



**Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

**Leaving Certificate Applied 2013**

**Marking Scheme**

**Technology**

**Common 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 Applied, 2013***

**Vocational Specialism - Technology**  
**(240 Marks)**

**MARKING SCHEME**

**General Directions:**

1. Write your examination number in this box:

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2. There are two sections in this paper.  
 Section 1– Answer **all three** questions. - 90 marks

- Q1. - Short answer questions**  
**Q2. - Graphical Communication**  
**Q3. - Health and safety**

Section 2– Five questions, answer **any three** - 150 marks

- Q1. - Introducing Technology**  
**Q2. - Design and Manufacture**  
**Q3. - Water Technology**  
**Q4. - Electrical Understanding and Basic Electronics**  
**Q5. - Tools and Equipment**

3. Write your answers in the spaces provided and include sketches (in pencil) where appropriate.

<b>Centre Stamp</b>
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1.	Total of end of page totals	
2.	Aggregate total of all disallowed question(s)	
3.	Total mark awarded (1 minus 2)	
4.	Bonus mark for answering through Irish (if applicable)	
5.	Total mark awarded if Irish Bonus (3 plus 4)	
	<u>Note:</u> The mark in row 3 (or row 5 if Irish bonus is awarded) must equal the mark in the Total mark box on the script.	

Section	No.	Mark
Section 1	<b>1</b>	
	<b>2</b>	
	<b>3</b>	
Section 2	<b>1</b>	
	<b>2</b>	
	<b>3</b>	
	<b>4</b>	
	<b>5</b>	
Total		

# Question 1

## Compulsory

(40 marks)

1. Answer **any Ten** of the following fifteen short questions.

- (a) High Impact Polystyrene (HIPS) is very suited to vacuum forming. Suggest **two** reasons for this.

Reason 1 It softens when heated. (2 Marks)

Reason 2 It gives very good definition and can be used to create complex forms. (2 Marks)



High Impact Polystyrene

- (b) Charles and Ray Eames's famous moulded chair, launched in 1946 is made from plywood. Suggest **two** reasons why they used plywood to achieve this design.



Eames LCW chair

Reason 1 Plywood can be steam bent into a 3D shape. (2 Marks)

Reason 2 Plywood is strong under load. (2 Marks)

- (c) The success of electric cars depends on many things one of which is recharging the batteries. List **two** important considerations that must be taken into account in the design of electric charging points.

1 They must be user friendly with clear operating instructions. (2 Marks)

2 The charge time must be as short as possible. (2 Marks)



Electric car charging point

- (d) The lopping shears shown uses levers to obtain a *mechanical advantage*. Explain what you understand by the term 'mechanical advantage' in the context of this shears.

**Answer** The shears gives a mechanical advantage to the user in that the effort force required is much less than the output force produced at the branch as it is being cut.  
(4 Marks)



Lopping Shears

- (e) List **two** metals suitable for turning on a lathe such as that shown.

1 Steel (any suitable metal) (2 Marks)

2 Aluminium (any suitable metal) (2 Marks)



Lathe

- (f) Complete the table below by naming the quantity measured using each of the given units.

<b>Units</b>	Metres	Kilograms	Newtons	Kilowatt
<b>Quantity</b>	Distance (1 Mark)	Mass (1 Marks)	Force (1 Marks)	Power (1 Marks)

- (g) Name a machine suitable for cutting intricate patterns in wood or plastic and give a reason for your choice.

**Machine** Laser Cutter (or CAD CAM Router)  
Scroll saw (or fret saw)  
(2 Marks)

**Reason** A laser cutter is very suitable as the design can be drawn out using CAD and sent to the laser cutter for clean and accurate cutting out.  
(2 Marks)



Geometric pattern

- (h) Touch screen computers are a recent innovation. Suggest **one** advantage and **one** disadvantage of this technology.

Advantage It makes the interaction between the user and the computer more interesting and quicker.  
(2 Marks)

Disadvantage Screens may need special covers to prevent scratching. Screens need regular cleaning. (2 Marks)



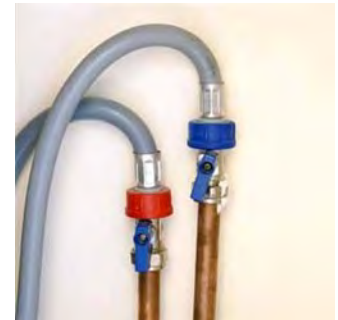
Touch screen computer

- (i) State where the plumbing fittings shown are used and say why one fitting is red and one is blue.

