



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Cycle Final Examination 2022

Applied Technology

Common Level

Tuesday 14 June Morning 9:30 - 11:00

120 marks

Examination Number

--	--	--	--	--

Day and Month of Birth

--	--	--	--

For example, 3rd February
is entered as 0302

Centre stamp

Running Total

Centre stamp		
Running Total		

For Examiner use only

	Ex. mark	Ex. mark	Adv. Ex. mark
Q 1			
Q 2			
Q 3			
Total			
Grade			

Instructions

Answer all questions.

Write your answers in blue or black pen. You may use pencil for sketches only.

Write your answers in the spaces provided in this booklet. There is space for extra work at the end of the booklet. Label any such extra work clearly with the question number and part.

Acknowledgements

Graphic Q1(a) (i) page 3. <https://www.wellerhire.co.uk/wp-content/uploads/2015/10/Garden-Hand-Tools-Tool-Hire.jpg>

Graphic Q1(a) (ii) page 3. <https://www.kepuchina.cn/ldyy/theme/agriculture/01/>

Graphic Q1(a) (iii) page 3. <https://www.pinterest.cl/pin/616500636480179672/>

Graphic Q2(a) (i) page 7. <https://www.facebook.com/AnimalsInPredicaments/photos/a.677382572401256/1910949759044525/>

Graphic Q2(c) (i) page 9. <https://3dandprint.eu/en/3d-printers/3d-printer-easythreed-nano/>

Graphic Q2(h) (i) page 14. https://en.wikipedia.org/wiki/History_of_monorail#/media/File:Palmer-monorail.png

Graphic Q2(h) (iv) page 14. <https://www.micro.ai/resources/case-studies/ai-enabled-defect-detection-solutions-in-manufacturing>

Graphic Q3(a) (i) page 15. <https://powertime.co.za/online/wp-content/uploads/2019/05/solar-air-conditioning.png>

Graphic Q3(a) (ii) page 15. http://www.renewable.com/images/System%20Parts/Panels/100_0054.jpg

Graphic Q3(a) (iii) page 15. <https://oddtymall.com/includes/content/this-shade-hat-has-a-solar-panel-that-powers-a-fan-to-keep-your-noggin-cool-0.jpg>

Question 1

- (a) (i) Gardening tools are often made from materials such as aluminium, hardwood, thermosetting plastic, and metal alloys.

Use a tic (✓) to show if each of the following statements is true **or** false.



Statement	True	False
Aluminium is a non-ferrous metal		
Hardwood trees are usually evergreen		
A thermosetting plastic will soften when heated		
An alloy is made from more than one metal		

- (ii) Greenhouses use a range of automated systems.
Outline **two** automated systems which could be used in a greenhouse.

1.
2.



- (iii) An image of a pepper-picking robot is shown. Identify **two** problems which the robot must overcome in order to pick the peppers successfully.



1.
2.

- (b) A student's design for a working model of a motorised gardening cart is shown.

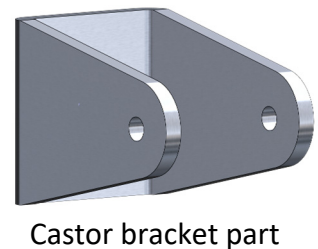
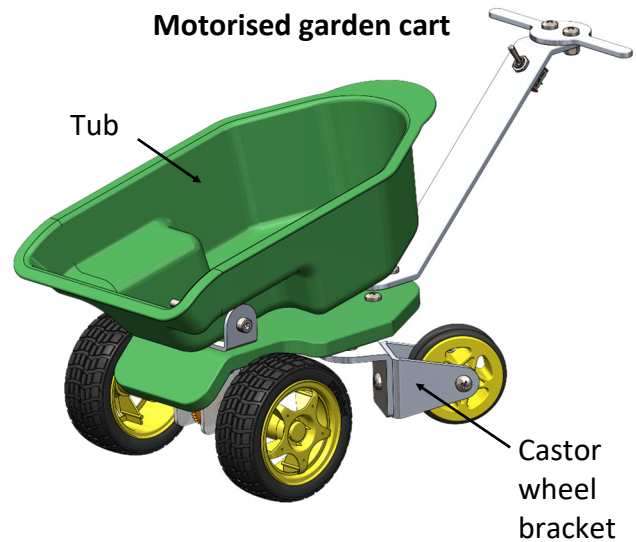
- (i) Name a suitable plastic from which to vacuum form the tub.

