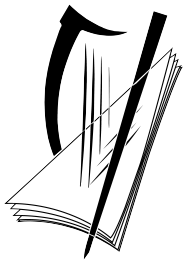


Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2017

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.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2017

Technology

Ordinary Level

Marking Scheme

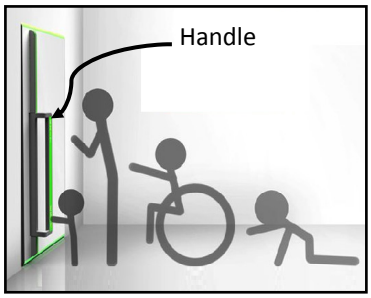
Section A - Core *(72 marks)*

Instructions:

(a) *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 graphic shows the design of a handle for an emergency exit door.



Give **one** advantage of using this door handle design.

Its long handle makes it user friendly for many people, etc.

State **one** *material property* which should be considered when selecting a material for the manufacture of the door handle.

Property: Strength, durability, appearance, weight, etc.

(4+4 marks)

2. The graphic shows *climote,* a device which allows a home heating system to be controlled remotely.

(i) Give **two** benefits of using this smart technology.

Heating can be activated while a person is not at home, user friendly, heating can be adjusted instantly as weather temperatures change, etc.

(ii) A householder purchases 1000 litres of kerosene for home heating at 60 cent/litre. If this fuel lasts for six months, calculate the average cost of this energy per month.

Cost of energy/month: 1000 × 0.60 = €600 ÷ 6 = €100 per month

(2+2+4 marks)

3. The *Drumi* from *Yirego,* is a portable washing machine that does not require electricity. The device is mechanically powered using a foot pedal.

Give **two** advantages of using such a device.

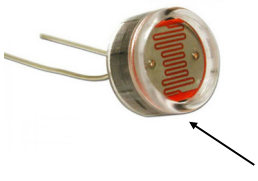
No cost for electricity to power the device, the device can be easily moved and stored out of sight, etc.

Suggest a suitable material which could be used to manufacture part **A**.

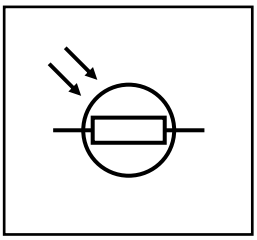
Material: **ABS, etc.**

(3+3+2 marks)

4. The graphic shows a light dependent resistor (LDR) which is commonly used in electronics.



(i) Using the *Formulae and Tables* booklet or otherwise, draw the symbol for this component in the box provided.



(ii) Outline a specific use for this component in a circuit manufactured by a student.

To automatically activate a motor, LEDs and/or a buzzer as light levels change, etc.

(4+4 marks)

5. The graphics show three safety signs found in the workplace.

(i) State the meaning of **each** safety sign.

A: Safety helmet must be worn

B: Electrical hazard

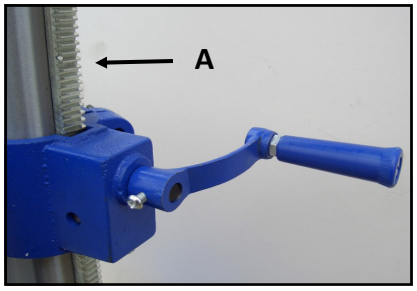
C: No running allowed

(ii) What colour is usually associated with an emergency exit sign?

(2+2+2+2 marks)

Green.

6. The graphic shows the mechanism which allows the table in a pillar drill to be raised and lowered.



(i) Name the component **A** shown.

Rack.

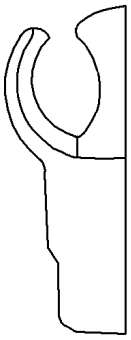
(ii) Lubricants are used to protect mechanisms from wear and to prolong the life of machines.

Suggest a suitable lubricant that could be used to protect machines while in use.

Grease, oil, etc.

