used?

Components	**I have seen them used in…**
Valves	
Cylinders	
Reservoirs	
Pipework	
Filters	

These symbols are used in engineering drawings. From memory draw the symbol for each of them. Then research the outstanding ones. Again use different coloured inks so you know what you have learnt and what you already knew.

Symbol	**Drawing of the details represented**
Holes	
Internal screw threads	
External screw threads	
Tolerance dimensioning	
Radii	
Centres	
Springs	

Now for the bigger test. Without looking any of them up draw the correct symbol into the correct box in this table.

Resistor		**Motor**	
Thermistor		**Buzzer**	
Capacitor		**Variable resistor**	
Bulb		**Diode**	
Battery			

Now log on to http://www.kpsec.freeuk.com/symbol.htm and check your own answers.

Keep a record of the websites that you visit so you can look them up in the future.
The first one has been done for you.

WWW address	Research Topic
http://www.kpsec.freeuk.com/symbol.htm	Electronic Symbols

Engineering Materials

Engineering materials are classified into the following groups.

✓ Ferrous metals
✓ Non-ferrous metals
✓ Alloys
✓ Thermosetting polymers
✓ Thermoplastic polymers
✓ Ceramics
✓ Composites

You must understand what properties each material has and how they might be used in engineered products.

Firstly let's start identifying some materials and where you have seen them used.
The first one has been started for you.

Examples of ferrous metals	**Where they have been used**
Example 1 Mild steel	Car body panels and pressed steel car wheels.
Example 2	
Examples of non-ferrous metals	**Where they have been used**
Example 1	
Example 2	
Examples of an alloy	**Where they have been used**
Example 1	
Example 2	
Examples of a thermosetting polymer	**Where they have been used**
Example 1	
Example 2	
Examples of thermoplastic polymer	**Where they have been used**
Example 1	
Example 2	
Examples of a ceramic	**Where they have been used**
Example 1	
Example 2	
Examples of composite material	**Where they have been used**
Example 1	
Example 2	

The property of a material can take many forms. In the table below can you identify properties for each of your materials? Look for advantageous properties and also some which may cause problems if used in certain engineered products.

The first one has been started for you.

Examples of ferrous metals	Properties of the material
Example 1 Mild steel	Steel oxidises and the material is eaten away. This is called rusting and so steel needs protection from the moisture in the atmosphere.
Example 2	
Examples of non-ferrous metals	**Properties of the material**
Example 1	
Example 2	
Examples of an alloy	**Properties of the material**
Example 1	
Example 2	
Examples of a thermosetting polymer	**Properties of the material**
Example 1	
Example 2	
Examples of thermoplastic polymer	**Properties of the material**
Example 1	
Example 2	
Examples of a ceramic	**Properties of the material**
Example 1	
Example 2	

Examples of composite material	Properties of the material
Example 1	
Example 2	

Composites are a very important material. Can you name two more?

Examples of composite material	Where they have been used
Example 1	
Example 2	

Examples of composite material	Properties of the material
Example 1	
Example 2	

Modern materials often replace other material in engineered products.

Complete the table below to identify **three** different engineered products, the modern material that they are made from and the material that has been replaced by the use of the modern material. The table has been started for you. Try to complete every row with an example.

Product	Modern Material used	Material replaced
Fishing Rod	Carbon fibre composite	
Car bumpers		Chromium plated steel
Heating plates on a cooker	Ceramic plates	

Engineering Components

You must also know about mechanical, electrical, electronic, pneumatic and hydraulic parts and components. You need to know what they do and why they are used in engineering products.

Mechanical components include:

- ✓ **Nuts**
- ✓ **Bolts**
- ✓ **Screws**
- ✓ **Springs**
- ✓ **Rivets**
- ✓ **Pins**
- ✓ **Clips**
- ✓ **Keys**
- ✓ **Drive mechanisms including gear trains**

Firstly let's start identifying where you have seen them used.
The first one has been done for you.

Mechanical component	Where they have been used
Nuts	Holding the wheels onto the studs of a cars wheel assembly.
Bolts	
Screws	
Springs	
Rivets	
Pins	
Clips	
Keys	
Gear trains	
Drive mechanisms	

Now let's get a little more detail for each of them.
Complete the table to explain whey they have been used in the application you stated above.
The first one has been done for you.

Mechanical component	Why they have been used
Nuts	They are available in a range of sizes and because of the hexagonal shape they are easy to turn and apply pressure using a wrench or wheel brace (this is like a long spanner).
Bolts	
Screws	
Springs	
Rivets	
Pins	
Clips	
Keys	
Gear trains	
Different drive mechanisms	

Now for some sketching practice. In the appropriate boxes below sketch each of the mechanical parts or components listed.