Plastic:

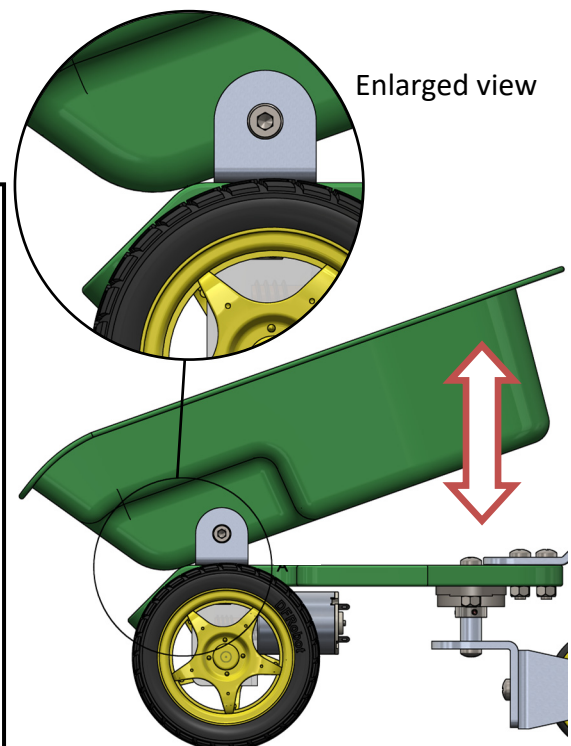
- (ii) Part of the castor wheel bracket is shown. Name a suitable material from which to manufacture the bracket **and** draw the development of this part.

Suitable material:

Development of part

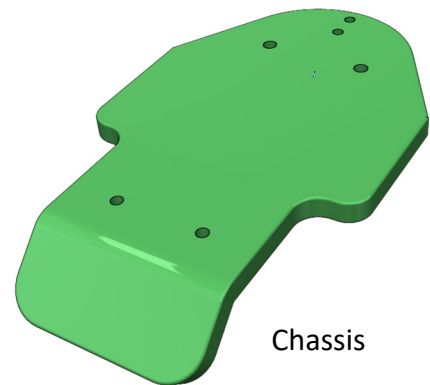


- (c) When using the cart, it was found that the tub could not tilt enough to allow the contents to fall out. In the space below, sketch a design change to correct this fault.



(d) Describe with the aid of sketches any **two** of the following manufacturing processes required to manufacture the chassis of the cart from acrylic.

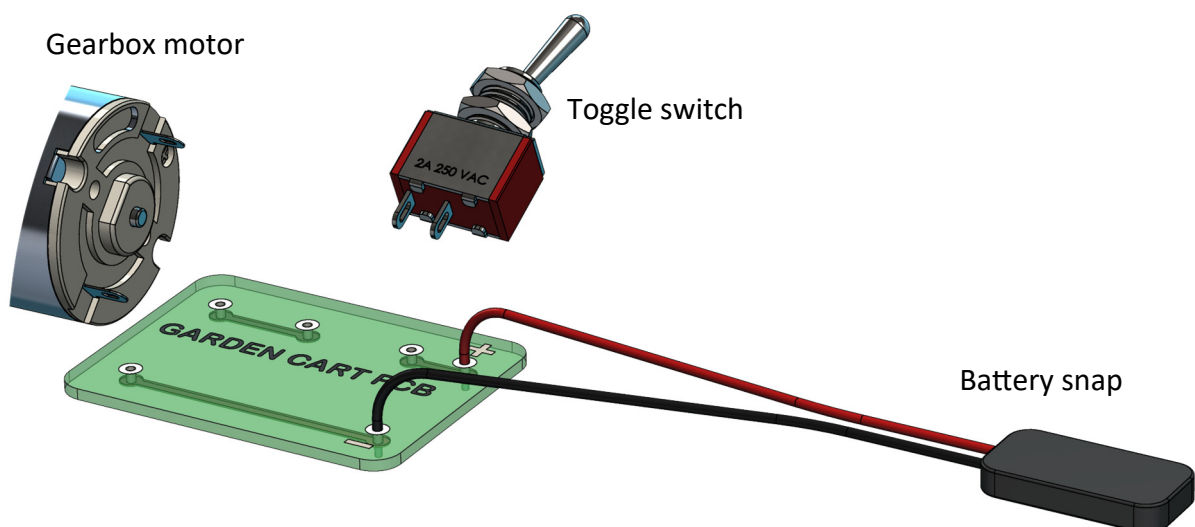
- Drilling the holes
- Cutting out the overall shape
- Rounding the corners
- Bending the material.