(4+4 marks)

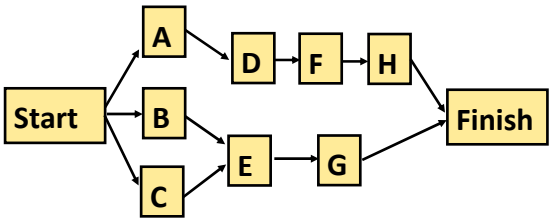
7. In the box provided, make a well proportioned **2D** sketch of the *Dyson Air Blade* hand dryer shown when viewed in the direction of the arrow **A**.



(Very good sketch - *8 marks*
Fair sketch - *4 marks)*

8. A *Work Breakdown Structure* (WBS) is a project management tool used by students and professionals.

(i) Outline **one** advantage of using a WBS.
Visual understanding of tasks to be completed, tasks are sequenced, problems can be identified, etc.



(ii) In the WBS shown, name the predecessor(s) of the tasks **D** and **E.**

Predecessors of task **D**: **A.**

Predecessors of task **E**: **B,C.**

(4+2+1+1 marks)

9. *Liquid Solvent Cements* are used to permanently join plastics together.

(i) Describe a suitable method of applying solvent cement safely.

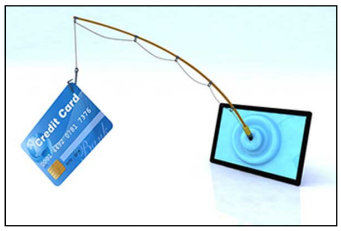
Syringe applicator, brush, etc.

(ii) Suggest **one** semi-permanent method of joining plastics.

Nut and bolt assembly, clip assembly, etc.

(4+4 marks)

10. *Phishing* is an attempt to acquire private information such as usernames, passwords and credit card details by pretending to be a trustworthy source.

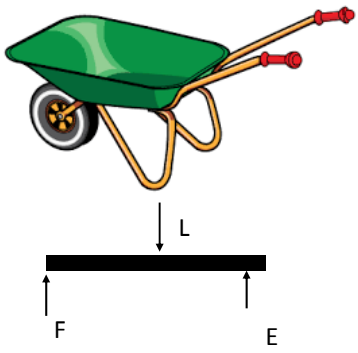


Outline **two** ways of minimising your risk of becoming a victim of phishing.

Set up a fire wall on the computer network, use anti-virus software, regularly change passwords, never provide personal details online to suspicious websites, etc.

(*4+4 marks)*

11. The graphics show a wheelbarrow. Also shown is a diagram of the forces acting on it. A wheelbarrow will always give a mechanical advantage to the user.



(i) What *class* of lever is a wheelbarrow?

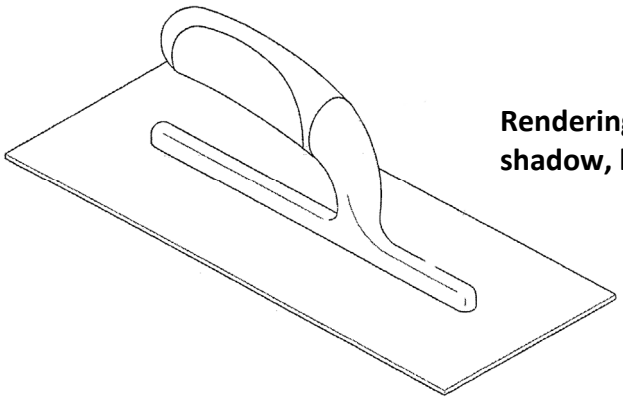
Class two.

(ii) Describe what is meant by a *mechanical advantage*, with reference to a wheelbarrow.

As the load in the wheel barrow is supported in two places (the wheel axle and the handlebars), the load is easier to lift when a person uses the wheelbarrow, etc.

(*4+4 marks)*

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



Rendering, colour, shadow, hatching, etc.

(*4+4 marks)*

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Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2017

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

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

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

2(a) The G2T, is an example of a *wearable technology* which claims to be the first cooling and heating electric scarf.

(i) Suggest **two** reasons why this device might be popular with consumers.
Dual purpose, fashionable, novel/new concept, etc.

(ii) Briefly outline **two** other wearable technologies which have become popular in recent times.
Activity trackers, bluetooth headsets, smart watches, etc.

