



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Cycle Final Examination 2025

Applied Technology

Common Level

Monday 16 June Morning 9:30 - 11:00

120 marks

Examination Number

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Date of Birth

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For example, 3rd February
2005 is entered as 03 02 05

Centre Stamp

Instructions

Write your Examination Number and your Date of Birth in the boxes on the front cover.

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.

This examination booklet will be scanned and your work will be presented to an examiner on screen. Anything that you write outside of the answer areas may not be seen by the examiner.

Acknowledgements

Graphic Q1(a)(i) page 3.

<https://www.stageengage.com/hire-shop/p/bubble-machine>

<https://www.adaptivetechsolutions.com/pd-gazillion-hurricane-bubble-blower-switch-adapted-toy/>

Graphic Q1(a)(iii) page 3.

<https://www.desertcart.ie/products/137389556-top-bright-activity-cube-baby-toy-for-1-year-old-boy-and-girl-gift-toddler-toys-for-one-year-old-present>

Graphic Q2(a) (i) page 8.

https://www.autoevolution.com/news/red-bull-rb19-f1-car-breaks-cover-and-max-verstappen-cant-tell-it-apart-from-the-rb18-209741.html#agal_0

Graphic Q2(b)(i) page 8.

<https://www.thetoyshop.com/transport-toys/remote-control/rc-cars/Extreme-360-RC-Stunt-Double---Side-Roll-Car---Green/p/548079>

Graphic Q3(a) Page 14.

<https://www.collectorsweekly.com/articles/ancient-androids/>

Graphic Q3(b)(i) Page 14.

<https://www.plasticsnews.com/article/20151013/NEWS/151019963/the-plastic-bionic-ants-go-marching>

Graphic Q3(c)(iii) Page 16.

<https://www.amazon.com/EBL-Batteries-Rechargeable-Battery-Charger/dp/B00HV4KFSA>

Question 1

(a) A toy bubble machine is shown.

(i) State **two** safety features of such toys.

Feature 1:
Feature 2:



Bubble machine

(ii) Plastics are commonly used in the manufacture of everyday products.
Use a tick (✓) to show if each of the following statements is true or false.

Statement	True	False
Thermoplastics can be remoulded when heated		
Acrylic is a thermosetting plastic		
PVC stands for Polyvinyl Chloride		
Drinks bottles are generally made from PET type plastic		

(iii) List **two** important things that a designer must consider when designing toys for very young children.

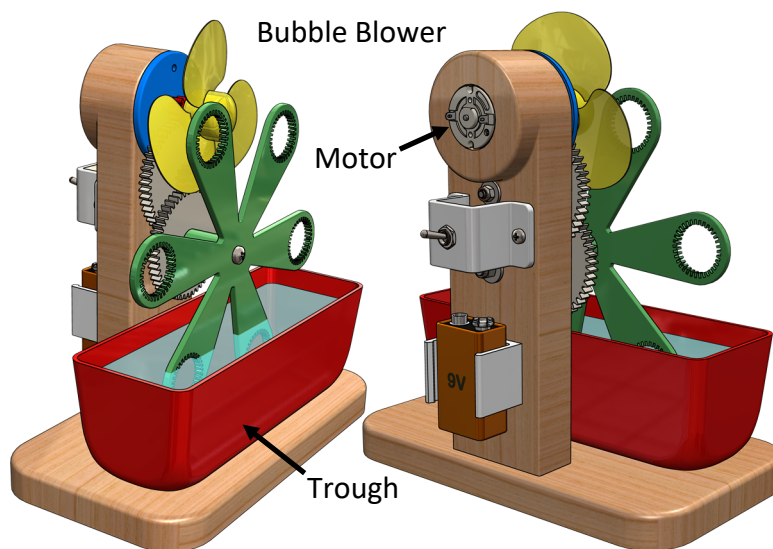


1:
2:

- (b) The front and rear views of a student design for a bubble blower are shown. The main column and the base are made from hardwood.

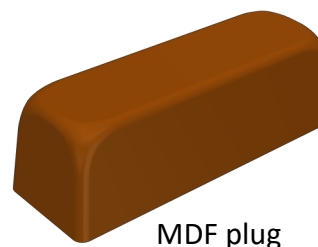
- (i) Name a suitable hardwood and give a reason for your choice.

