

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2013

Marking Scheme

Technology

Ordinary Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.



Leaving Certificate Examination, 2013

Technology

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Section A - Core (72 marks)

*Answer any nine questions in the spaces provided.
All questions in Section A carry 8 marks.*

Section A. Answer any nine questions. All questions carry 8 marks.

1. The graphics show the National Library logo as used in 1982 and in 2009.

Discuss how the change in logo reflects the evolution in the storage and accessing of information in libraries over the last 30 years.

1982: Books were the primary source of information in libraries.

People had to visit a library to access information.

Books took up a lot of physical space in a library etc.

2009: Advances in technology have allowed information to be stored and accessed in electronic format along with the traditional use of books.

Digital information can be accessed wirelessly through the use of computers, tablets and smartphones etc. The internet has enabled web users to access a vast amount of information in an instant etc.



1982



2009

2.



- (i) The Volvo ocean race visited Galway in 2012. The image shows one of the yachts.

Suggest a suitable material for the **hull** and for the **sail** of the yacht.

Hull: **Carbon composite.**

Sail: **Nylon/Polyester/Carbon Fibre etc.**

- (ii) Give **one** property of **each** chosen material that makes it suitable for its purpose.

1. **Lightweight/Strong etc.**

2. **U.V resistant/Lightweight/Good tensile strength etc.**

3.

The use of nuclear-thermal rockets is being considered for the propulsion of spacecraft.

Outline **one** advantage and **one** disadvantage of using nuclear power in this situation.



Advantage: **Large amounts of energy available/Small fuel load etc.**

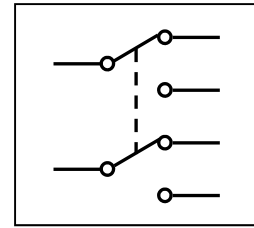
Disadvantage: **Risk of explosion/Radiation leak etc.**

4.



The graphic shows a DPDT slide switch used in electronics.

- (i) Using the formulae and tables booklet or otherwise, draw the symbol for this switch in the box provided.



DPDT switch

- (ii) Outline a specific use for this switch in circuits manufactured by students.

Forward and reverse control of a DC motor etc.

5.

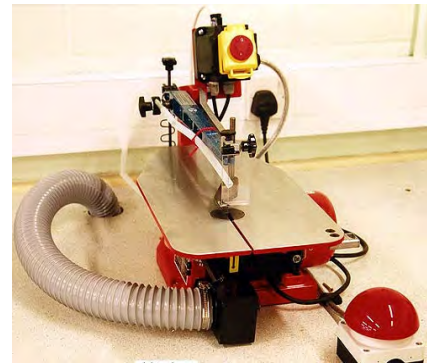
The image shows a scroll saw suitable for use by students in the Technology room. The saw has a number of safety features.

Give **two** safety features of this scroll saw.

1. **Emergency stop switch.**
2. **Blade guard/Dust Extraction etc.**

Outline **one** safety precaution that a student should observe when using a scroll saw.

**Wear goggles/No loose clothing/jewellery
Tie back hair/Obey exclusion zone etc.**



6.

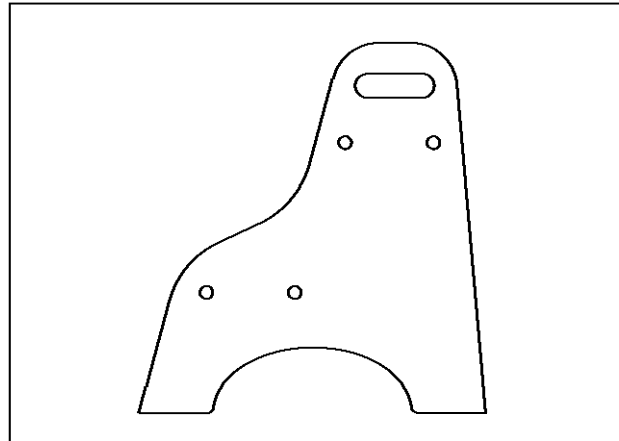
On October 24th 2012, Saorview, Ireland's free digital television service was launched.

Give **two** advantages of digital television.

