



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2012

Marking Scheme

Technology

Ordinary Level



Leaving Certificate Examination, 2012

Technology

Ordinary Level

Marking Scheme

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. *Steve Jobs* (co-founder of Apple) has been compared to a modern day *Thomas Edison*.

(i) Give **two** innovations attributed to Steve Jobs.

1. **iphone.**

2. **ipad/ipod etc.**

(ii) Name **one** invention by Thomas Edison.

Light bulb.



2. *Smart cards* are commonly used in everyday life.

(i) Give **one** use of smart cards.

Bank Cards (credit/debit)/ golf handicap cards etc.

(ii) List **two** advantages of using smart cards.

1. **Personal details such as PPSN can be stored.**

2. **They can be protected by using pin numbers etc.**



3. The Mizen Bridge is built using *reinforced* concrete.

(i) Name a suitable material used to reinforce concrete.

Steel/Iron/composites etc.

(ii) Name a force acting on element **A** of the bridge.

Compression.



4.

- (i) The graphic shows an LDR sensor used in electronics.
Write out in full the words represented by LDR.

LDR: Light Dependent Resistor.

- (ii) An LDR is a *non-polarised* electronic component.
Explain what is meant by the term non-polarised.

**As there is no polarity (positive/negative) in the LDR,
the legs can be connected either way in a circuit.**



5.

Name **one** energy conversion that takes place
in a rechargeable battery.

Chemical to electrical.

The use of *rechargeable* instead of *disposable* batteries is better
for the environment.

Outline **two** environmental benefits of using rechargeable batteries.

1. **Reduction in the use of landfill sites.**
2. **Less ground contamination etc.**



6.

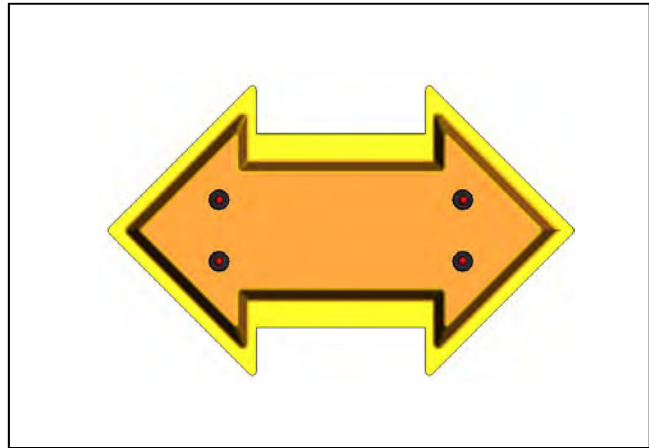
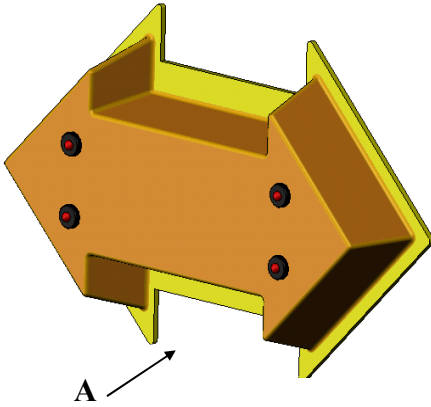
The pen shown is *ergonomically* designed.

Explain what is meant by the term ergonomics.

**Designing equipment and devices with the human
body in mind.**



7.



In the box provided, make a well proportioned 2D sketch of the hazard warning light when viewed in the direction of arrow A.

8.

During the London riots of 2010, it was reported that inaccurate and inflammatory accounts of the events were posted on *Social Media* sites and that this may have led to further disturbances.

Name **two** Social Media sites.

1. **Facebook.**
2. **Twitter etc.**



9.

Shown is the logo of the *Environmental Protection Agency* (EPA).
Outline the function of the EPA.



To protect the environment through its licensing, enforcement and monitoring of activities, e.g., Water Framework Directive etc.

10. List **four** items of work that should be included in a *Work Breakdown Structure* (WBS) for the building of a house.