Use For connecting the hot and cold water to a washing machine. (2 Marks)

Red The Hot connection. (1 Marks)

Blue The cold connection. (1 Marks)



Plumbing fittings

- (j) Name the plumbing fitting shown and say where it is used.

Name An Olive (2 Marks)

Where used This fitting is used to create a seal between a plumbing pipe and the nut of a compression fitting.  
(2 Marks)



Plumbing fitting

- (k) Shown is a DPDT relay switch. Explain DPDT and give **one** use for a relay.

DPDT Double Pole Double Throw (2 Marks)

Relay use Automatic directional control of a motor. In this instance it could be used to control the motor driving an automatic door.

(Also used to interface two circuits operating off different voltage power supplies. Eg. A 9V sensor switching a 240V security light) (2 Marks)



Relay switch

- (l) Calculate the cost of running a 1.2kW electric lawnmower for 2 hours if a unit of electricity costs 18 cent.

Solution

$$\text{Cost} = 1.2\text{kW} \times 2\text{hrs} \times \text{€}0.18 = \text{€}0.432$$

Correct formula = (2 marks)

Correct solution = (2 marks)

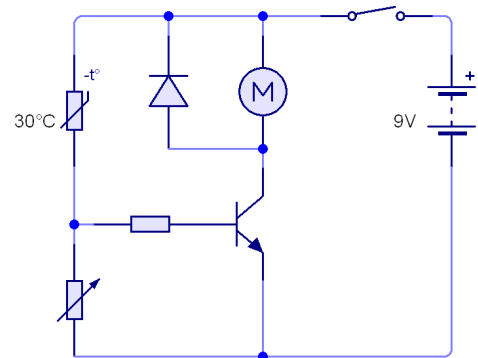


Electric Lawnmower

- (m) A sensing circuit using a thermistor is shown. State the physical condition this circuit is sensing and give **one** use for it.

Physical condition      Temperature (2 marks)

Use      This circuit could be used to activate a fan when temperatures rise to a certain level. (2 marks)



Sensing circuit

- (n) Hang gliding is an extreme sport. List **two** important properties of the fabric used in the wings of the hang glider.

- 1      The fabric must be rip proof.      (2 marks)
- 2      The fabric should be rot proof and resistant to mildew. (2 marks)

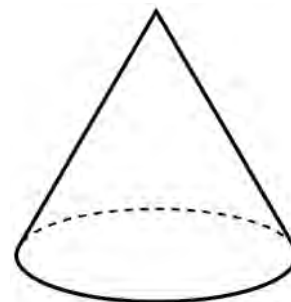


Hang Glider

- (o) Apply shading to the drawing of the cone shown. The shading should help to convey the shape of the cone.

Appropriate shading indicating light. (4 Marks)

Sliding scale 1- 4



**Compulsory**

**2. Graphical Communication**

- (a) A pictorial view of a public information kiosk is shown below.  
In the space opposite draw a well proportioned Elevation and End View of the kiosk.
- (b) Estimate and include 4 dimensions on your completed drawing.



Information Kiosk



**Estimate and include 4 dimensions on your completed drawing.**

Elevation = 11 marks

End View = 11 marks

For each view a sliding scale is applied:

Poor = 3 marks

Fair = 6 marks

Good = 9 marks

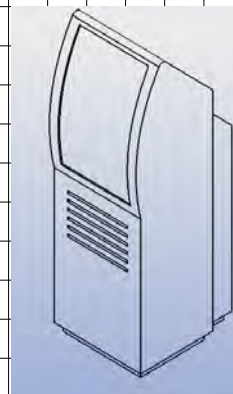
Excellent = 11 marks

1 mark



11 marks

Dimensions with dimension lines = 8 marks  
(2 mark each)



## Compulsory

### 3. Health and Safety

(a) (i) Suggest **two** safety precautions that should be observed when using corded power tools such as the saw shown.