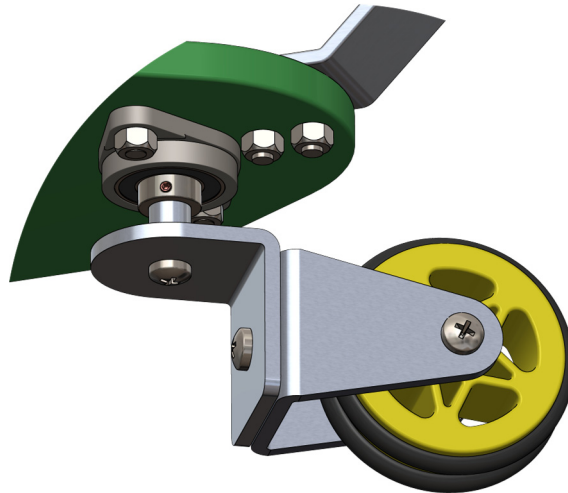
Process 1: _____

Process 2: _____

(e) Four wires are required to complete the circuit below which controls the motor. Draw in the **four** required wire connections.

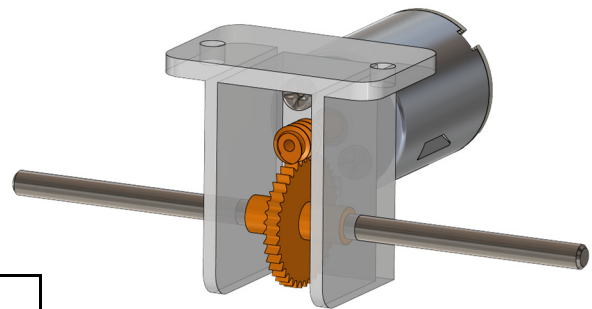


- (f) A view from underneath the castor wheel assembly is shown.



- (i) Explain why a castor wheel is necessary for this design of cart.

- (ii) Name the mechanism shown, which is used to drive the garden cart and give a reason for its selection.



Name:

Reason:

Question 2

- (a) Elevated monorail transport systems are common in modern cities.



- (i) Suggest **two** reasons why these transport systems are elevated.

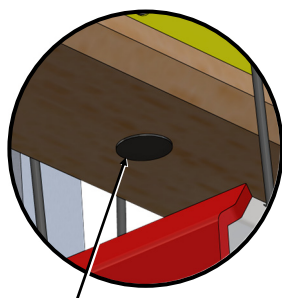
Reason 1:
Reason 2:

- (ii) Outline **two** ways in which public transport systems, like monorails, help reduce environmental pollution.

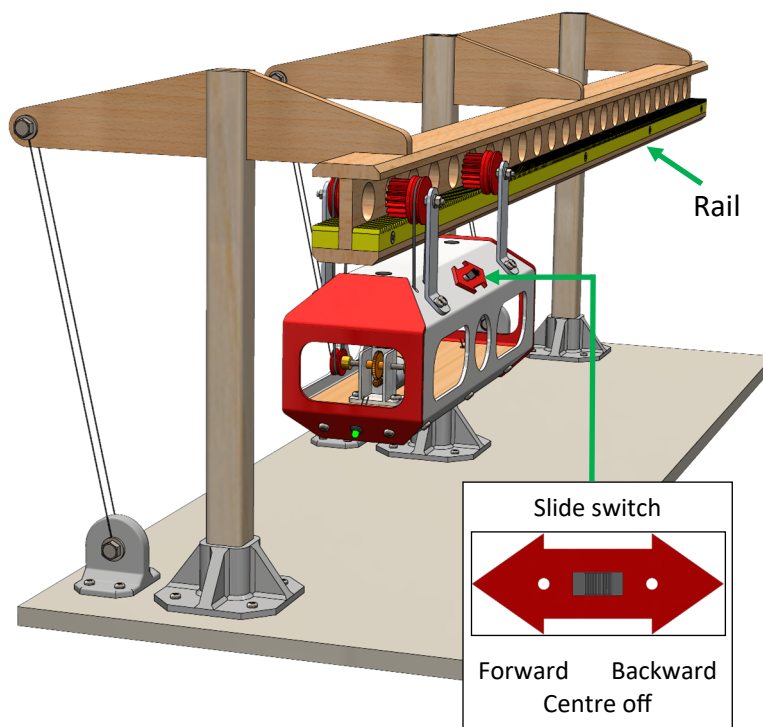
1.
2.

- (b) A working model of an electrically operated, suspended monorail transport system is shown.

The system is powered by an on-board electric motor and includes magnetically operated limit switches at the end of each rail.