1. Obtain planning permission
2. Pour foundation
3. Build walls
4. Fit windows etc.

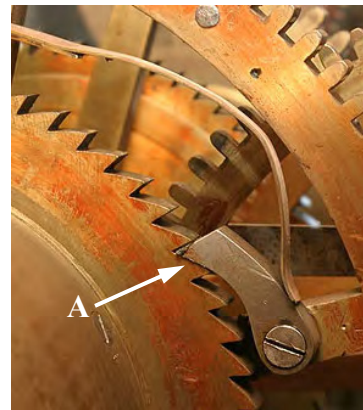


11. Name the gear arrangement shown at A.

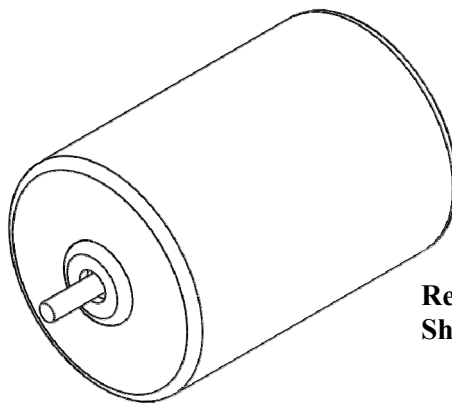
A: Ratchet and Pawl.

Give **one** everyday application of this gear arrangement.

Clocks/Hoists/Turnstiles etc.



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



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

Blank Page



Leaving Certificate Examination, 2012

Technology

Ordinary Level

Marking Scheme

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

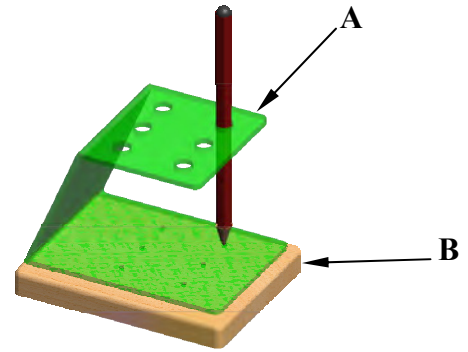
2(a) The 3D graphic shows a pencil holder designed by a student.
The pencil holder is made from a *thermoplastic* and a *hardwood*.

- (i) Suggest a suitable thermoplastic **and** a suitable hardwood for the making of this project.

3mm Acrylic/Polypropylene, Beech/Teak etc.

- (ii) Using simple annotated sketches, describe a suitable method of joining the plastic part (A) to the wooden base (B).

Countersunk screws/Impact adhesive etc.



2(b) The top edge of the wooden base has been rounded as shown.

- (i) Describe how this rounded edge could be produced.
Give **two** Health and Safety considerations that should be observed when carrying out this process.

Machine Routed/Plane etc.

Eye protection/Ear protection/mask etc.



- (ii) The hardwood base requires a surface finish to be applied.
Name **two** appropriate surface finishes which could be used.

Danish oil/French Polish/Polyurethane varnish/Beeswax/Water based varnish etc.

- (iii) Describe how the base should be prepared **before** the surface finish is applied.

Cracks/dents in the wood should be filled.

Use various grades of abrasive paper to smoothen the surface before applying the finish.

Answer 2(c) or 2(d)

2(c) Gantt charts are used to represent the phases and activities in the management of a project.

Shown is a simple Gantt chart for the manufacture of the pencil holder at 2(a) above.

Task/Duration						
Mark out base						
Manufacture base						
Mark out holder						
Manufacture holder						
Project assembly						

(i) List **two** advantages of using Gantt charts.

**Tasks can be managed more effectively.
A chart can potentially identify scheduling difficulties.
It identifies the dependencies of specific tasks etc.**

(ii) From the Gantt chart shown, suggest an appropriate time period to complete the pencil holder project.

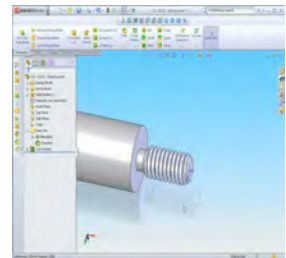
Six periods

OR

2(d) Students can use CAD software programs such as SolidWorks when designing and manufacturing projects.

(i) Outline **two** benefits of using such software programs when undertaking project work.

**Greater visual understanding of design related issues.
Drawings for manufacture can be printed.
CNC router/Laser cutter can use CAD files for manufacture.**



(ii) When a student completes a project it is desirable to include a digital image of that project in the design portfolio.