Hardwood:
Reason:



- (ii) The plug (mould) used to vacuum-form the trough for holding the bubble solution is made from MDF. What do the letters MDF stand for?

M	D	F
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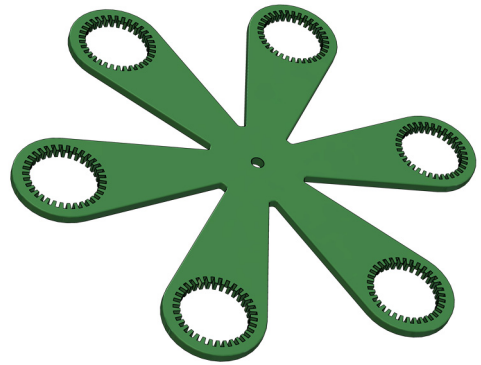


- (iii) In the space below describe, using notes and sketches, the processes required to make the plug from **three** layers of MDF.

- (iv) The rotating 'dipper', made from acrylic, is complex in shape and detail.

Name a suitable computer controlled machine that could be used to cut out this shape and briefly describe the process.

Name of machine:
Process:



Acrylic dipper

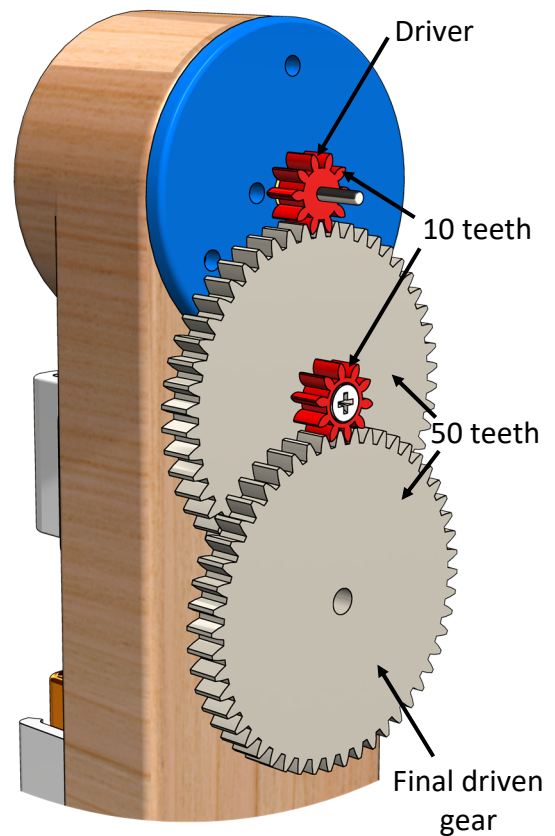
- (c) The dipper is rotated by the final driven gear of the gear train shown. The smaller gears have 10 teeth and the larger gears have 50 teeth.

- (i) Using the formula below, calculate the Velocity Ratio (VR) of this gear train.

$$VR = \frac{\text{No. of teeth on driven gear}}{\text{No. of teeth on driver gear}} \times \frac{\text{No. of teeth on driven gear}}{\text{No. of teeth on driver gear}}$$

Calculation

Answer _____



Compound gear train

- (ii) If the motor shaft rotates at 500 RPM, calculate the rotational speed of the dipper.

Calculation:

Answer _____

- (d) (i) In the space provided, describe with the aid of sketches, a suitable method of joining the wooden column and base.



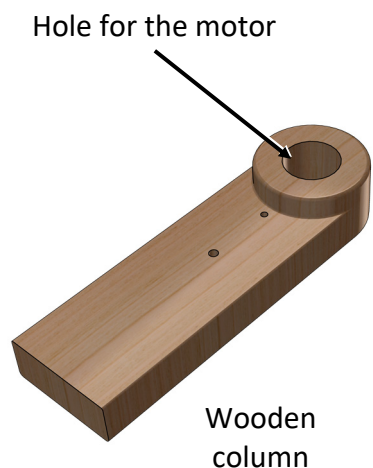
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- (ii) Name a suitable protective finish for the wood and briefly describe **two** processes required to prepare the wood for this finish.