1 The cord should be placed over the shoulder to prevent any contact with the power tool.  
(2 Marks)

2 All parts must be secure and properly adjusted. Dust collection bags must be fitted where appropriate.  
(2 Marks)



Power saw

(ii) List **two** safety precautions that should be observed when using a band saw.

1 Wear safety equipment such as ear muffs and safety glasses.  
(2 Marks)

2 A dust extraction system should be in place.  
(2 Marks)



Band saw

(iii) Describe **two** personal protection equipment signs (other than the one shown here) that are in common use in a workshop.

1 Ear protection signs - wear ear muffs.  
(2 Marks)

2 Wear gloves signs - such as when handling hot plastics in an oven.  
(2 Marks)



(b) Outline a safety precaution you should take when carrying out each of the following activities:

1. Spreading contact adhesive on a sheet of plywood.

Precaution A mask should be worn to prevent inhalation of fumes. (2 Marks)  
Gloves should be worn to prevent contact with skin.  
Or any other acceptable precaution.

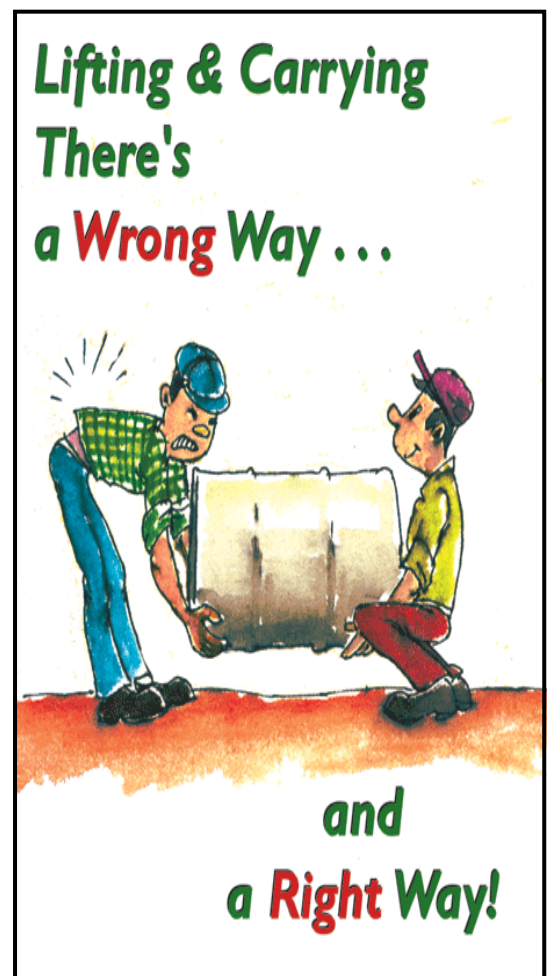
2. Turning a piece of wood on a wood lathe.

Precaution The wood must be properly secured in the chuck. (2 Marks)  
Long hair must be tied back.  
There must be no loose clothing.  
Or any other acceptable precaution.

(c) Using the poster opposite as a guide, describe the correct steps that should be taken by both men when lifting and moving the barrel.

Answer As each man lowers himself to lift the barrel they must keep their backs straight (vertical) and bend their knees. They should keep the barrel as close to the chest as possible. The barrel is then lifted by both men at the same time so that it stays horizontal. The men must maintain a vertical back as they lift the barrel.

(4 Marks)



Lifting Technique poster

## Section 2 (150 marks)

Answer **ANY THREE** Questions from this section.

### 1. Introducing Technology

(50 marks)

- (a) An elevation and plan of a bracket for a castor wheel are shown.  
Make a 3D sketch of the bracket in the space provided.