Describe how this can be achieved.

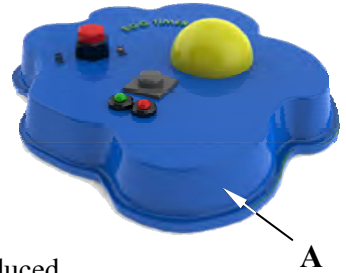
**Take the image with a digital camera.
Save it to a specified folder on the computer using a USB cable.
Copy/paste the image into the relevant text document.
Edit/crop/resize the image as necessary etc.**

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

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

3(a) The graphic shows a design for an egg timer.

Part **A** of the project is produced by vacuum forming a sheet of High Impact Polystyrene (HIPS).



(i) Suggest a suitable material for the mould used to vacuum form part **A**.

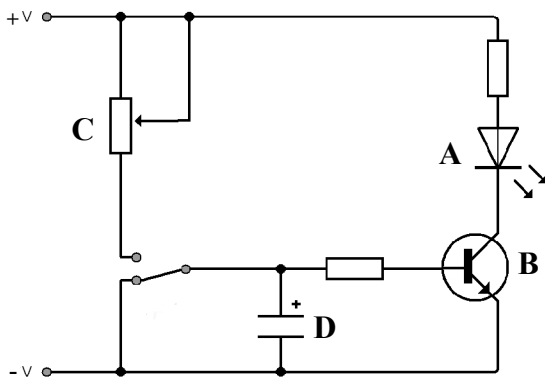
Softwood (Pine)/Hardwood (Teak)/ High density modelling foam etc.

(ii) Describe using notes and annotated sketches how the mould could be produced.

The mould could be manufactured from a CAD file on a CNC router.

The mould could also be produced using hand tools/ a sanding machine etc.

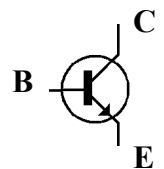
3(b) The diagram shows a timer circuit for the above project.



(i) Using the formulae and tables booklet or otherwise, name component **A**.

Light Emitting Diode (LED)

(ii) Redraw transistor **B** in your answerbook and label the collector, base and emitter.



(iii) Describe why potentiometer **C** is used in conjunction with capacitor **D** in this circuit.

To increase/decrease the time delay before the LED comes on. Generally, the larger the values of potentiometer C and capacitor D, the greater the time delay.

Answer 3(c) or 3(d)

3(c) The graphic shows a simulated printed circuit board (PCB) similar to the above timer circuit.

(i) Name a software program that could be used in school to produce simulated circuit diagrams.

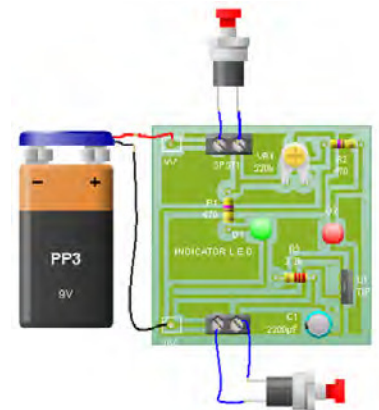
Circuit Wizard/Bright Sparks etc.

(ii) Outline **two** advantages of using circuit simulation software when designing a circuit.

Circuits can be tested before they are made.

Simulations allow for a greater understanding of the operation of a circuit.

Cost of components is also available from some software packages etc.



OR

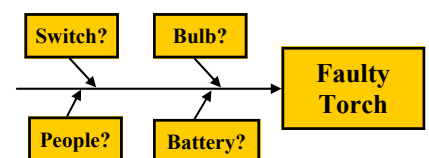
3(d) Cause and Effect Diagrams are used to identify the causes of quality related problems in products.

(i) Describe how *human error* could cause problems in the quality of a manufactured product.

Poor assembly techniques/ Irregular quality inspections etc.

(ii) Identify **two** potential consequences for a company which manufactures a batch of faulty products.

Loss in sales/return of faulty products/ negative publicity/ failure of business 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) PICs can be programmed to carry out a range of tasks.
Explain the terms 'PIC' and 'programmed'.

PIC: Peripheral Interface Control

Programmed: A flowchart (set of instructions) that can be downloaded to a PIC board etc.