Limit switch on underside of rail at **each** end

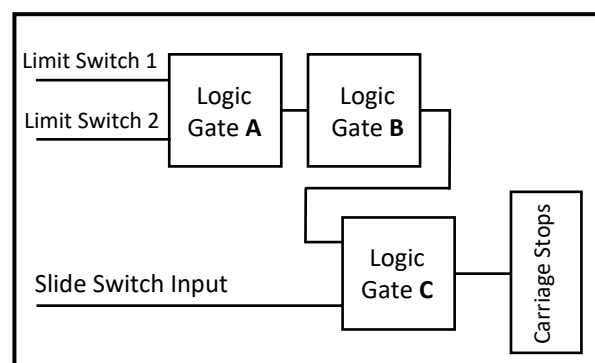


The control system for the monorail uses the digital logic system below.

- Slide switch (forward or backward) = logic level 1
- Slide switch in centre position = logic level 0
- Limit switch open = logic level 0
- Limit switch closed = logic level 1.

- (i) Name the logic gates **A**, **B**, and **C** required to make the carriage stop at each end.

Logic Gate A	
Logic Gate B	
Logic Gate C	



Control System

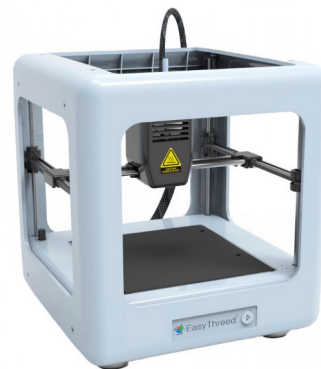
- (ii) Draw the symbol for Logic Gate **A** and complete the Truth Table for this gate.

Symbol for Logic Gate **A**

Input 1	Input 2	Output
1	1	1
1	0	
0	1	
0	0	

(c) The image shows a 3D printer.

- (i) Give **one** advantage and **one** disadvantage of using a 3D printer in the Applied Technology classroom.

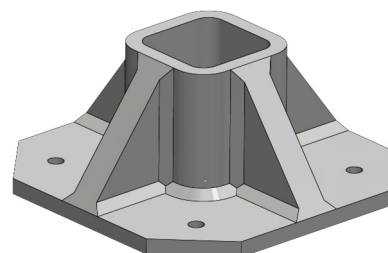


Advantage:

Disadvantage:

- (ii) The wooden columns supporting the rail sit into plastic shoes which have been 3D printed.

Explain why 3D printing is a suitable technology to use in the manufacture of this part.



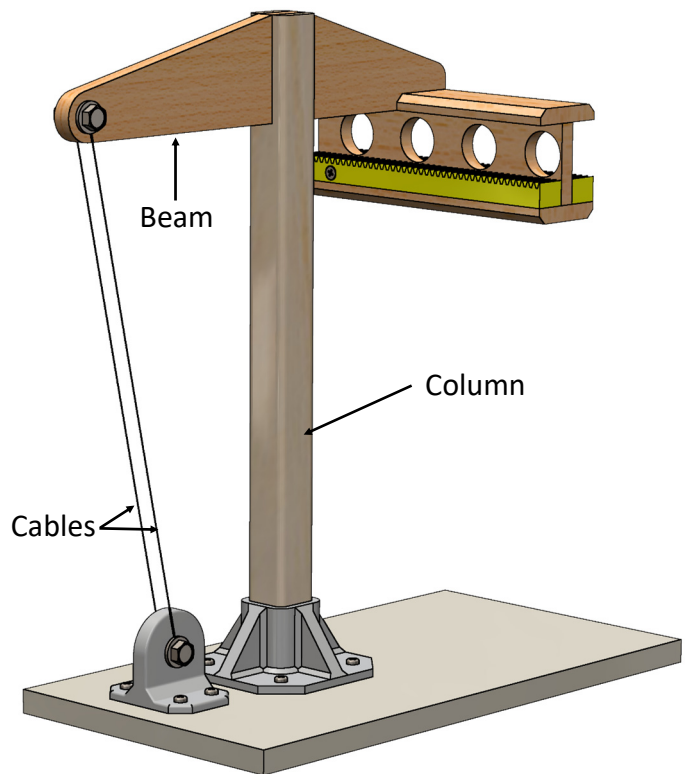
3D Printed column shoe

- (iii) 3D printing is a form of **Additive Manufacturing**. Explain the meaning of this term.

- (d) An image of the main components of the monorail supporting structure is shown.

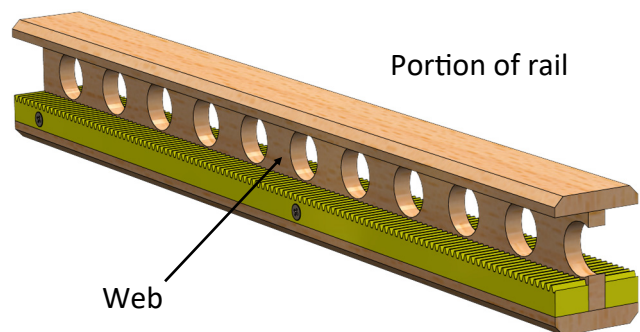
- (i) Name the primary force acting in **each** of the components named below.