**Superior picture quality.
Superior sound quality.
7 Day on-screen TV guide.
RTE Radio service etc.**



7. In the box provided, make a well proportioned 2D sketch of the footstool shown when viewed in the direction of the arrow A.



8. The solar powered LED keyring torch shown has been designed with sustainability in mind.

Outline **two** advantages of such a design.

No need for batteries.
LEDs are long lasting.
No pollution.
Lower carbon footprint etc.



9. The gearing system shown allows an input and an output shaft to rotate at 90° to each other.

- (i) Name this gearing system.

Bevel Gear System.

- (ii) Give **one** example of where this gearing system would be used.

Hand Drill/Clocks etc.



10. The iPhone holder shown is to be manufactured from a **single** piece of acrylic.

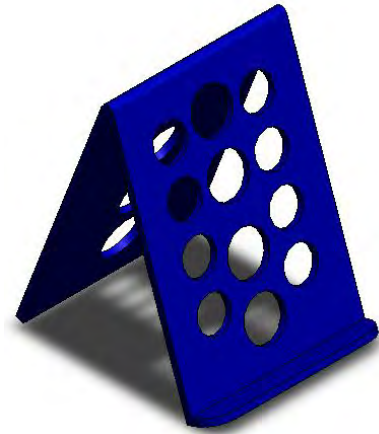
List **four** main steps required to manufacture this item.

Mark out design.

Drill Holes.

Finish and polish edges.

Bend fold lines etc.



11. The image shows a QR Code.

(i) Name **one** electronic device that uses QR codes.

Smartphone.

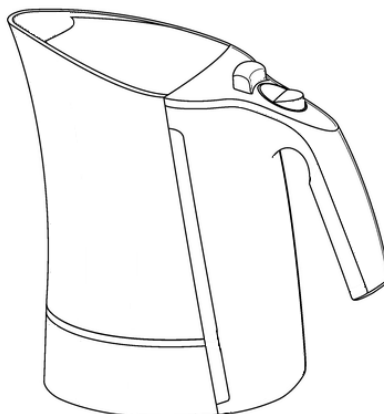
(ii) Give **two** advantages of using QR Codes.

Contents/information is decoded instantly.

A QR code can contain a vast amount of information such as products for sale/promotions/share contacts/map locations etc.



12. Use **two** graphic techniques to enhance the graphic representation of the electric kettle shown.



**Rendering, Colour/Shading
Shadow / Hatching etc.**

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Leaving Certificate Examination, 2013

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Section B - Core (48 marks)

Answer both questions.

Each question in Section B carries 24 marks.

Section C - Options (80 marks)

Answer two of the five options presented.

All questions in Section C carry 40 marks.

Section B - Core *Answer Question 2 and Question 3.*

Question 2 - Answer 2(a) and 2(b)

(a) - 10 marks, (b) - 8 marks, (c) OR (d) - 6 marks

2(a) Advances in technology in recent years have allowed greater use of renewable sources of energy for the heating of homes.

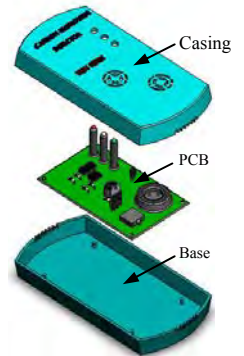
The graphic shows wood pellets, which are burned in wood pellet boilers.



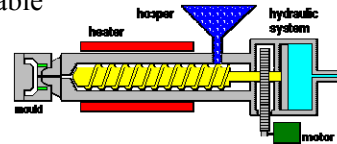
- (i) Outline **two** benefits of using renewable sources of energy to heat homes.
Sustainable source of energy, less reliance on fossil fuels, more environmentally friendly etc.
- (ii) Name **one** energy conversion that takes place in burning wood pellets.
Chemical to heat, Chemical to light etc.

2(b) Carbon monoxide is a highly dangerous gas sometimes referred to as ‘the silent killer’. It can arise in poorly ventilated spaces where fossil fuels are burned. For this reason it is recommended that every home should have a carbon monoxide alarm.

The image shows an exploded view of a carbon monoxide alarm.