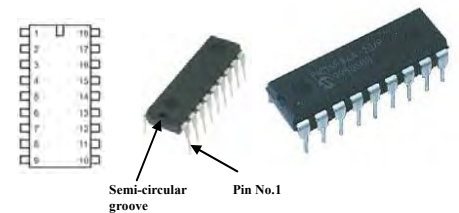
- (ii) Give **two** examples of electronic devices that are controlled using PIC technology.

Microwave/Washing machine/ Electronic toys etc.

- 1(b) The graphic shows an 18-pin PIC chip.

- (i) Explain, using a simple diagram, how pin number 1 can be identified on this chip.

A semi-circular groove on the chip identifies the top of the chip. A small circular indentation is placed next to pin no 1.

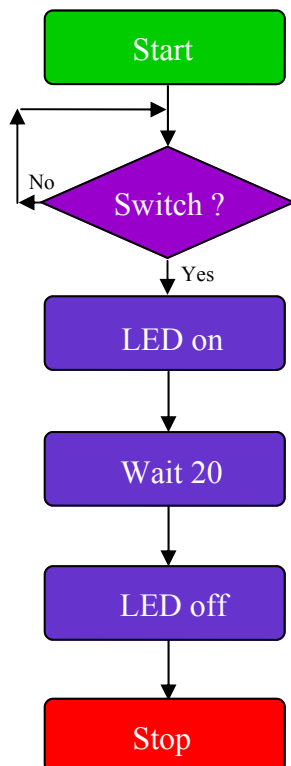


- (ii) This chip can use *Analogue* and *Digital* inputs.

Give **one** analogue input and **one** digital input that could be used with a PIC.

Analogue: Light/Sound/Heat sensor etc.

Digital: Push-to-make/Push-to-break switch etc.



- (iii) A battery powered LED is used as a light source inside a wardrobe. When a switch is activated the LED turns on for 20 seconds and then turns off automatically.

Copy the given flowchart into your answerbook and complete it to represent the information above.

Answer 1(c) or 1(d)

1(c) Following the Japanese earthquake and tsunami of 2011, robots were deployed to aid rescue workers.

- (i) Outline **two** advantages of the use of robots in these situations.

**They can be deployed in areas not safe for people to work in.
They can access air voids where rescue workers might not be able to access etc.**



- (ii) The graphic shows the *Quince* robot which is designed to assist in gathering data from environmental disaster zones.

Suggest **two** possible devices that could be incorporated into the *Quince* robot, to enable the collection of data.

**Sensors can detect air quality/contamination.
Cameras can provide live pictures to a remote location etc.**

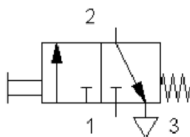
OR

1(d) Pneumatics in Technology deals with the use of pressurised air to produce mechanical motion.

- (i) Give **one** everyday example of the use of pneumatics.
Outline the advantages of using pneumatics in the example you have given.

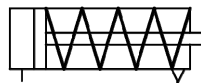
**Air brakes for trucks/Buses, Production lines in factories, Dentists drill
Air is safe, clean, inexpensive and readily available etc.**

- (ii) Name the **three** pneumatic components A, B and C shown below:



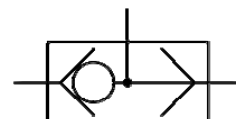
A

3/2 port valve



B

Single acting spring return cylinder



C

Shuttle/OR valve

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

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

2(a) The 555 IC shown can be configured in two states when building circuits. These states are *monostable* and *astable*.



(i) Outline the difference between monostable and astable.

Monostable: A mode in which a 555 IC produces a single pulse for a preset amount of time in response to an input.

Astable: A mode in which a 555 IC produces a string of on/off pulses at a preset frequency.

(ii) Give a simple use for each of the circuit states above.

Monostable configuration: Timer circuit/Touch switches etc.

Astable configuration: Lamp flashers/Pulse generators etc.