3D Sketch

(14 Marks)

Any 3D representation

Poor = 4 marks

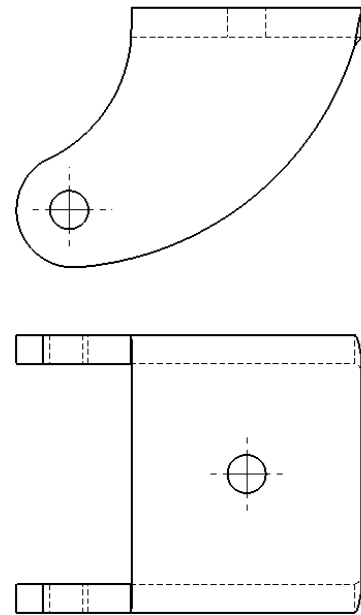
Fair = 8 marks

Good = 12 marks

Excellent = 14 marks

1 mark

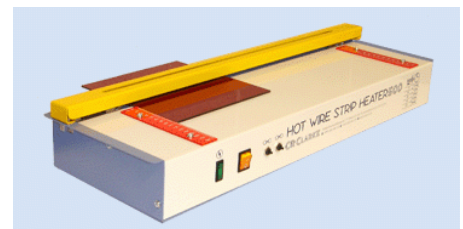
14 marks



- (b) The bracket in part (a) above was bent using a hot wire strip heater. Name a suitable plastic for the bracket and describe the bending process..

Suitable plastic Any thermoplastic such as acrylic, Polystyrene or PVC. (3 Marks)

Bending process Mark out the bend lines. Place the part over the hot wire with the bend line directly over the wire. When the plastic is soft enough to bend, bend the plastic by hand around a block of wood to the 90 degree angle. Hold the plastic at this angle until it cools. Repeat the process for the other side of the bracket.  
(6 Marks)

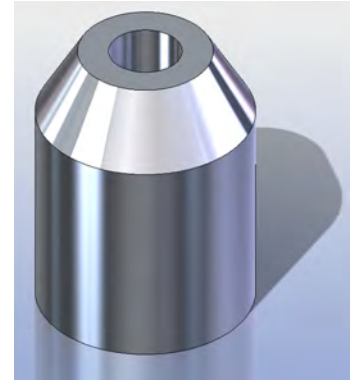


Hot wire strip heater

(c) Outline the steps used to turn the machine part shown on a lathe.

Answer Explain the process using terms like: facing off, parting, drilling, chuck, cross table, tapering, tailstock.

(10 Marks) for complete answer with a sliding scale being applied depending on the quality of the response.



Machine part with taper and through hole

(d) (i) As part of the movement towards a greener environment we are encouraged to '*Reduce, Reuse and Recycle*'. Explain each of these terms.

**Reduce** To reduce means to avoid using materials unnecessarily. For example, food producers could use less packaging for their products. (3 Marks)

**Reuse** By using products over and over such as a shopping bag people can help to maintain a greener environment. Reusing machine parts such as car parts and building materials helps to reduce our carbon footprint. (3 Marks)

**Recycle** Recycling involves reprocessing materials to make new products. For example, shredding plastic bottles to produce bin liners. (3 Marks)

(ii) Explain the meaning of the following terms associated with the environment:

**Carbon Footprint** This refers to the amount of carbon dioxide released into the atmosphere during the production of a material or product. It may also refer to the amount of CO<sub>2</sub> released due to any form of transport or other activity. (4 Marks)

**Global Warming** The phenomenon whereby the earth is gradually warming up due to the increase in greenhouse gases in the atmosphere. (4 Marks)

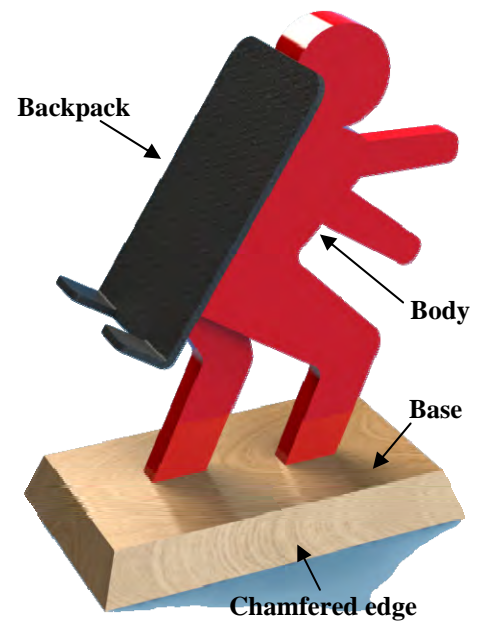
## 2. Design and Manufacture

(50 marks)

- (a) A design for a mobile phone holder is shown.  
The backpack and body are made from plastic and the base is made from oak.