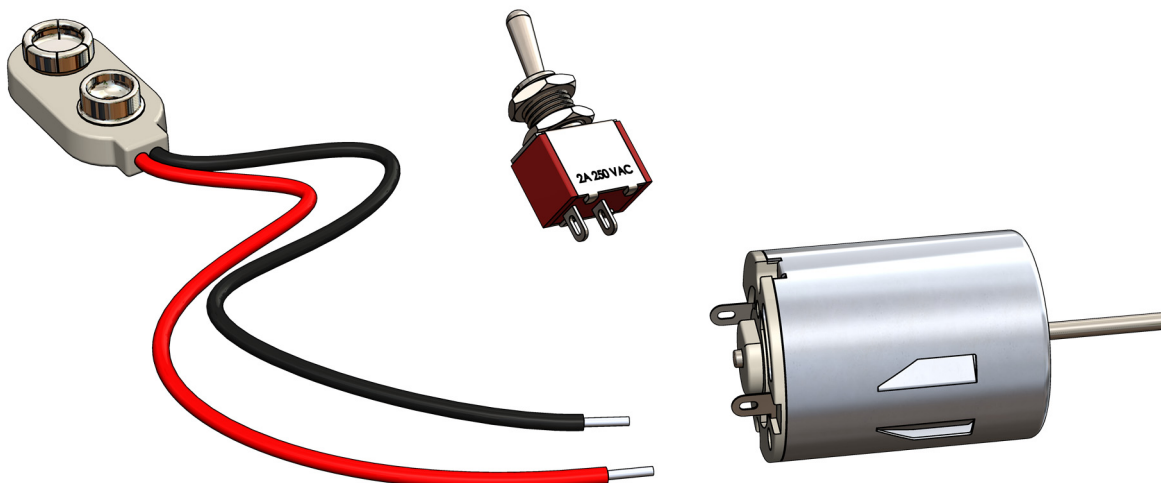
Protective finish:
Process 1:
Process 2:

- (iii) Name a suitable machine to use when drilling the hole for the motor and list **two** precautions that should be observed when operating this machine.

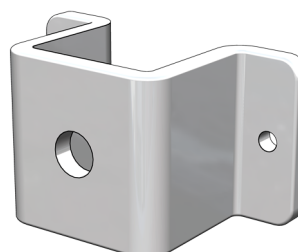
Machine name:
Precaution 1:
Precaution 2:



- (e) Draw in the **three** wires required to connect the components of the control circuit to operate the bubble blower.



- (f) (i) The acrylic mounting panel for the on/off switch is shown. In the space below make a sketch of the complete development (flat pattern) for this panel showing all holes and bend lines.



- (ii) Number the following steps in their correct sequence (order) to produce a good quality finish on the edges of the switch panel. The first step is numbered for you.

Steps in the process	Order
Firmly rub all the edges with a fine grade steel wool	
Burnish the edges using a cloth and a suitable polish	
Sand all the edges with a suitable sandpaper	1

Question 2

Modern Formula 1 cars are designed to operate at an extremely high level of performance.

Two important considerations in the design of Formula 1 cars are aerodynamics and a low centre of gravity.



2023 RB19 Formula 1 Car

(a) (i) Explain the following terms.

Aerodynamic:
Low centre of gravity:

(ii) The body of a Formula 1 car is typically made from carbon fibre composites. List **two** properties of carbon fibre that make it suitable for this purpose.

Property 1:
Property 2:

(b) RC toys are a popular source of entertainment for all ages.

(i) What do the letters RC stand for?

R	C
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(ii) Name **one** other device that uses RC technology.

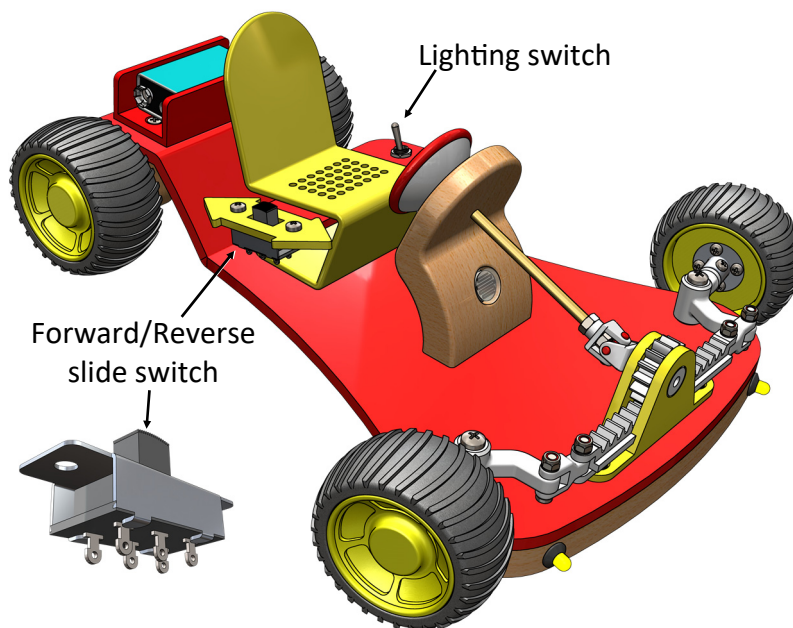
Device:

- (c) A student design for a motorised toy car with manual steering is shown.

The car has forward and reverse motion control and LED headlights that operate automatically in low light conditions.

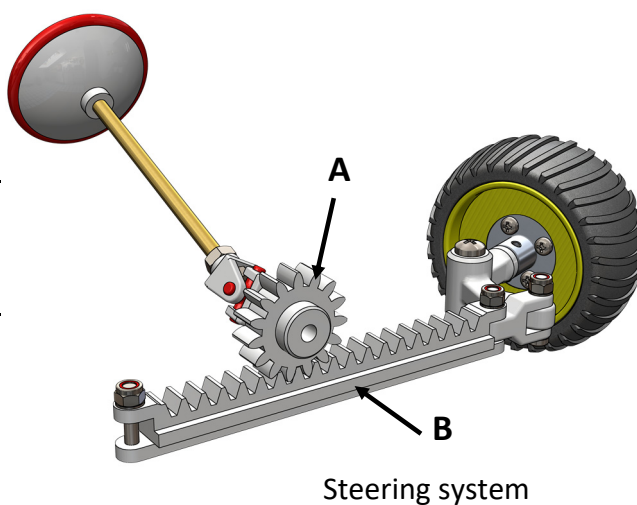
- (i) Use a tick (✓) to identify the type of switch used to control the motor.

DPST	
DPDT	
SPDT	



- (ii) The steering system uses a two-part mechanism as shown.
Name the mechanism.

Name:



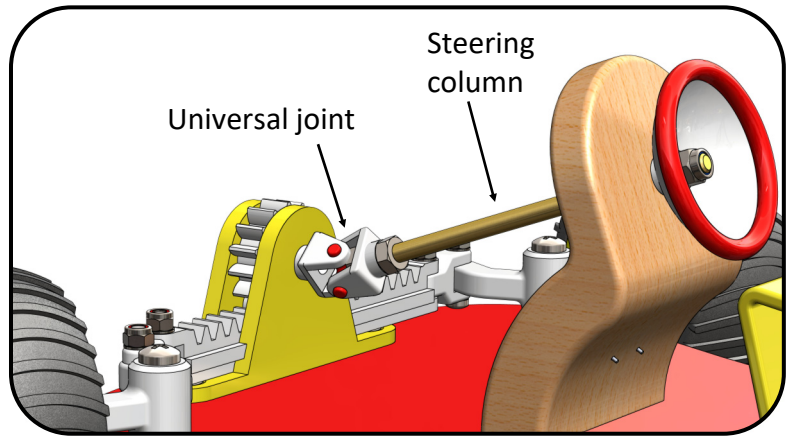
- (iii) Component **A** changes one type of motion into another type of motion at component **B**.

Name **each** type of motion.

Motion at A :	Motion at B :
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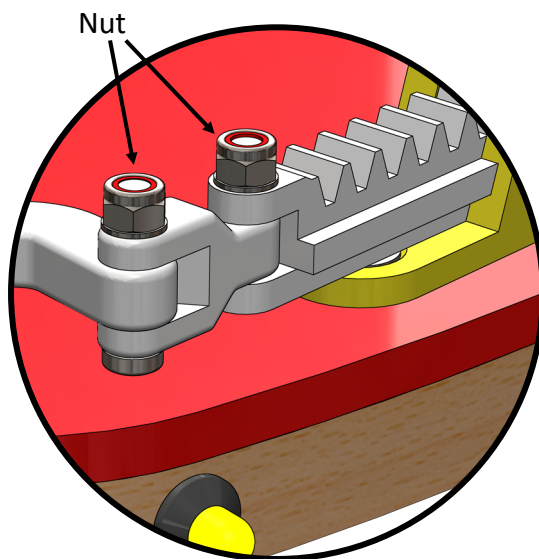
- (iv) A special coupling is used to connect the steering column to the steering mechanism. It is called a Universal Joint.