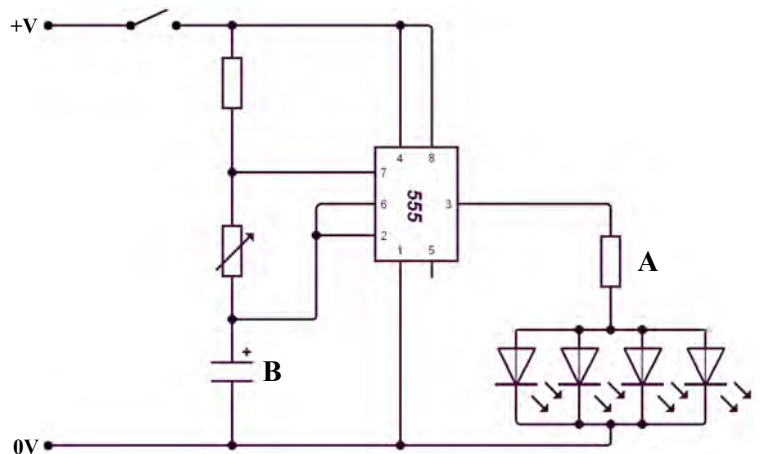
2(b) The circuit diagram shows a 555 IC in the astable state.

(i) Explain why LEDs are often used instead of bulbs in circuit building.

**Less current required/more energy efficient.
More reliable than bulbs etc.**

(ii) Give the function of the resistor A in this circuit.

**To control the amount of current passing through the LEDs.
Protect LEDs etc.**



(iii) Name the unit of capacitance.
Explain why capacitor B is used in this circuit.

Unit of Capacitance: The Farad.

Capacitor B in conjunction with the variable resistor provides the required time delay for the LEDs.

Answer 2(c) or 2(d)

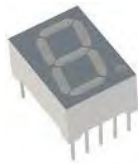
2(c) Sensors are widely used in the operation of conveyor systems.



- (i) Suggest a suitable sensor that could be used to count the number of boxes moving along a conveyor belt. Give **two** reasons for your selection.

Infra red, Light sensor (LDR), Pressure sensor etc.
Any appropriate reason– accuracy of detection, reliability, cost etc.

- (ii) A *seven segment display* is used to display the number of boxes which have been counted. Show, using a labelled sketch, the configuration on the seven segment display that would represent **five** boxes counted.



Seven Segment Display

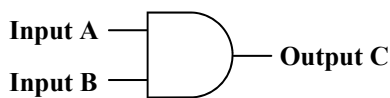


Number Five

OR

2(d) The electronic circuit that controls a conveyor system uses logic gates to separate boxes into two categories, based on their weight and size.

- (i) Draw the symbol for an **AND** gate suitable for use in the conveyor system as outlined.



AND gate

- (ii) In your answerbook, draw and complete the truth table for an **AND** gate.

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

AND gate truth table

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) (i) When describing computers, explain the difference between the terms *Hardware* and *Software*.

Hardware refers to the physical components of a computer system. **Software** refers to a set of programs that instruct a computer what to do and how to do it. There are two categories— systems and applications software.



- (ii) Give **two** examples of each.

Hardware: Power supply, motherboard, graphics card, mouse, printer, monitor etc.
Storage devices such as USB keys and external hard drives etc.

Software: Operating systems such as Windows 7, Vista, XP, Linux, Mac OSX etc.
Applications such as SolidWorks, Microsoft office, Adobe photoshop, anti-virus software, device drivers etc.

- 3(b) In a computer the graphics card is a specialised circuit board.

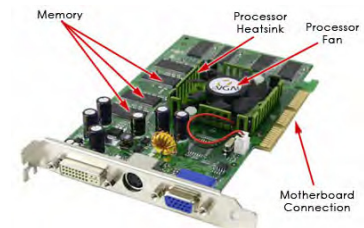
- (i) Give **two** functions of a graphics card.

It reduces the load on the CPU so that graphic information can be used.

It allows for faster transfer of information.

It allows the running of software such as Solidworks which has high graphic requirement.

It acts as an interface between the computer and monitor.



- (ii) Explain the term *pixel*.

A pixel is a single point on a raster image. Each pixel has its own address which corresponds to its co ordinates.



- (iii) Explain how pixels influence the image quality on a computer screen.

The quality of the image displayed on a computer screen is determined by the number of pixels used to form the image. The greater the screen resolution (no. of pixels used) the higher the quality of image. This will also increase the size of the file when saved.

Answer 3(c) or 3(d)

3(c) *Cloud computing* stores music, photographs and documents which can be accessed wirelessly from devices such as smartphones, laptops and netbooks.