Component	Force
Beam	
Column	
Cables	



- (ii) A portion of the wooden rail on which the carriage is suspended is shown. The web of this rail has a series of holes drilled through it.

Give a reason for including these holes in the design of the rail.



Reason for holes:

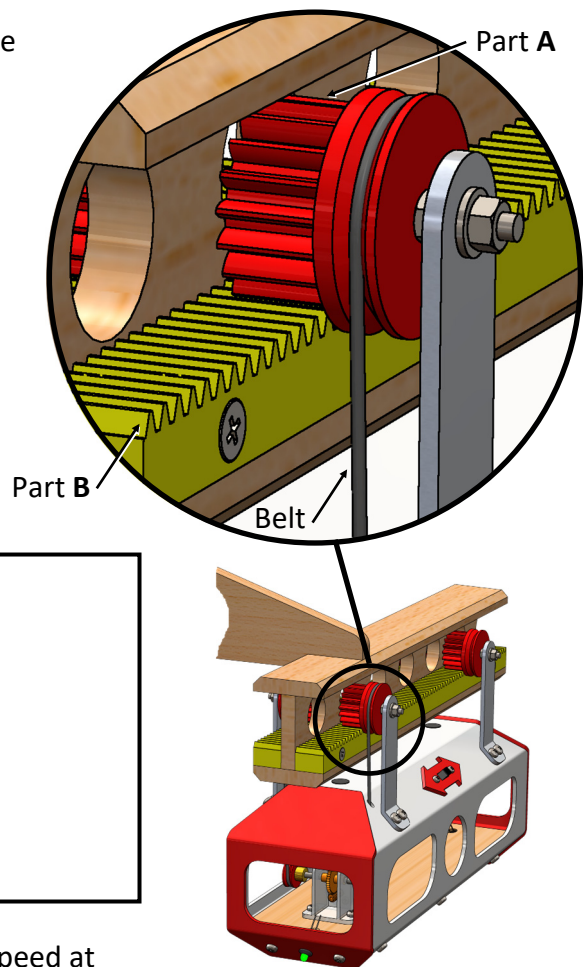
- (e) A detail view of the mechanism used to move the carriage along the overhead rail is shown.

(i) Name this mechanism.

Name:

- (ii) Part A has 18 teeth and the distance between the teeth on Part B is 5 mm.
Calculate the distance travelled for one full revolution of Part A.

Calculation:



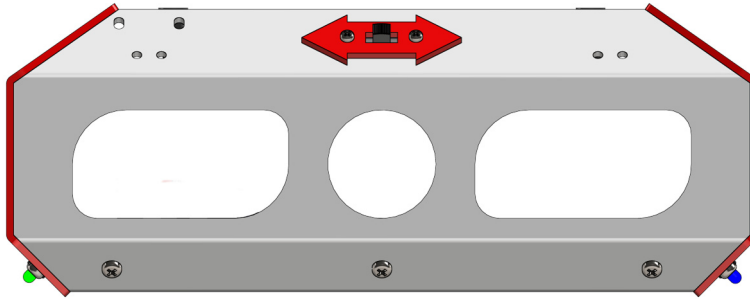
- (iii) If Part A rotates at 10 RPM, calculate the speed at which the carriage moves in millimetres per minute.

Calculation:

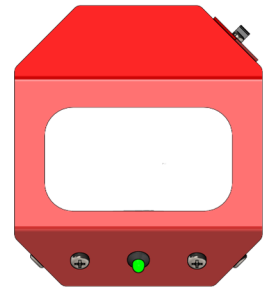
- (iv) A belt drive is used to transfer motion from the gearbox to the upper mechanism.
Give **one** advantage of using a belt drive instead of a chain and sprocket in this situation.

Advantage:

- (f) The Elevation and End View of the carriage are shown.
In the space below, sketch an alternative design for the carriage.



Elevation



End View

Alternative Design

- (g) Two LEDs are used in the control circuit to indicate that the carriage is in motion.

(i) What do the letters **LED** stand for?

L	E	D
----------	----------	----------



(ii) What name is given to the longer leg of an LED?

Name:

(iii) It is best practice when soldering wires to LEDs to use heat shrink sleeve.
Explain why this should be done.