(10 Marks, 4+6)

2(b) The plastic outer shell for the neck piece is mass produced in a variety of colours.

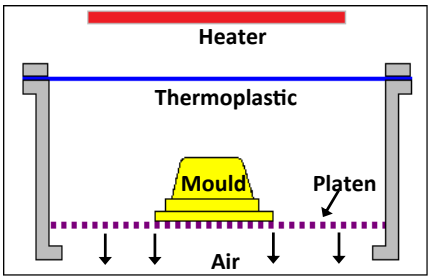
(i) Name a suitable *plastic* that could be used to manufacture the outer shell shown.
ABS, HIPs, etc.

(ii) Give **two** properties of your chosen material that make it suitable for this part.
Easy to mould, multiple colours, durable, etc.

(iii) A vacuum former is often used by students to manufacture moulded parts for projects.

Using notes and annotated sketches, briefly describe the process of *vacuum forming*.

Manufacture the mould and place it into the vacuum forming machine, clamp the thermoplastic sheet and allow to be softened with heat, raise the platen and turn on the vacuum to extract the air, as the platen is raised the air suction causes the thermoplastic to form to the shape of the mould, etc.



(8 Marks, 2+2+4)

*Answer 2(c) **or** 2(d)*

2(c) Wearable devices are often charged and powered using a *USB* connection.

(i) Explain what is meant by the abbreviation USB.
Universal Serial Bus.

(ii) In 2009 *Micro-USB* was specified by the European Commission as the standard format to be used by all mobile device manufacturers.

Give **two** advantages of using the same type of connection across multiple devices and manufacturers.
One connection is suitable for multiple devices, mass production of a common type of connection reduces costs for manufacturers and consumers, less clutter with cables, etc.

(6 Marks, 2+4)

OR

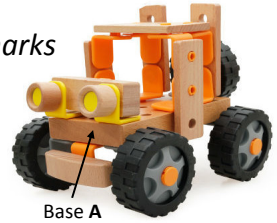
2(d) Many products sold in Europe have a label displaying the *CE mark* as shown below.

(i) Briefly describe what the CE mark on a product represents.
The product has passed specific European quality standards, etc.

(ii) Describe **two** simple ways in which a student could evaluate a project to determine if it is fit for purpose.
Analysis of the following: use of materials, electro-mechanical systems, assembly techniques, safety elements, testing, etc.

(6 Marks, 2+4)

Question 3 *- Answer 3(a)* ***and*** *3(b) (a) - 10 marks, (b) - 8 marks, (c) OR (d) - 6 marks*



Self-Assembly

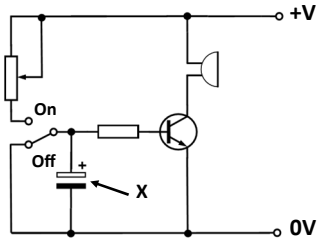
3(a) The graphic shows a toy sports utility vehicle (SUV) that requires self-assembly after purchase.

(i) Name a suitable hardwood that could be used to manufacture base **A**.
Beech, Ash, Oak, etc.

(ii) Outline **two** advantages for a manufacturer who sells a product that requires self-assembly by the end user.
Reduced production costs and time, reduced size of packaging, etc.

(10 Marks, 4+6)

3(b) An electronic circuit is to be incorporated into the toy to activate a buzzer.



(i) Name component **X** in the circuit shown.
Polarised Capacitor.

(ii) Briefly describe how the circuit operates.
When the switch is toggled 'on', the capacitor begins to charge. When the threshold voltage is reached the transistor activates turning on the buzzer until the switch is toggled 'off'. The capacitor discharges when the switch is toggled off, etc.

(iii) Using notes and annotated sketches, describe how this circuit could be housed and accommodated in the design of the toy SUV shown at ***3(a)*** above.
A sketch showing where the circuit is placed in the design of the toy SUV, etc.

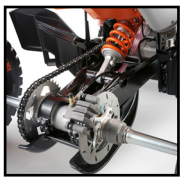
(8 Marks, 2+2+4)

Answer 3(c) ***or*** *3(d)*

3(c) The graphic shows the chain and sprocket drive system for an all-terrain vehicle (ATV).