(i) Outline **three** advantages of cloud computing.

Costs can be reduced by sharing resources and software applications.

External storage will free up computers and increase operational speeds etc.

Secure remote access to files from any computer allows users to work way from home etc.

(ii) Give **one** example of a phone “app” and outline how this app could enhance an aspect of our leisure time.

Any appropriate app and enhancement to leisure time, e.g. ‘viber’.

This app allows its users to make free calls and texts to each other etc.

OR

Multi-national companies all over the world use *video conferencing*.

3(d) (i) Give **one** advantage and **one** disadvantage of using video conferencing.

Advantages: No need to travel long distances.

Cuts company expenses.

More environmentally friendly/reduced Carbon footprint.

Disadvantages: No personal touch.

Different time zones across the world.

Cost implications for initial purchase and maintenance of equipment/ staff training etc.



(ii) Potential health risks can be associated with the regular use of computers.

Give **two** potential risks and suggest how these risks could be reduced.

Repetitive strain injury.

Repeating same movements frequently.

Eye strain/headaches from screen glare.

Increase in weight due to a lack of mobility etc.

Use furniture that is ergonomically designed with the user in mind, e.g, chair, desk, computer screen.

Use screen filters and correct lighting.

Wrist support /Regular breaks/Varying types of work etc.

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

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

- 4(a) The graphics show a laptop computer and a wedding cake.
These products have been produced as *Made-to-Order* and *Assemble-to-Order* items.



- (i) Identify which product was made-to-order.

The Wedding Cake.

- (ii) Explain the difference between *Made-to-Order* and *Assemble-to-Order*.

Made-to-Order: This item is specifically designed and made to the requirements of the customer. This item could be once off or batch produced depending upon the needs of the customer. The order is complete in a minimum amount of time etc.

Assembled-to-Order: In this case, a base unit or module is produced onto which options can be added according to the specification of the customer. For example, a customer may choose a notebook machine and specify the operating system, hard drive, type of processor etc. The manufacturer then assembles the product for the customer etc.

- 4(b) Coca-Cola has become a highly competitive global brand by *competing on cost* in relation to the range of soft drinks it sells.



- (i) Outline some of the key steps a manufacturer like Coca-Cola might undertake to 'compete on cost' with their market competitors.

Carry out market research on your target customers.

Source materials from competitive suppliers.

Reduce cost of labour.

Automate production methods.

Reduce overhead costs (building, electrical, heating) etc.

- (ii) Other than *competing on cost*, outline **one** strategy Irish manufacturers could engage in to be more competitive in difficult economic times.

Market products using special offers/promotions.

Identify the strengths and weaknesses of the company– making improvements as required.

Identify the strengths of competitors.

Compete on quality and flexibility.

Focus on improving speed of production/service etc.

- (iii) Outline **one** element of *team work* that would be important in a task such as designing and producing the logo for the 2012 Olympics bottle shown.

Identify a team leader.

Identify clear roles/responsibilities for each employee.

Establish a set of goals/objectives.

Work effectively together.

Effective communication between design and production teams etc.

Answer 4(c) or 4(d)



4(c) Many electronic products are designed with a short life-cycle.

- (i) Suggest **two** reasons why a product might have a short life-cycle.

Products with short life cycles could require manufacturers to produce more products. This in turn would increase the sales/profits for manufacturers. Companies could also benefit from servicing and maintenance contracts. Products with short life cycles also allow companies to keep up-to-date with emerging technologies etc.

- (ii) Outline **one** negative environmental impact of a product with a short life-cycle and describe how the impact of such a product could be reduced.

**Increased use of landfill sites.
Increase in carbon footprint of manufacturing companies.
Reduction in fossil fuels globally etc.**

**Recycle/Reuse components and parts.
Make products more reliable/longer life cycle.
Use alternative materials and more environmentally friendly production methods etc.**

OR

- 4(d) (i) Outline **two** reasons why products should be tested before they are sold to consumers.

**To ensure that products comply with the relevant manufacturing standards.
To ensure that they are safe to use.
To identify how the quality of products might be improved.
To maintain the reputation of manufacturers etc.**



- (ii) Identify **two** aspects of the hair dryer shown that could be tested to ensure that it meets the highest performance standards.