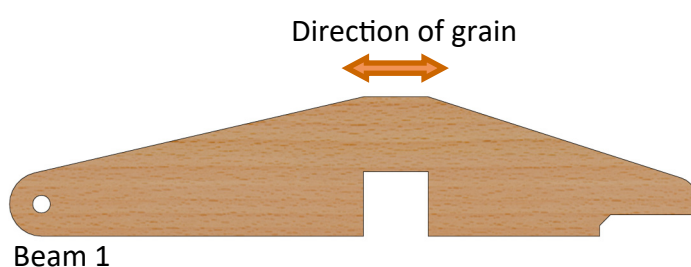


Heat Shrink Sleeve

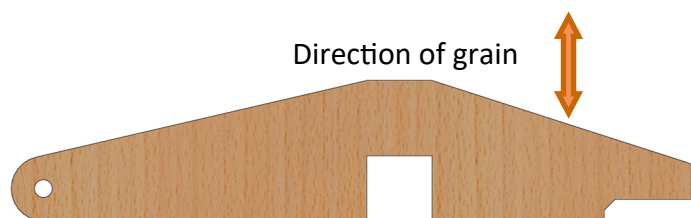
(iv) When cutting out the wooden beams, the student had a choice between beam 1 or beam 2. State which beam is strongest and explain why.

Strongest beam:

Explanation:

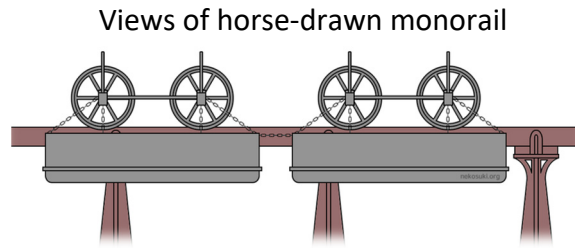


Beam 1



Beam 2

- (h) The first passenger-carrying monorail was invented by H.R. Palmer in England in 1824. This monorail was horse-drawn.



- (i) Outline the first major technological development that made it possible for inventors to power machines without the use of horses.

Technological development:

- (ii) Mass production became popular in the late 1910s.

Name the person who popularised this method of production.

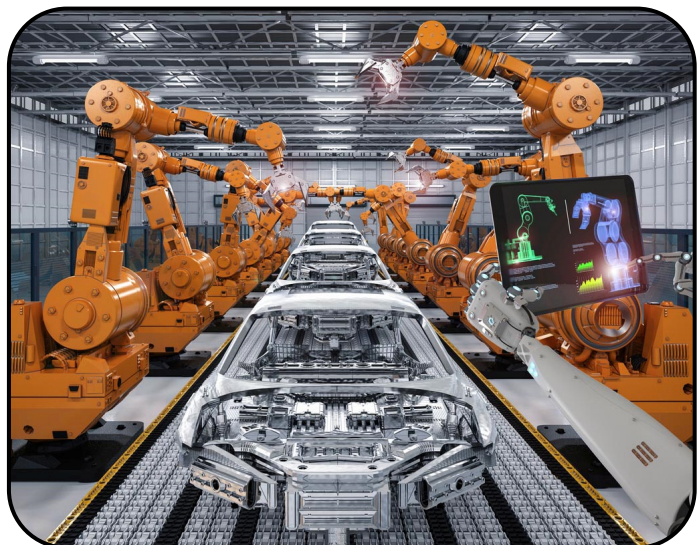
Name:

- (iii) List **one** benefit of mass production for the consumer and **one** benefit for the producer.

Consumer:

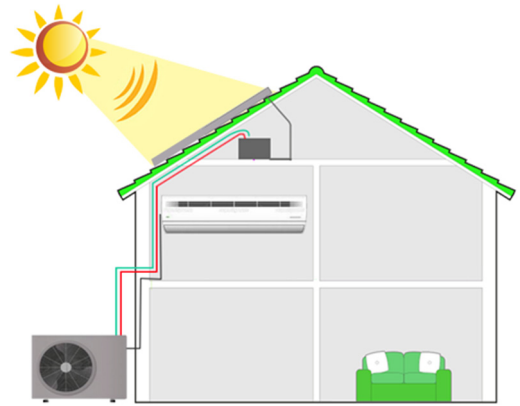
Producer:

- (iv) Outline **one** benefit of the use of industrial robots in the production of cars.



Question 3

- (a) Air conditioning is necessary in hot countries but requires expensive electrical energy to operate. For this reason many people are installing solar-powered air conditioning systems that make use of photovoltaic cells (PVs) on the roof of their homes.



- (i) State the energy conversion associated with photovoltaic cells.

From		To	
------	--	----	--

- (ii) The photovoltaic panel shown is designed to tilt and turn automatically. Give **one** reason why it is designed to do this.