(i) Suggest **two** reasons why chain and sprocket systems are commonly used to drive modes of transport such as ATVs and motorbikes.
No-slippage, strength, can be made to any size, etc.

(ii) The *ratio* between the driver sprocket and the driven sprocket was found to be 6:1. Briefly describe what is meant by a gear ratio and explain how it is determined.



Gear ratio: A gear ratio allows an output (driven) shaft to rotate at different speed to its input (driver) shaft. The gear ratio is determined by the relationship of the number of teeth on the driver sprocket to the number of teeth on the driven sprocket.

(6 Marks, 4+2)

OR

3(d) A batch of faulty ATVs were returned to a manufacturer due to a problem with the suspension system.

(i) Suggest **one** strategy or problem solving tool a manufacturer could use to help identify and clarify the problem.
Cause and effect diagram, scatter diagram, tally chart, etc.

(ii) Tubular (hollow) metal is used to make part of the frame of the suspension system.

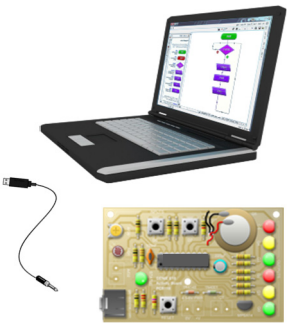
Give **two** reasons why manufacturers use tubular materials in the manufacture of parts.
Lightweight, reduced cost of raw materials, no loss in strength, etc.

(6 Marks, 2+4)

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) *PICs* (Peripheral Interface Controllers) are commonly used in Leaving Certificate Technology projects.

(i) Outline **two** advantages of using a PIC in a technology project.

Multiple inputs and outputs, programme can be edited and downloaded more than once, compact, etc.

(ii) Students regularly encounter problems when programming PIC chips.
Briefly describe **two** common mistakes which can be made when writing a PIC program.

Wrong microcontroller selected for a program, wrong commands used, incorrect inputs/outputs identified within these commands, flowchart layout incorrect etc.

(10 Marks, 6+4)

1(b) A student is designing a flowchart to control an electric gate, similar to the one shown in the image.

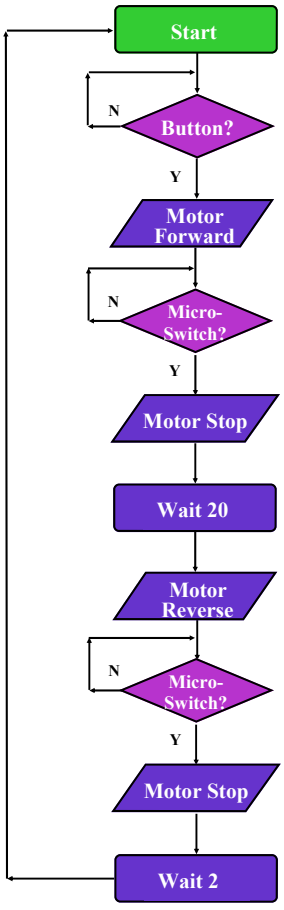
(i) Complete the flowchart shown to operate the gate in the following sequence:

- When a button is pressed the motor activates and the gate begins to open
- the motor stops when the gate makes contact with a micro-switch
- after 20 seconds the motor reverses and the gate begins to close
- the motor stops when the gate makes contact with another micro-switch.

(ii) Show how your flowchart could be modified to allow the gate to open and close continuously.

The addition of a wait block and a continuous loop as represented in the flowchart shown.

Any valid alternative solution.



(iii) Suggest a suitable sensor which could be included in an automatic gate project.

Motion sensor, light sensor, etc.

(20 Marks, 8+6+6)

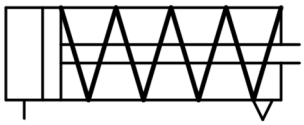
*Answer 1(c) **or** 1(d)*

1(c) The image shows a pneumatic tool which is commonly used in a manufacturing workshop.

(i) Give **one** advantage and **one** disadvantage to using pneumatic tools in a workshop.