**The operation of the on/off switch.
The operation of the fan/heating element.
Attaching accessories.
The ergonomic design of the hair dryer 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 pincers and the drinks-can shown have been made using a *ferrous* and a *non-ferrous* metal respectively.



(i) Explain the difference between ferrous and non-ferrous metals.

Ferrous metals contain iron and therefore rust, e.g. mild steel.

Non-ferrous metals don't contain iron and therefore don't rust, e.g. Lead.

(ii) Name a suitable metal for the manufacture of **each** item.

Pincers: Alloy steel/Forged steel.

Drinks-can: Aluminium/Aluminium alloy etc.

5(b) The new 787 Dreamliner jet, manufactured by Boeing, recently landed in Dublin as part of its world showcase tour. *Composite materials* are widely used in the manufacture of this highly efficient aircraft.



(i) Explain the term 'composite material'.

Composite materials consist of two or more materials combined in such a way that the individual materials are easily distinguishable. The combination creates a superior and unique material.

(ii) Give **two** examples of composite materials.

Glass Reinforced Plastic (GRP), Concrete, Plywood, Carbon Fibre, Metal Matrix etc.

(iii) Give **two** advantages of using composite materials instead of aluminium in the construction of airplanes.

High strength to weight ratio.

Do not suffer from metal fatigue and crack growth.

Lower maintenance costs.

Very smooth for curved surfaces therefore less drag and more aerodynamic etc.

Answer 5(c) or 5(d)

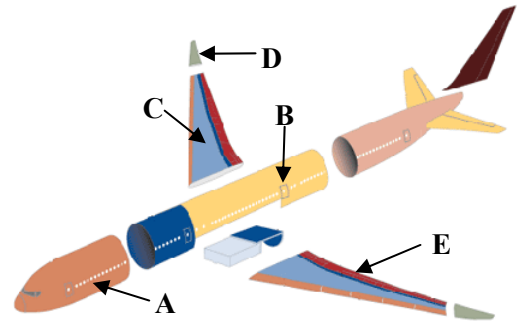
5(c) Sections of this aircraft were manufactured in different parts of the world before being assembled in one location.

- (i) Outline **two** reasons why various sections might be manufactured in different plants around the world.

Different plants may specialise in constructing various sections— therefore the quality of manufacture would be of a higher standard.

Cost— it may be cheaper to manufacture various sections in different plants.

Universal design/manufacturing techniques allows parts to be manufactured globally etc.



	Part	Made in
A	Forward fuselage	USA
B	Centre fuselage	Italy
C	Wing	Japan
D	Wing Tip	South Korea
E	Trailing Edge	Australia

- (ii) *Permanent* and *semi-permanent* joints are used in the manufacture of this aircraft. Name **one** permanent and **one** semi-permanent joint that might be used in its assembly.

Permanent: Welded joint, adhesive joint etc.

Semi-permanent: Pop-rivet, machine screw assembly, lap/seam joint, knock-down assembly etc.

OR

5(d) The back of the headrest shown has been *injection moulded*.

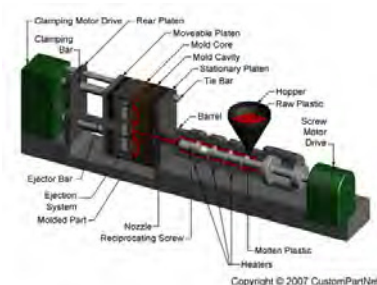
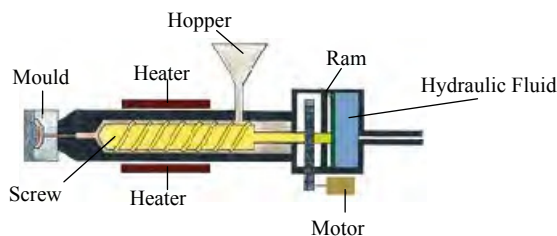
- (i) Name a suitable plastic for use in an injection moulding machine.

ABS, Nylon, Polycarbonate, Polypropylene etc.

- (ii) Describe, using notes and sketches, the process of injection moulding.



Back of headrest



Plastic pellets/granules are fed into the hopper. The heaters soften the plastic granules.

The Ram drives the screw auger which in turn forces the molten plastic into the mould.

Once the plastic cools the mould is opened to release the part manufactured etc.