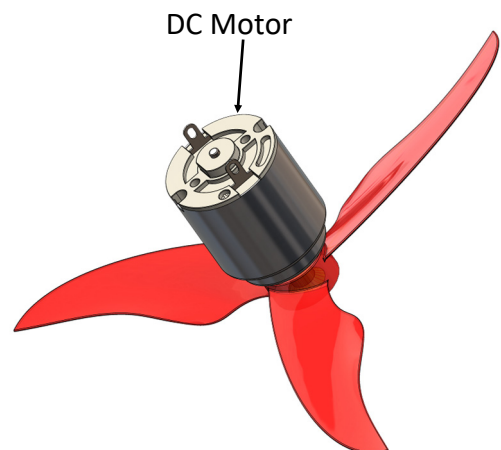
Reason:



- (iii) The novelty air-cooled hat shown uses a PV cell to drive a DC motor with attached fan blades.

DC motors are **polarised**.
Explain the term polarised and give a reason why this must be considered when attaching the fan blade to the motor.

Polarised:
Reason:



- (b) The image shows a student design for a study desk cooling fan with tilt and turn features. The fan activates automatically at a set temperature.

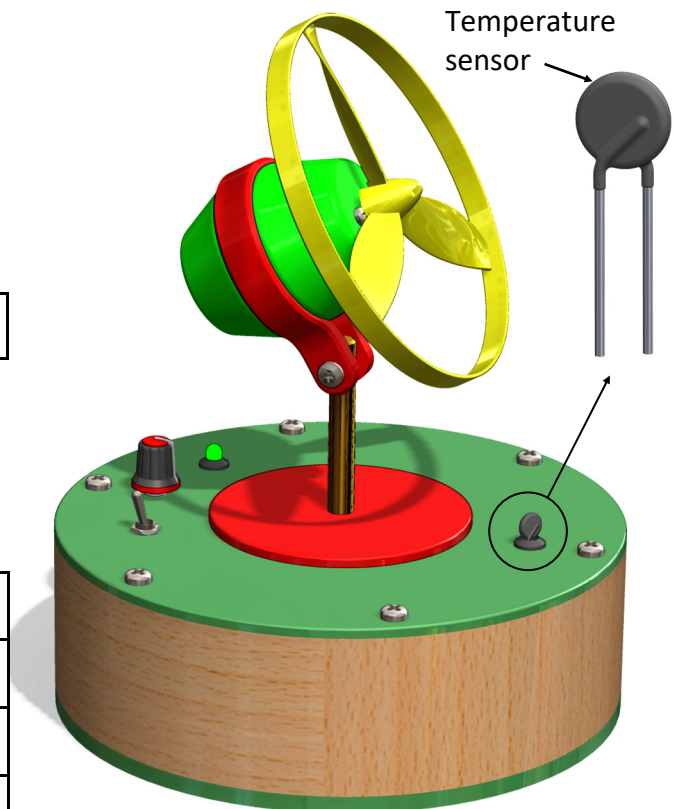
- (i) Name the temperature sensing component shown.

Name:

- (ii) Name **two** other devices which use temperature sensors as part of their control system.

Device 1:

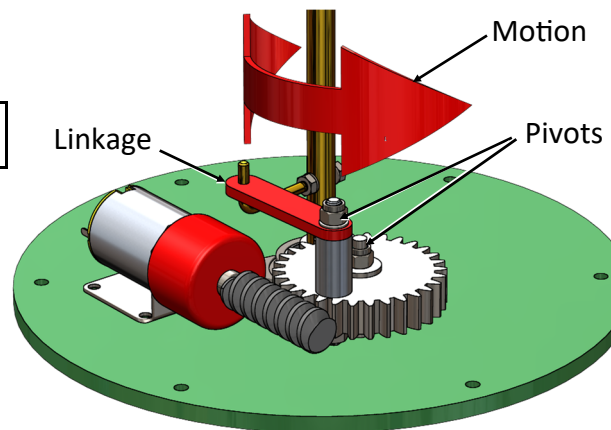
Device 2:



- (iii) The fan turns from side to side when in use. The linkage mechanism for the fan is shown.

Name the type of motion produced by this linkage mechanism.

Motion:



- (iv) Name **two** other devices that use this type of motion.

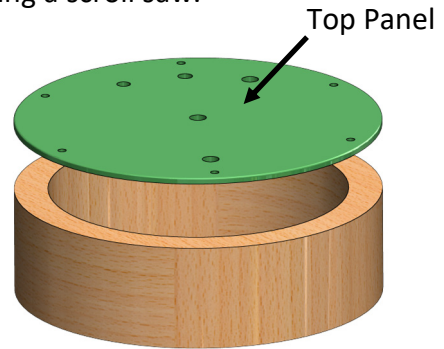
Device 1:

Device 2:

- (c) The circular top panel of the housing is to be cut out using a scroll saw.



Scroll Saw



- (i) List **two** specific safety precautions that should be observed when using a scroll saw.