Advantage: Fast, no risk of electric shock or spark discharge, unlimited supply of air, etc.
Disadvantage: Generally loud, safety risk for employees, etc.

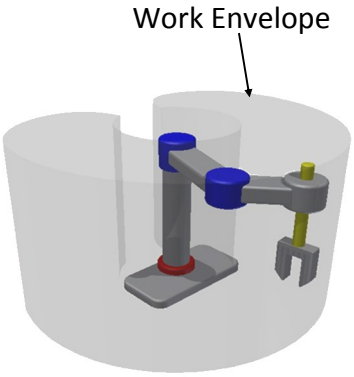
(ii) Sketch the pneumatic symbol for a *single acting actuator*.



(10 Marks, 6+4)

OR

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



(i) Explain what is meant by the term work envelope.

The volume of space the robotic arm works within, etc.

(ii) The robotic arm shown uses a *servo motor* to rotate.

State **two** advantages of using servo motors in robotics.

High level of control, accuracy in movement, compact, etc.

(10 Marks, 4+6)

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 graphic shows an outdoor security light which is activated when an individual comes into range of its motion sensor.

(i) Describe **one** other application where a motion sensor is commonly used.
Reversing cars, automatic doors into shops, etc.

(ii) *Range*, *sensitivity* and *time* are settings that commonly vary on motion sensors.

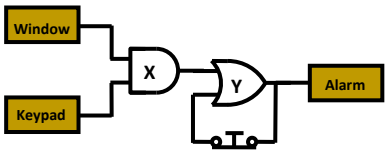
Briefly outline the role of **any two** of these settings in the control of a motion sensor.
Range: The area of coverage of the sensor.
Sensitivity: The ability to detect small to large movements, etc.
Time: How long the light will be activated for, etc.

(10 Marks, 4+6)

2(b) The digital logic circuit shown below describes the conditions required to activate an alarm when an intruder attempts to gain access to a house.

(i) Explain the difference between a *digital* signal and an *analogue* signal.
Digital signal: Only two possible outputs, i.e., high '1' and low '0'.
Analogue signal: A range of outputs, e.g. controlling the volume of sound, etc.

(ii) Name the logic gates labelled **X** and **Y**.
X: AND gate, Y: OR gate.



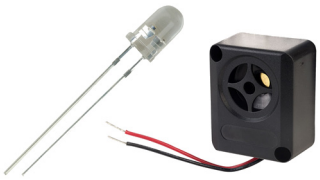
(iii) Briefly outline how the push-to-break switch operates in conjunction with logic gate **Y** to reset the alarm.

Once the AND gate is activated, the OR gate latches on continuously due to the loop containing the push-to-break switch. This sounds the alarm indefinitely. Once the PTB switch is pressed the latch is broken hence the AND gate is also deactivated. The alarm stops sounding as a result, etc.

(20 Marks, 8+6+6)

*Answer 2(c) **or** 2(d)*

2(c) The graphics show an LED and a Piezo mini-siren.
Both are examples of *polarised* electronic components.



LED **Mini-Siren**

(i) Explain what is meant by the term polarised.
Current flows through the component in one direction only, e.g from positive to negative, etc.

(ii) Describe how a student would ensure that the LED and the Piezo mini-siren are correctly polarised when included in a circuit.
The long leg of the LED and the red wire of the mini-siren would be connected to the positive side of the power supply.

(10 Marks, 4+6)

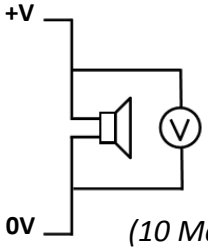
OR

2(d) The mini-siren shown in ***2(c)*** above is suitable for use in a domestic alarm system.

(i) If the mini-siren has an operating voltage of 9 Volts and draws a maximum current of 0.1 Amps, calculate the power used in the mini-siren.

Note: *Power = Current(I) × Voltage(V)*
P= I × V = 0.1 A × 9V = 0.9 Watts (W)

(ii) Draw a simple circuit to show how the voltage drop across the mini-siren could be measured using a voltmeter.