Explain why this joint is a necessary part of the steering system.



Answer:

- (v) The steering mechanism is assembled using a specific type of nut, as shown. Name this type of nut and explain why it is used in this situation.



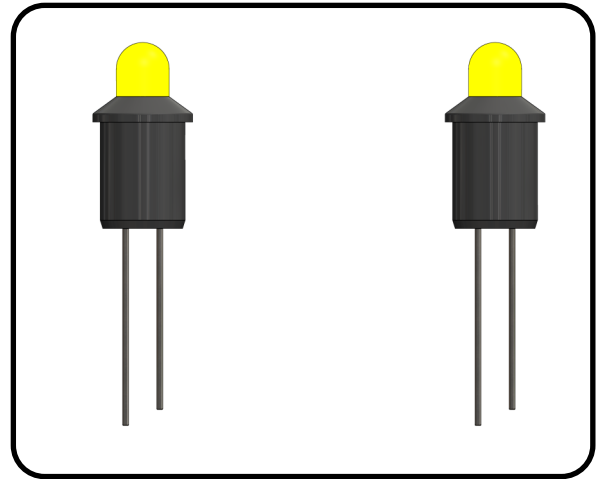
Steering mechanism assembly

Type of nut:

Explanation for using this type of nut:

- (d) (i) As part of the control circuit for the automatic lighting, the LED headlights are connected in parallel.

In the image opposite, sketch in the **two** wire connections necessary to connect the LEDs in parallel.



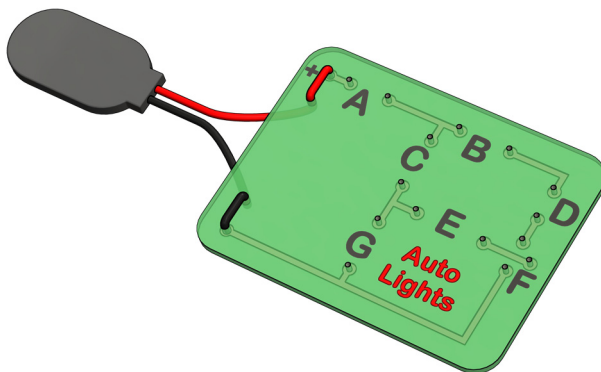
- (ii) An LDR is used as an input for the sensing circuit to switch on the LEDs when light levels are low. What do the letters LDR stand for?

L	D	R
---	---	---

- (iii) A battery is used to power the lighting circuit.
Name an energy conversion taking place when the lighting circuit is switched on.

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

- (iv) The circuit board for the lighting circuit is shown below. Complete the table opposite indicating the position of each of the components on the circuit board.
Three components have been completed for you.



Printed Circuit Board

Component	Location
	B
	A
	D

- (e) (i) Name a suitable computer aided manufacturing process that could be used to produce the plastic steering wheel.



Process:

- (ii) The steering wheel is an example of a shell structure.
List **two** other examples of a shell structure.

Example 1:

Example 2:

- (iii) Name the machine used to bend the plastic seat and briefly describe **three** steps in the bending process.

Machine:

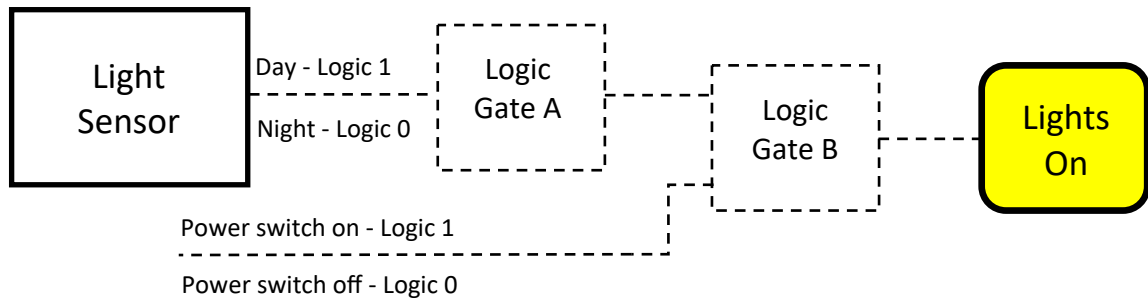
Step 1:

Step 2:

Step 3:



- (f) An alternative method of controlling the automatic LED lighting is to use Logic Gates. The block diagram below shows the control system and the different logic level inputs.