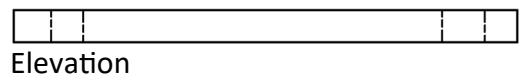
Precaution 1:

Precaution 2:

- (ii) Name **one** other tool which could be used to cut out the top panel.

Name:

- (iii) The elevation and plan of the linkage (connecting-rod) are shown.
Make a 3D sketch of this part in the space provided (include shading as appropriate).

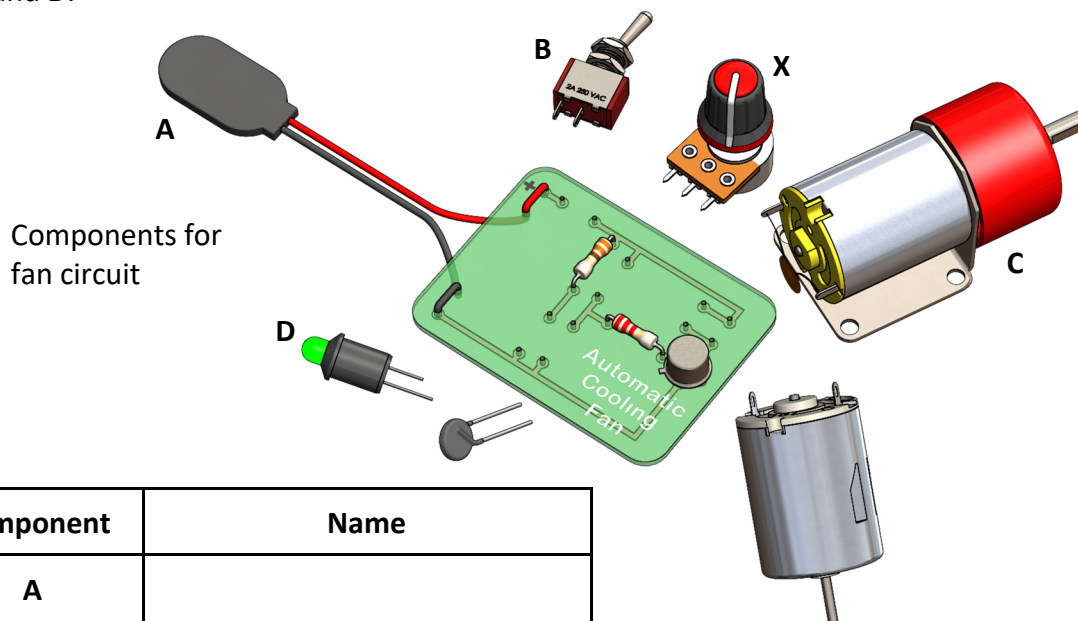


Elevation



Plan

- (d) (i) Complete the table below by naming the components of the circuit labelled **A**, **B**, **C**, and **D**.

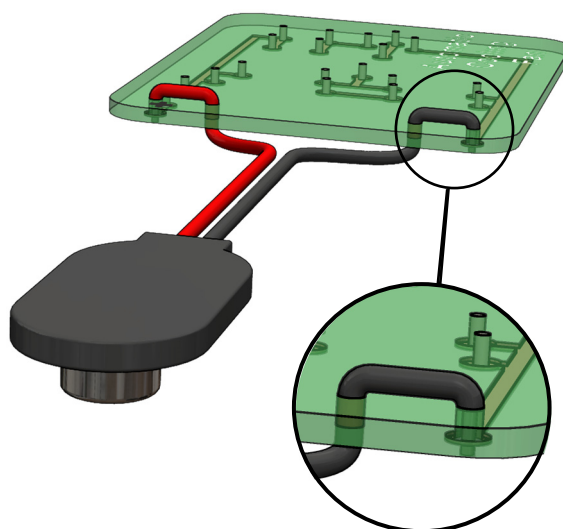


Component	Name
A	
B	
C	
D	

- (ii) Name, and sketch the electronic symbol for the component labelled **X** in the image above.

Name	Symbol

- (iii) Explain why the wires are looped through the PCB as shown.



[illegible]

Do not write on this page

Copyright notice

This examination paper may contain text or images for which the State Examinations Commission is not the copyright owner, and which may have been adapted, for the purpose of assessment, without the authors' prior consent. This examination paper has been prepared in accordance with *Section 53(5) of the Copyright and Related Rights Act, 2000*. Any subsequent use for a purpose other than the intended purpose is not authorised. The Commission does not accept liability for any infringement of third-party rights arising from unauthorised distribution or use of this examination paper.

Junior Cycle Final Examination – Common Level

Applied Technology

Tuesday 14 June

Morning 9:30 - 11:00