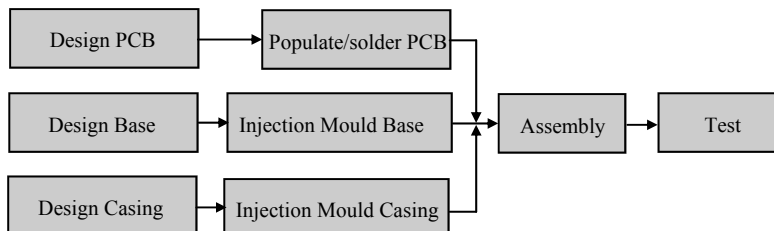
- (i) Name a suitable material for the production of the casing.
ABS/Polypropylene/Polycarbonate etc.
- (ii) Describe using notes and annotated sketches a suitable method for producing the casing for this alarm.
Injection Moulding etc.



- (iii) Suggest a suitable method of attaching the PCB to the base of the alarm. Use simple sketches to support your answer.
Self adhesive clips/screw fixture etc.

Answer 2(c) or 2(d)

2(c) (i) Draw a Work Breakdown Structure for the design and manufacture of the alarm.



- (ii) Gantt charts can play a critical role in the successful management of a project. List **two** functions of a Gantt chart.
Time management/co-ordination/communication/clarity/motivation etc.

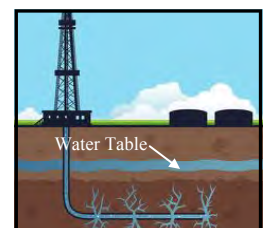
OR

2(d)

Hydraulic fracturing creates large cracks in rock formations by injecting sand, water and chemicals deep into the ground. It is done to release oil and natural gas. Hydraulic fracturing has been linked to environmental issues in other countries.

Hydraulic fracturing as a method of extracting natural gas is now being considered in parts of Ireland.

- (i) Suggest **one** advantage and **one** disadvantage of this procedure.
Advantage: Job creation, exploit new natural resources etc.
Disadvantage: Possible health risks, contamination of water supply etc.
- (ii) Briefly describe **one** other method of energy generation currently used in Ireland.
Hydro-electric/ Wind turbines etc.



Question 3 - Answer 3(a) and 3(b)

(a) - 10 marks, (b) - 8 marks, (c) OR (d) - 6 marks

3(a) Exercise and sport can be fun for participants and can also have many health benefits.

- (i) Tennis rackets which were made of timber in the past are now often made of carbon fibre. Describe **two** other items of sports equipment which have been improved through the use of modern materials.

Golf clubs, swimming goggles, footballs etc.

- (ii) Smartphone 'apps' have been developed to help individuals to plan, manage and record their training and exercise.

Describe **any two** smartphone 'apps'.

Any two apps such as 'couch to 5k' etc.



3(b) The image shows a modern exercise machine. When purchased these products often come 'flat-packed' and must be assembled.

- (i) Outline **two** reasons why some manufacturers do not pre-assemble their products but instead supply them flat-packed.

Reduce packaging/size, cost of transport, reduce manufacturing costs/time etc.

- (ii) Permanent and semi-permanent joints are used in the manufacture of the exercise machine. Using notes and annotated sketches, describe where **one** permanent joint and **one** semi-permanent joint could be used in the exercise machine.

Permanent joint: any welded joint correctly identified etc.

Semi-permanent: any nut/bolt joint correctly identified etc.

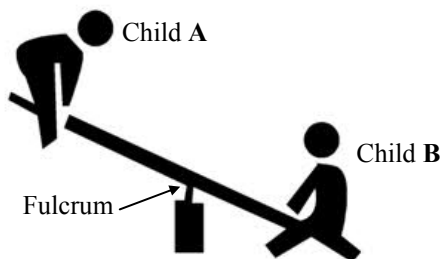
- (iii) Suggest a suitable material for the production of frame A.

Steel/Aluminium



Answer 3(c) or 3(d)

3(c) The graphic shows two children playing on a see-saw.



- (i) Name the class of lever shown in the graphic.
Class one.

- (ii) Child A is lighter than Child B.

Describe using notes and annotated sketches how the children on the see-saw could work together to balance the lever.