- (i) Name the Logic Gates at A and B.

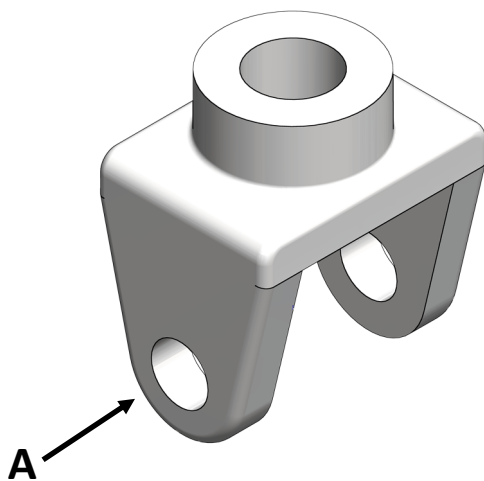
Logic Gate A	
Logic Gate B	

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

Logic Gate B Symbol

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

- (g) In the space opposite, sketch the elevation of the universal joint part shown, when looking in the direction of arrow A.



Question 3

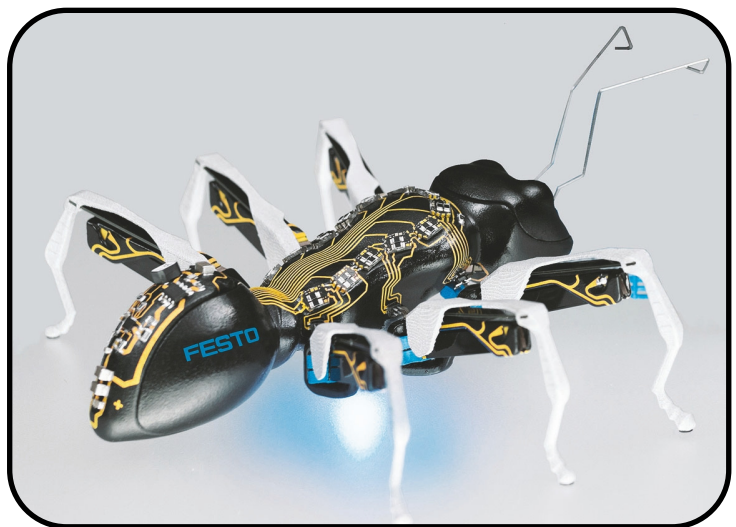
For centuries man has experimented with robotics. The earliest robots were purely mechanical creations referred to as automatons. The automaton in the picture was designed to make a specific drawing repeatedly.

- (a) Outline **one** way in which modern robotics has changed industry in recent decades.

Answer:



- (b) German company Festo have created a bionic ant as part of their work in the area of Biomimicry. Many engineering companies are now involved in biomimicry where they research how natural creatures move, swim, navigate, fly etc. and try to reproduce this in man-made animatronics.



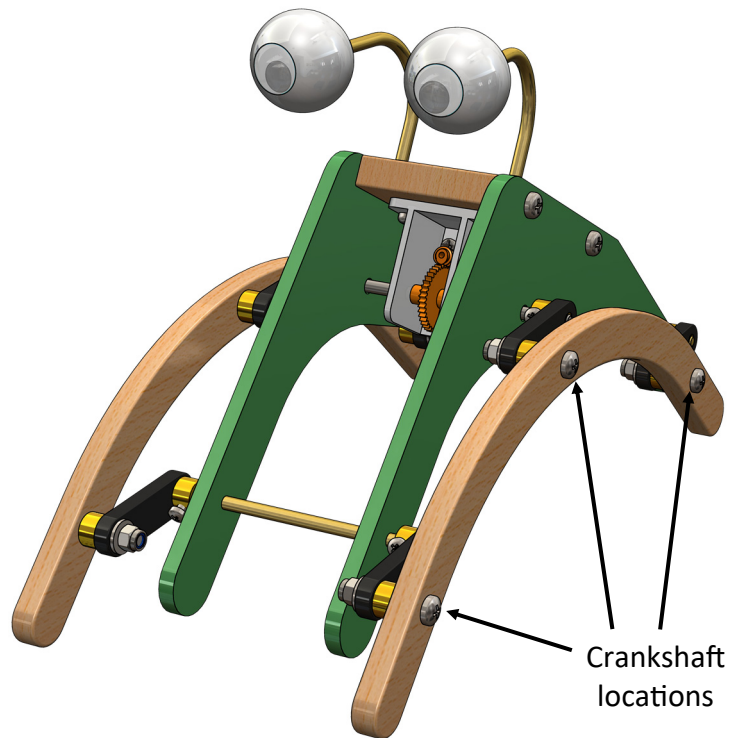
Name **one** technological advance that makes it possible to produce robotic insects such as that shown above.