- (i) Name a suitable method of joining the backpack to the body and describe how this technique is carried out.

Answer Description of any suitable method of Joining such as gluing with an appropriate glue/solvent or screwing with countersunk screws.  
(8 Marks)



Mobile Phone Holder

- (ii) A suitable finish is to be applied to the wooden base.  
Name a suitable finish and describe how the wood should be prepared before applying this finish.

Finish Any suitable finish such as varnish, lacquer, stain or wax. (4 Marks)

Preparation The wood should be planed and sanded with a fine grade sandpaper before applying a finish. (4 marks)

Answer

Any suitable method with suitable sketches. (10 marks)

Sliding scale from 1 to 10 applied.

- (b) (i) In the *Design and Manufacture* module you designed and manufactured a product. Name the product you made and make an isometric sketch of it on the grid below.

Product Name \_\_\_\_\_

\_\_\_\_\_

(20 Marks)

Sliding Scale 1 - 20

Poor = 5

Fair = 10

Good = 15

Excellent = 20

1

20

- (ii) Describe **two** new skills you learned when doing this project. (2 x 2 Marks)

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

### 3. Water Technology

(50 marks)

- (a) (i) A solar panel for heating water is shown. List **two** important factors that need to be considered when installing solar panels.

- 1 The panel should be placed on a south facing roof surface. (4 marks)
- 2 There should be no obstructions to the sunlight from neighbouring buildings, trees etc. (4 Marks)



Solar panel

- (ii) Solar panels are generally used for heating water in the hot water cylinder. Outline **two** measures that a householder can take to minimise heat loss from this hot water system.

- 1 Lagging of the hot water cylinder (or use a pre-insulated hot water cylinder) and piping. (4 Marks)
- 2 Insulation under the roof surface so that the attic space is not cold. (4 Marks)

- (b) Explain, step-by-step, how you would replace a faulty hot water tap on a bathroom sink.

**Answer** Switch off the water supply. Run the tap so no more water flows out the spout. Undo the pipe connection to the tap under the sink while holding the body of the tap to prevent it from twisting. When the supply pipe has been disconnected remove the plastic nut and seal from the tap under the sink. Lift out the tap. When fitting the new tap the same process is carried out but in reverse. Make sure to remove any thread tape or jointing compound from the old plumbing fitting and ensure it is thoroughly cleaned before refitting with new thread tape or jointing compound. Hold the tap by hand when tightening the nut on the pipe if it is a compression fitting.

(10 Marks)



Typical bathroom sink



(c) Compare copper plumbing pipes with plastic plumbing pipes under the following headings:

**Available lengths** Plastic piping comes in a long length roll whereas copper piping comes in shorter straight lengths. (3 Marks)

**Cost** Plastic piping is a little less expensive than copper generally. (3 Marks)

**Flexibility** Plastic piping is quite flexibility and can bend around corners. Copper piping must be bent using a special machine/tool. Copper piping is not flexible. (3 Marks)

**Insulation** Plastic is a natural insulation whereas copper is a very good conductor. (3 Marks)

(d) Explain the function of **each** of the plumbing fittings shown.

**Float ball valve** This is used to control the flow of water into a tank or water closet. The rising float closes a valve shutting off the water from entering through the valve. (3 Marks)



**Water pressure vessel** Generally found in a domestic pump house in conjunction with a well. Water is pumped into the vessel which acts as a reservoir for the house supply. When the pressure drops in the vessel the pump switches on and refills it. (3 Marks)



**Non return valve** These valves can be used in central heating systems or an outdoor tap so that water can flow in one direction only. (3 Marks)



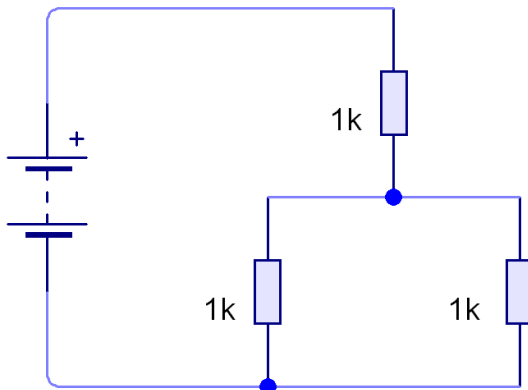
**P Trap** P traps are used under a sink where the outlet pipe is horizontal rather than vertical. (3 Marks)



## 4. Electrical Understanding and Electronics

(50 marks)

- (a) Determine the total resistance in the circuit below. (4 Marks)







Answer

Two 1K resistors in parallel is equivalent to 500 Ohms.  
Hence total resistance is 1500 Ohms

- (b) The table below shows some of the components required for a motor speed-control circuit.