(10 Marks, 6+4)

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

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

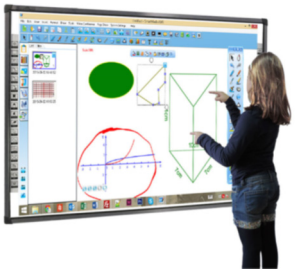
3(a) It is now globally recognised that the long term use of ICT equipment can pose serious health issues for users.

(i) Suggest **two** health problems that can arise for people using ICT equipment over long periods of time.
Strained eyes, poor posture, headaches, etc.

(ii) For **each** health problem identified above, outline **one** step that can be taken to overcome or minimise this problem.
Any relevant step, e.g., take a break, adjust chair/table, etc.

(10 Marks, 6+4)

3(b) The image shows an interactive whiteboard (IWB) used in many classrooms and workplaces.



(i) Suggest **two** benefits of using interactive whiteboards for educational purposes.
Visually appealing, engages users, work can be saved and used again, access to the internet, etc.

(ii) Explain what is meant by the term *resolution* when referring to the quality of a projected image.
The number of colour pixels that form the image.
The higher the number of pixels, the higher the quality of image, etc.

(iii) Some IWBs allow users to interact with the screen by using *infrared (IR)* technology.

Name **two** other applications of IR technology.
N**ight vision, thermal imaging, communications such as in remote controls, etc.**

(20 Marks, 8+6+6)

*Answer 3(c) **or** 3(d)*

3(c) Innovations in online banking have made it easier for people to manage their money. Customers can access their accounts by logging on to their bank's computer servers.

(i) Describe **two** ways computer hackers could misuse personal data accessed online.
Misuse personal data such as financial records or home address, create false identities, cyber bullying, etc.

(ii) Banks require customers to use various authentication methods to access their accounts online.

Describe **two** such authentication methods.

Individual or multiple use of the following: Pin codes, ID numbers, username/ password, passcode generators, additional verification software, etc.

(10 Marks, 6+4)

OR

3(d) Many people prefer to use an *external solid state drive* (SSD) as an alternative to using a *hard disk drive* (HDD) when backing up computer data.

(i) Give **two** advantages of using an external solid state drive to backup and store data.
Portable device, stable, data can be easily accessed on different computers, no moving parts, lower power consumption, etc.

(ii) It is important to store electronic data safely.

Describe **one** other method that can be used for data storage.
Cloud storage, USB flash drives, DVDs/CDs, etc.

(10 Marks, 6+4)

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

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

4(a) A sandwich company wishes to expand its business by developing a new range of specialist sandwiches to compliment existing products offered to customers.

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(i) Outline **two** reasons why market research is carried out before offering a new product to customers.
Gather data about demand, customers needs, identify potential problems, etc.

(ii) Suggest **two** techniques a company could use to gather data about the demand for a new product.
Conduct survey's, interviews, observations, perceptual mapping, etc.

(10 Marks, 6+4)

4(b) The graphics below show a sandwich that is *made-to-order* and a sandwich that is *pre-packed.*

Made-to-Order Sandwich

Pre-packed Sandwich

(i) In **each** case, give **two** reasons why a customer might purchase:
- A *made-to-order* sandwich: **custom-made, fresh, quality assurance, etc.**
- A *pre-packed* sandwich: **convenience, labelling on pack, portion size, etc.**

(ii) Outline **one** benefit for a sandwich company which adopts a *Just In Time (JIT)* approach when sourcing ingredients for their made-to-order sandwiches.
Produce arrives only when needed making it fresh, less space required, etc.

(iii) Describe **one** way in which a sandwich company could reduce the environmental impact of their products.
Recycle packaging, sell produce close to its best-before date at a discounted price, composting, food banks, etc.

(20 Marks, 8+6+6)

*Answer 4(c) **or** 4(d)*

4(c) Customers have complained that the quality of the sandwich bread is occasionally poor. To help resolve this issue, the sandwich company used a *cause and effect* diagram to identify possible causes of the problem.

(i) Suggest how the **equipment** used and/or **staff** could be the primary cause for the poor quality of the sandwich bread.
Faulty machines, lack of maintenance, poor training, apathy towards work, etc.