Answer:

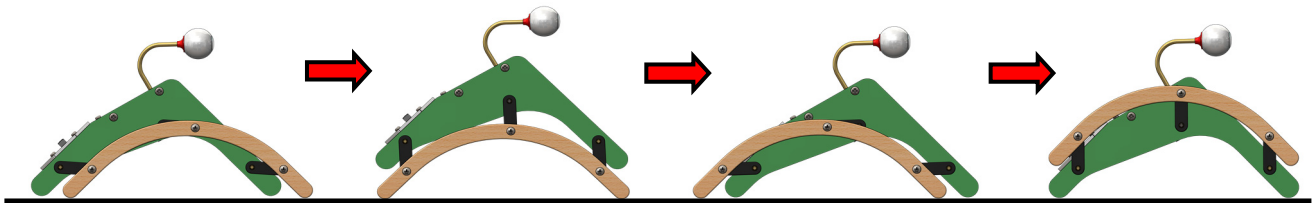
- (c) A solution to a student design brief for an animatronic insect is shown. The solution uses a motor, gearbox, and three cranks. One crankshaft is driven by the motor and gearbox.

The result is a forward or reverse motion where the main body and side supports are constantly rising and falling as the insect moves.

The progression of movement is shown below.

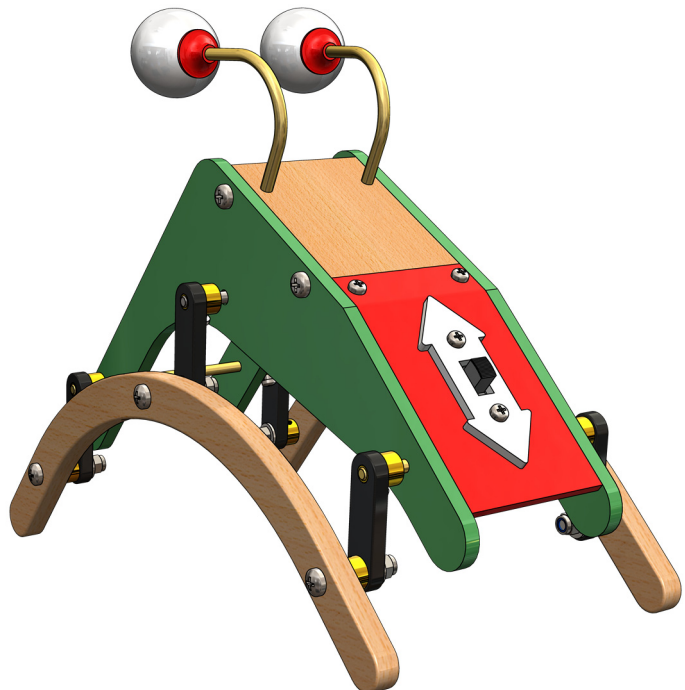


Progression of forward movement of the insect



- (i) Suggest a suitable surface on which to operate this insect and give a reason for your choice.

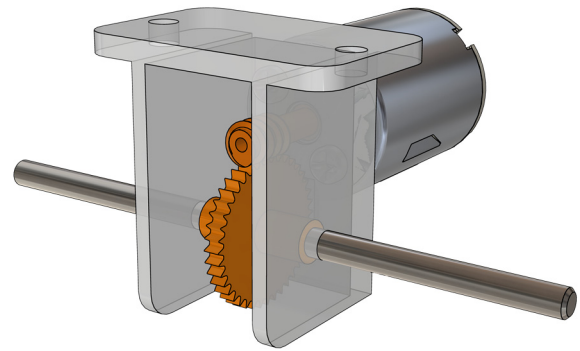
Suitable surface:
Reason:



Rear view showing motor control

- (ii) Name the drive mechanism shown and give **two** reasons for its selection in this design.

Mechanism name:
Reason 1:
Reason 2:



Drive mechanism

- (iii) It was decided to power the insect using rechargeable batteries.

Give **two** advantages of using rechargeable batteries over standard single use batteries.

Advantage 1:
Advantage 2:



Rechargeable batteries

- (d) (i) Name a suitable manufactured board from which to make the side supports.

Manufactured board:



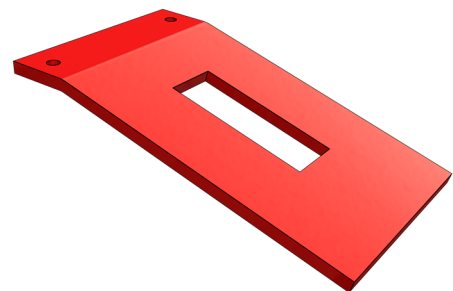
Side support

- (ii) In the space below describe, with the aid of sketches, the processes involved in cutting and shaping a side support.

--

- (iii) Name a machine or tool that could be used when cutting out the rectangular slot in the acrylic control panel.

Machine or tool:



Acrylic control panel

- (e) (i) The driver crankshaft highlighted below must have enough turning force to move the insect.

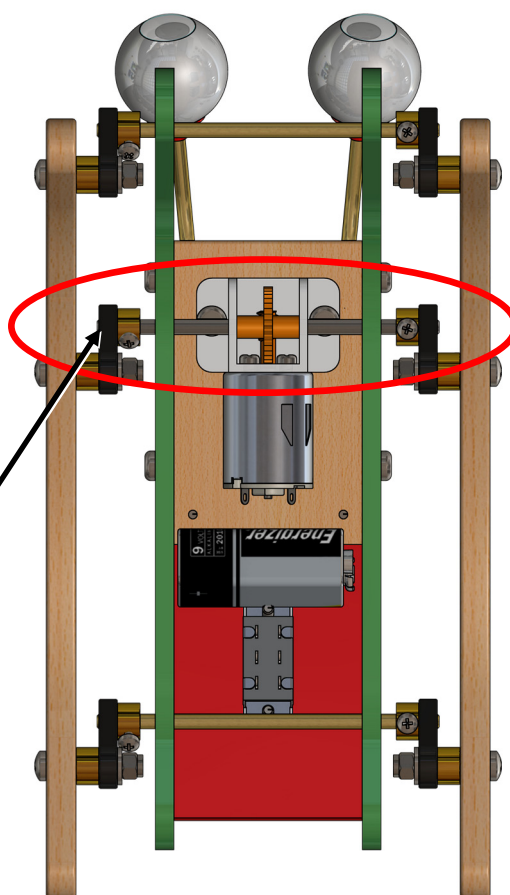
What is the name for this turning force?

Name:

- (ii) Name a machine or tool that uses this same force when operating.

Machine or tool:

Driver crankshaft

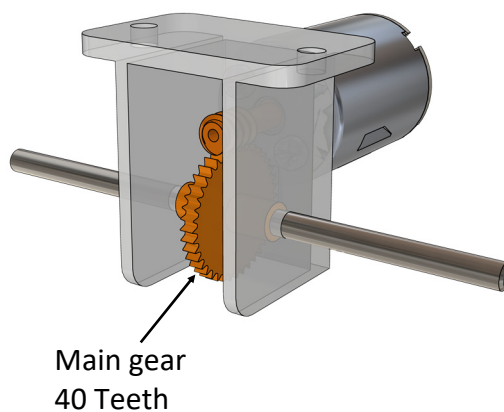


View of the insect from underneath

- (iii) The main gear of the drive mechanism has 40 teeth. The motor speed is 2000 RPM. Calculate the rotational speed of the main gear.

Calculation

Answer _____



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Junior Cycle Final Examination – Common Level

Applied Technology

Monday 16 June

Morning 9:30 - 11:00