- (i) Name the components in the spaces provided. (4 x 3 Marks)

<b>Component</b>				
<b>Name</b>	Potentiometer or variable Resistor	Transistor (could be a voltage regulator)	Toggle Switch	Resistor

- (ii) The speed-control circuit is to be used to control the speed of a cooling fan such as that shown opposite. The power supply for the fan is to be either a battery **or** a mains power supply unit.

State which power supply you would use giving two valid reasons for your choice.

Power supply \_\_\_\_\_

Reason 1      Valid reason      (4 Marks)

Reason 2      Valid reason      (4 Marks)



Small cooling fan



Mains power supply unit

- (c) (i) The device opposite is used to monitor the running cost of any appliance that is plugged into it. What is the advantage of using this type of “Smart” technology?

Answer It would be a great help in keeping down one’s electricity bill especially if used to monitor appliances such as tumble driers and electric heaters. It would encourage people to invest in A rated energy appliances thereby lowering one’s carbon footprint.

(6 Marks)



- (ii) Calculate the cost of running a 500 Watt security light for 12 hours at 20 cent per unit of electricity.

Solution

$$\begin{aligned} \text{Cost} &= \text{Power(kW)} \times \text{Time(hrs)} \times \text{Cost per unit} \\ &= 0.5 \times 12 \times 0.2 \\ &= \text{€}1.20 \end{aligned} \quad (6 \text{ Marks})$$



- (iii) Calculate the current passing through the element of a 240V 24W soldering iron.

Solution *Note: Power = Voltage × Current*

$$\begin{aligned} 24\text{W} &= 240\text{V} \times I \\ I &= 0.1 \text{ Amps} \end{aligned} \quad (6 \text{ Marks})$$



- (iv) A photograph of an electricity generator that harnesses energy from waves is shown.

Describe **two** other devices that generate electricity from renewable energy sources.

1 Wind Generators generate electricity from the kinetic energy of the wind.

(4 Marks)

2 Solar cells (photovoltaic cells) generate electricity from sunlight (mainly UV light from the sun).

(4 Marks)



Electricity generation using wave energy

## 5. Tools & Equipment

(50 marks)

(a) A range of equipment found in workshops is shown.

1.



2.



3.



4.



Name each piece of equipment and give its use.

(8 x 3 Marks)

No.	Name	Use
1	Belt sander	For sanding wood surfaces
2	Wood turning lathe	For spindle and faceplate turning of wood products such as lamp stands and bowls
3	Allen Key set	For loosening/tightening Allen head bolts/screws
4	Toolmakers clamp	For clamping small parts during assembly

(b) Describe **four** main steps in the process of vacuum forming.

- 1 Put baby powder on the mould/plug and place it centrally on the bed of the vacuum former. (2 Marks)
- 2 Clamp the thermoplastic and pull the pre-heated hood over it. (2 Marks)
- 3 Wait for the plastic to soften so that it sags a little. (2 Marks)
- 4 Push back the hood, raise the mould, switch on the vacuum pump and allow the formed plastic shape to cool before removing. (2 Marks)



Vacuum-forming machine

(c) Make sketches of **any 4** of the following tools in the spaces below. (4 x 3 Marks)

Spring dividers	Claw hammer	Stock and die	Wood chisel	Bullnose pliers

(d) PCBs are widely used in the electronics industry.

(i) Explain the term PCB.

Answer Printed Circuit Board (3 Marks)

(ii) *Flux* is generally applied to circuit boards. Explain why this is necessary.

Answer It prevents corrosion of the copper and prevents oxidation of the copper when it is being soldered. This ensures a good conducting joint.

(3 Marks)



Flux being applied to a PCB

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