Mechanical component	Sketch	Mechanical component	Sketch
Nuts		**Rivets**	
Bolts		**Pins**	
Screws		**Clips**	
Springs		**Keys**	
Gear trains		**A Different drive mechanism**	

Engineering Components

You must also know about mechanical, electrical, electronic, pneumatic and hydraulic parts and components. You need to know what they do and why they are used in engineering products.

Electronic components include:

Resisters	**Batteries**
Diodes	**Motors**
LED's	**Buzzers**
Bulbs	**Variable resisters**
Wire	**Thermisters**
Cable	**Transistors**
Insulators	**Integrated circuits**

Again let us start identifying where you have seen them used.
The first one has been done for you.

Electronic components	What they do and where they have been used
Resisters	Resistors restrict the flow of electric current, for example a resistor is placed in series with a light-emitting diode (LED) to limit the current passing through the LED in a digital radio.
Capacitors	
Bulbs	
Wire	
Cable	
Insulators	
Batteries	
Motors	
Variable resisters	
Thermisters	
Transistors	
Integrated circuits	

Another useful WWW site for you is: http://www.kpsec.freeuk.com/components/resist.htm Don't forget to add it on to your list on page 39.

Can you remember the symbols for them all? Fill in the table showing the symbol for each but don't look back to page 39 until you have really tried to do them all on your own.

Electronic component	Symbol used	Electronic component	Symbol used
Resisters		**Insulators**	
Capacitors		**Batteries**	
Bulbs		**Motors**	
Wire		**Variable resisters**	
Cable		**Thermisters**	
Integrated circuits		**Transistors**	

Engineering Components

You must also know about mechanical, electrical, electronic, pneumatic and hydraulic parts and components. You need to know what they do and why they are used in engineering products.

Pneumatic & hydraulic components include:

Directional control valves
Cylinders
Filters
Flow control valves
Reservoirs

Again let us start identifying where you have seen them used.
The one has been done for you.

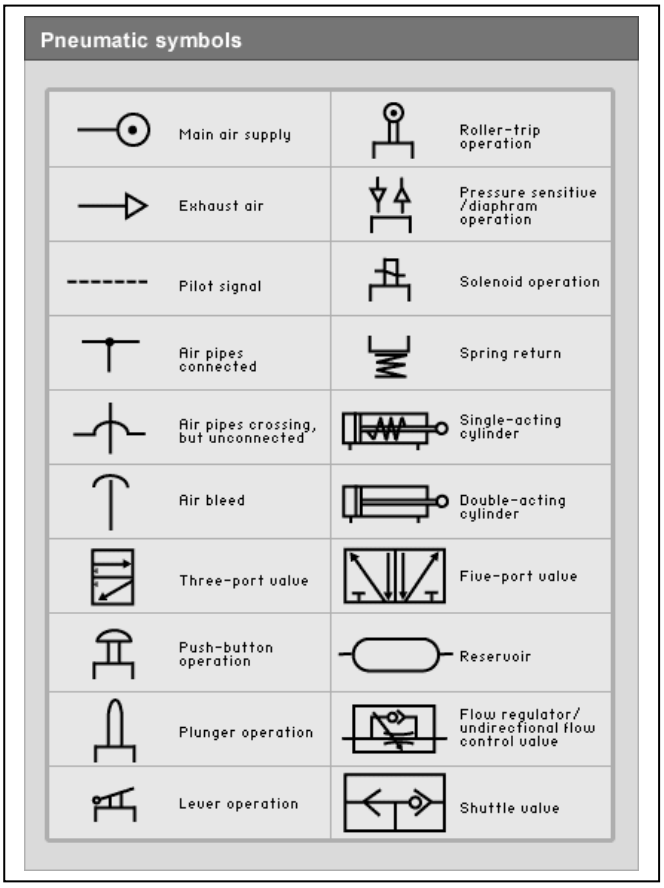
Pneumatic & hydraulic components	What they do and where they have been used
Directional control valves	
Cylinders	
Flow control valves	
Filters	A **pneumatic filter** is a device which removes contaminants from a compressed air stream. Air filtration applications are used in marine and aviation systems. A **hydraulic filter** is a very important part of hydraulic machinery. Metal filings are continually produced by mechanical components and need to be removed, along with other contamination. A good example is in JCB earth moving equipment.
Reservoirs	