(ii) Outline **two** benefits for a business which uses cause and effect diagrams to resolve quality related issues.
Clarity in establishing and resolving the problem, improved reputation, less likelihood of claims against the business, etc.

(10 Marks, 6+4)

OR

4(d) When setting up a new manufacturing business it is essential that suitable people are recruited if the business is to be successful.

(i) Briefly describe **two** important roles of the managing director when setting up a manufacturing business.
Appoint staff, delegate workload, network with suppliers and potential customers, etc.

(ii) If a person were being interviewed for the role of deli-assistant in a sandwich shop, describe **two** essential qualities the person should have to fulfil this role successfully.
Friendly towards staff and customers, hard working, efficient, honest, etc.

(10 Marks, 6+4)

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

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

5(a) The image shows the '*Waaf*' desk lamp by French designer Peter Stadelmann. The design of the desk lamp pays homage to mans best friend, the dog. The design consists of an oak-veneered plywood frame attached to a *non-ferrous* metal lamp shade.

(i) Outline what is meant by the term non-ferrous.
Metals that do not contain iron, etc.

(ii) Name a suitable metal that could be used for the manufacture of the lamp shade and justify your selection.
Aluminium– light, easy to shape, etc. - any suitable metal with justification.

(10 Marks, 4+6)

5(b) The overall presentation and clever design make the desk lamp appealing to potential customers.

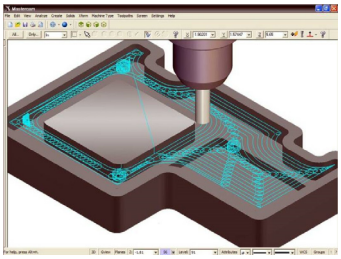
(i) Suggest a suitable finish for the metal lamp shade and also a suitable finish for the wooden frame.
Metal: Paint, Anodised, etc. **Wood: Varnish, Polyurethane, etc.**

(ii) Give **two** specific safety precautions that should be observed when applying finishes to materials.
Wear respiratory protection, use extraction systems, avoid skin/eye contact, wear gloves, wash your hands, etc.

(iii) The parts of the wooden frame could be produced using *CAD/CAM* technology. Using notes and annotated sketches, explain what is meant by a CAD/CAM process.

CAD/CAM: Computer Aided Design/Computer Aided Manufacture

Parts are designed using CAD software. The manufacturing process can be simulated prior to manufacture. CNC routers/milling machines or laser machines can be used to manufacturer parts once the design process is complete, etc.



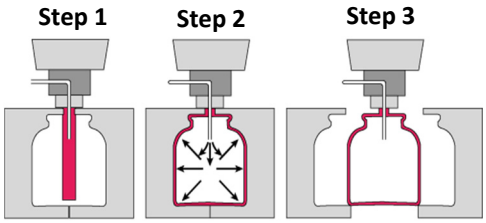
Sample CAD process

Sample CAM machine

(20 Marks, 6+6+8)

*Answer 5(c) **or** 5(d)*

5(c) Plastic bottles can be manufactured using *blow moulding*. The main steps of a blow moulding process are shown in the graphics below.



(i) Briefly describe the steps involved in blow moulding as outlined in the graphics.

Melted plastic is extruded into a hollow tube (a parison) and placed inside a mould.
Air is then blown into the parison inflating it to the shape of the mould.
Once the plastic cools the mould opens to release the part (bottle), etc.

(ii) Outline **one** negative consequence for the environment caused by using plastics to manufacture products.
Long time to degrade, plastic rubbish is unsightly, landfills created, etc.

(10 Marks, 6+4)

OR

5(d) The International Standards Organisation (ISO) is a body which ensures that finished products meet specific standards of quality.

(i) Outline **two** benefits for a company that ensures its products meet specific ISO standards.
Products are more reliable with costs reduced, better reputation for manufacturer, better work environment for employees, fairer competitive market, etc.

(ii) Describe **two** aspects of the desk lamp shown at ***5(a)*** above which could be checked to see if the lamp is safe for purchase by consumers.

Inspect the quality of manufacture, e.g, safe edges, assembly, non-toxic paints, etc.

(10 Marks, 6+4)

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