The children would need to adjust their positions so that the moments on both sides of the fulcrum were balanced etc.

OR

3(d) Cause and effect diagrams are often used to identify the root causes of quality related issues in manufactured products. The graphic identifies four possible reasons for a faulty exercise machine.

- (i) Describe how any **two** causes identified in the graphic could contribute to poorly manufactured exercise machines.

Wrong choice in materials could affect the durability of parts manufactured.

Careless employees could lead to production schedules being delayed.

Poor machining could lead to faulty parts being manufactured.

Poor methods of manufacture could lead to assembly difficulties etc.

- (ii) In **each** case suggest how these problems might be resolved.

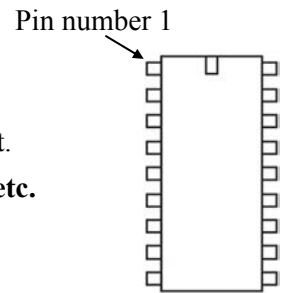
Select appropriate materials, machines and methods of manufacture/staff training etc.

Section C - Options - Answer any two of the Options

Option 1 - Applied Control Systems - Answer 1(a) and 1(b)

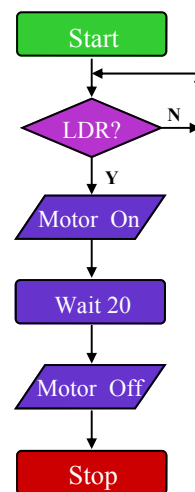
(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

- 1(a) (i) The image shows an 18 pin PIC chip.
Explain using a simple sketch how to identify pin number 1.
- (ii) Pins D1/A1 and D0/A0 can be used for either digital or analogue inputs.
Give **one** example of an analogue input and **one** example of a digital input.
- Analogue Input: LDR/thermistor/variable resistor/moisture probes etc.**
Digital Input: PTM switch/microswitch etc.



- 1(b) A student has produced a simple flowchart to control a motorised blind system in a bedroom.
The system uses an LDR as a sensor to activate the motor to close the blind in darkness.

- (i) Describe in detail the operation of the motorised blind as controlled by the flowchart.
During daylight hours the motor is not activated by the LDR. The flowchart takes the 'No' loop continuously.
As light levels fall, the LDR activates the motor. After 20 seconds the motor stops and the program comes to a stop etc.

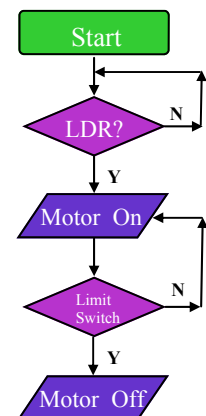


- (ii) During operation it was found that the motorised blind did not stop at the bottom of the window.
Suggest a suitable way to ensure that the blind stops accurately at the bottom of the window.

Incorporate a limit switch at the bottom of the window, Adjust the wait time on the given flowchart so that the motor stops at the bottom of the window etc.

- (iii) Outline **two** advantages of using PICs in Applied Control technology.

Programs can be modified repeatedly.
High level of control/rapid changes can be made to programs.
They allow for complex solutions for given tasks etc.

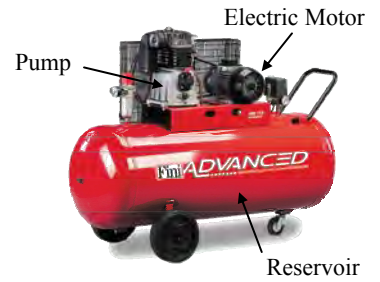


Suggested modified flowchart

Answer 1(c) or 1(d)

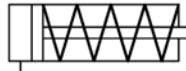
1(c) The image shows an air compressor as used in pneumatic systems.

- (i) Describe the function of the *electric motor*, *pump* and *reservoir* in a pneumatic compressor.



**The electric motor is required to drive the pump.
The pump is used to compress air.
The reservoir provides storage for the compressed air etc.**

- (ii) Name the pneumatic component shown below.
What is the function of the spring in this component?

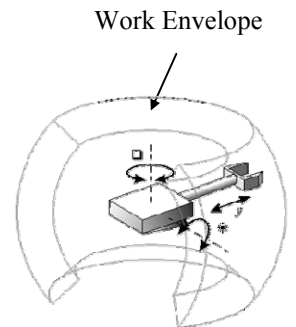


**Single acting cylinder.
The spring returns the piston on removal of air from the cylinder etc.**

OR

1(d) The image shows a robot and its *work envelope*.

- (i) Name the type of robot shown and explain the term work envelope.



Spherical/Polar robotic configuration.

The work envelope defines the space around a robot that is accessible for the end effector or gripper etc.

- (ii) Servo Motors are often used to power robotic joints.
Outline **two** features of servo motors that make them suitable for this purpose.

Smooth control/precise movement/high level of torque/compact etc.



Option 2 - Electronics and Control - Answer 2(a) and 2(b)

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

2(a) Graphics A, B and C show various power accessories.



A



B

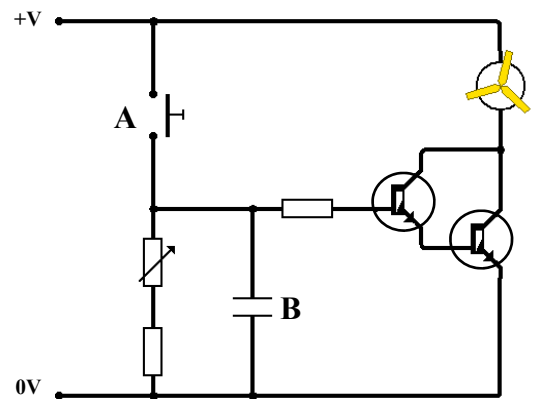


C

- (i) Name **each** of the items A, B and C.
A: Transformer B: Solar panel C: Button/Coin Cell
- (ii) AC and DC electricity are commonly used as power sources in the Technology room. Using notes and annotated sketches outline the difference between AC and DC electricity.
AC: Alternating current (mains supply) DC: Direct current (battery supply) etc.
Suitable sketches etc.

2(b) The circuit diagram shown activates a motor inside an air freshener unit. When activated the motor runs for a set period of time.

- (i) Name component A in this circuit.
PTM switch.
- (ii) Component B is a *non-polarised* capacitor. Explain what is meant by the term non-polarised.
Neither positive nor negative-the capacitors legs can be connected either way in the circuit.
- (iii) A *Darlington Pair* of transistors is used in this circuit. Suggest a reason for the use of a darlington pair in this circuit.
To amplify the current supply to the motor etc.



Answer 2(c) or 2(d)

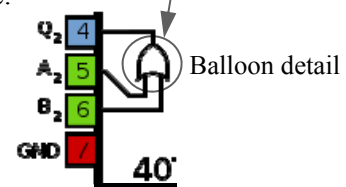
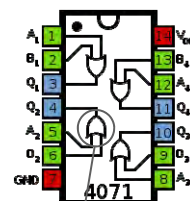
2(c) The circuit at 2(b) above can be purchased as a PCB 'project kit' ready to be soldered.

- (i) Outline **two** advantages of using PCB 'project kits' instead of designing and producing PCBs in the Technology room.
A kit contains all of the components for the PCB and is ready to be soldered etc.
Time considerations in designing and manufacturing PCBs in a classroom etc.
- (ii) Once the circuit has been soldered, describe **two** tests a student could carry out on it to see if it is working correctly.
Connect a power supply and activate switch A.
Check that all components are placed correctly in the PCB.
Use a multimeter to measure current, voltage and resistance in the circuit etc.

OR

2(d) The image shows an integrated circuit (IC) with 4 logic gates. One of the logic gates is enlarged in the balloon detail shown below.

- (i) Name the type of logic gate used in the IC.
OR gate.
- (ii) What are the pin numbers for the *inputs* and *output* of this gate.
Inputs: Pin 5 and Pin 6
Output: Pin 4



Option 3 - Information and Communications Technology - Answer 3(a) and 3(b)

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

3(a)



WiFi hotspots are often found in public areas such as coffee-shops, hotels and airports.

Recently Irish Rail launched free Wifi to customers on train routes across Ireland.

- (i) Outline what is meant by the term WiFi hotspot.
A place where wireless internet access is available to consumers etc.
- (ii) Discuss how **work** and **leisure** time can be enhanced for individuals by access to 'WiFi hotspots'.
Work: Individuals can use WiFi hotspots to access work files remotely/ WiFi access on public transport offers individuals opportunities to work as they travel etc.
Leisure: Individuals can browse the internet as they relax in coffee-shops etc.

3(b) An advertisement for a laptop includes the following specification:

Hard Disk 640GB / 6GB RAM / Operating System Windows 7 64 Bit / WiFi Connectivity / Multi Card Reader / 4 USB Ports / Screen Resolution 1920x1080 Pixels / Blue Ray Disc Rewritable and DVD Multi Drive



- (i) Describe **one** magnetic storage device this computer uses.
Hard Disk.
- (ii) Describe **one** optical device in this computer.
DVD Multi drive.
- (iii) Explain the term 'DVD-RW'.
Digital Versatile Disk- Rewriteable: Information can be written and erased numerous times etc.

Answer 3(c) or 3(d)

3(c) Online bookings of hotels, concert tickets and holidays have become increasingly popular in today's society.

- (i) Give **two** advantages of online booking.
Book at your convenience/ immediate feedback on availability/ price comparison between websites/consumer reviews etc.
- (ii) Give **two** important items of personal data other than name and address that would be stored in an online booking system.
Email address/date of birth/phone number/personal preferences etc.

Online Booking



OR

3(d) Recent developments in mobile technology have allowed *cyberbullying* to become an unfortunate and serious problem, especially among younger people.



- (i) Explain the term 'cyberbullying'.
Cyber bullying is the use of the internet and related telecommunications to harm other people in a deliberately hostile and repeated manner etc.
- (ii) Describe **two** ways of protecting individuals from cyberbullying.
Report incidents to the relevant authorities/use preference or privacy tools/education seminars for young people etc.

Option 4 - Manufacturing Systems - Answer 4(a) and 4(b)

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

4(a) Consumers expect cars to be manufactured to the highest standards in terms of *safety* and *performance*.



- (i) Briefly describe how cars can be made **safe** and **perform** to the highest standards.
Safe: Anti lock braking systems/airbags/seat belts etc.
Perform: Hybrid engines/aerodynamic design/tyres etc.
- (ii) Outline **two** financial consequences for a manufacturer who produces poor quality products.
Replace faulty parts in cars free of charge/lawsuits taken against the manufacturer on behalf of consumers etc.

4(b) A company developing a new range of marmalades has decided to use the 'Deming Cycle' as part of a quality management strategy.

The four stages of the Deming Cycle are *Plan, Do, Study* and *Act*.



- (i) Describe any **two** stages of the cycle outlined above.
Plan: Collect data and develop a strategy for improvement.
Do: Implement the strategy for improvement.
Study: Examine the problems or opportunities as a result of the previous stage.
Act: Implement changes for improvement before embarking on another cycle etc.
- (ii) Outline the key benefits for a manufacturer who uses the Deming cycle.
Overall improvement to their products/greater reputation etc.
- (iii) Products can be *Once off, Batch* or *Mass* produced. Select a suitable production process for the manufacture of the marmalades and justify your selection.
Once off: Custom made for one customer.
Batch: A limited edition of the range of marmalades (medium term).
Mass: Wide scale production of the range of marmalades over a long period of time etc.

Answer 4(c) or 4(d)

- 4(c) (i) *Team work* is essential when a group of people work for a company. Outline **two** elements of team work that would be important when developing new products such as the range of marmalades at 4(b) above.
Identify a team leader/establish roles and responsibilities/focus on strengths of individuals within the group/set targets/work together for the common good etc.
- (ii) It is important for companies to consider *environmental impact* when manufacturing their products. Outline **two** initiatives the marmalade producer could undertake to reduce the impact of its products on the environment.
Source ingredients locally (reduce transport)/reduce energy consumption in the manufacture of the products/reduce packaging/increase the lifespan of the product/recycle glass jars etc.

OR

4(d) The graphic shows a simple *Kanban Card* that could be attached to a container of parts ready to be shipped. Kanban cards are used like order forms when parts are required in the production line of a product.

Part Description				Part Number	
Mirror-Left-Door				2542	
Qty	200	Lead Time	1 week	Order Date	11/10
Supplier	Ace Car Parts Ltd		Due Date	18/10	
Planner	Mary K.	Location	Rack 2A		

Kanban Card

- (i) Outline **two** advantages of using Kanban systems in manufacturing products.
Minimum stock is kept in the manufacturing plant– parts are only purchased as required.
Production lines run more smoothly as a result of better co-ordination etc.
Bar codes on the kanban cards help to eliminate ordering errors etc.
- (ii) Describe any **two** items of information contained on the Kanban card shown.
Valid description in relation to any two items contained on the card.
The 'lead time' suggests that the order will take one week for delivery etc.

Option 5 - Materials Technology - Answer 5(a) and 5(b)

(a) - 10 marks, (b) - 20 marks, (c) OR (d) - 10 marks

5(a) The images show a pottery vase, a rain jacket and the bristles of a toothbrush.



Pottery vase



Rain jacket



Toothbrush bristles

- (i) Name a suitable material for the manufacture of **each** item.
- (ii) For any **two** of the items, outline **one** property of the material chosen which makes it suitable for the product.

Pottery Vase: clay/ceramic– Hard wearing/mouldable etc.

Rain jacket: polyester/‘gore-tex’- waterproof/breathable etc.

Toothbrush bristles: Nylon– flexible/non-toxic etc.

5(b) The graphic shows a docking station for an MP3 player. The main parts of the project have been assembled using *M4* threaded bars which are concealed by aluminium tube inserts.

- (i) Explain what is meant by the term *M4*.
- (ii) Describe the key steps in manufacturing the acrylic part **A** in a Technology room.

M4: ISO Metric thread– a standardised screw thread system– nominal size M4 etc.

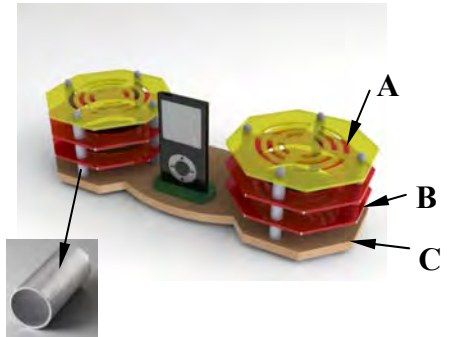
Mark out slots/holes and external shape.

Process slots/holes.

Cut external shape.

Edge finish and polish etc.

Alternatively use CAD/CAM to manufacture part etc.

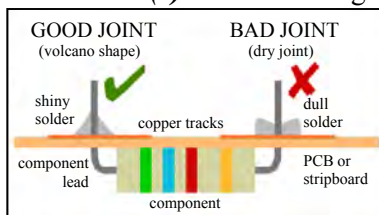


Aluminium tube insert

- (iii) Give **two** reasons for using aluminium tube inserts between the acrylic parts **A**, **B** and **C**.
- To conceal threaded bars/To act as spacers in-between the shelves/decorative feature etc.**

Answer 5(c) or 5(d)

5(c) The docking station at 5(b) above requires a soldered electronic circuit.



- (i) Name **two** metals typically used in the manufacture of solder wire.
Lead and Tin.
- (ii) The graphic shows one good soldered joint and one bad soldered joint. Describe using notes and annotated sketches the key elements required to produce a good soldered joint.

Ensure that the soldering iron/tip is in good working order.

Heat up the soldering iron and tin the tip.

Allow tip to heat the copper strip/pad.

Feed in solder wire allowing it to flow around the joint.

Cut off wire ends when the joint has been soldered etc.

OR

5(d) The Kindle e-book reader uses an electronic paper display. This type of display uses an *electronic ink* which carries a charge, enabling it to be updated electronically. This electronic ink is a *smart material*.

- (i) Define the term ‘smart material’.
A smart material can significantly change its properties in a controlled manner in response to external stimuli such as temperature, light etc.
- (ii) Name **two** other smart materials and give a use for **each**.
Polymorph/Thermochromic thermometers/Quantum Tunnelling Composite (QTC) etc.