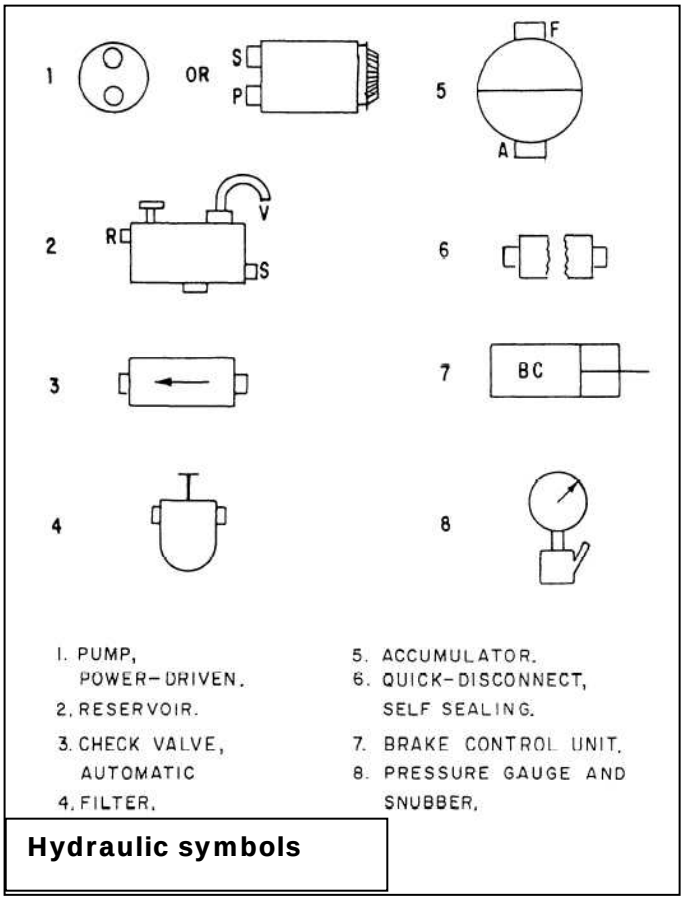
Do you know the symbols which represent these components?

Neatly draw them in the boxes below.

Pneumatic & hydraulic components	Symbol used	Pneumatic & hydraulic components	Symbol used
Filters		**Flow control valves**	
Reservoirs		**Directional control valves**	
Cylinders			

When you research these you might find another useful WWW site so don't forget to add it on to your list on page 39.





Hydraulic symbols

Engineering Processes

You must also know about a range of engineering processes. What they, are, what they do and when they would be used.

They are classified under the following headings.

- ✓ Material removal
- ✓ Shaping and manipulation
- ✓ Joining and assembly
- ✓ Heat and chemical treatment
- ✓ Surface finishing

The following is a list of the processes from the classifications shown above.
One has been done for you.

adhesion	
annealing	
bending	
brazing	
coating	
crimping	
drilling	
etching	
etching	
filing	✓
forming	
grinding	
hammering	
hardening	
milling	
plating	
polishing	
soldering	
tempering	
threaded fasteners	
turning	
welding	
wiring	

Individual processes	Engineering Processes by classification
filing	**Material removal**
	Shaping and manipulation
	Joining and assembly
	Heat and chemical treatment
	Surface finishing

Some of these processes you will have done your self and many you will have seen on your visits or on videos or even read about. Some internet sites give very good information with video clips to help you understand.

However you find out the information you must be as descriptive as possible both in your portfolios for both unit 1 and unit 2 and also in the written paper unit 3.

The next few pages are going to be a lot of work for you But try your hardest. Doing it well will reward you in the long run!

Remember the ❶, ❷, ❸.

1. **Complete the following exercise by completing the details for all the processes you have already done yourself.**

2. **Then, in a different colour ink, complete the details for the processes you have seen done either on real life or on video etc.**

3. **Finally research the remaining ones and remember to log your good internet sites on page 38.**

For <u>every one</u> of the processes complete the table to "<u>explain</u>" where it might be used and how it is undertaken.

Remember the ❶, ❷, ❸.

Tip

Always try to use <u>different examples</u> to explain things

Engineering process	An example of when and where it might be used <u>and</u> how it is undertaken
Adhesion	
Annealing	
Bending	
Brazing	
Coating	
Crimping	
Drilling	
Etching	

Filing	
Forming	
Grinding	
Hardening	
Milling	
Planishing	
Plating	
Polishing	
Soldering	
Tempering	
Threaded Fasteners	
Turning	
Welding	
Wiring	

Notes: