An innovative design; the clarity of the proposed solution helps the examiner to understand the applicant's design thinking. The flowchart also helps to explain the function of the prototype. The diagrams are clear - however, the candidate does not fully explain how all aspects of the mechanism operate, especially the opening and closing of the door/flap. Where possible, all aspects of the operation of a machine must be explained.

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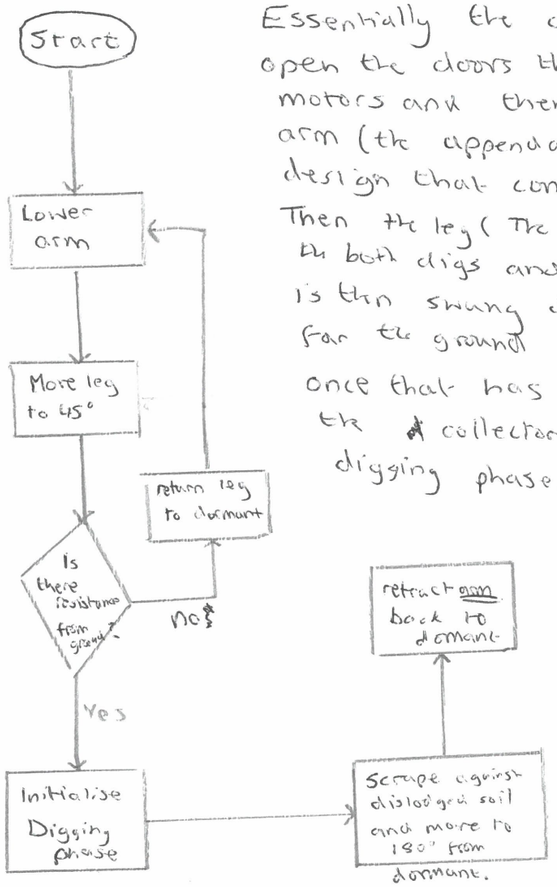
ARKWRIGHT ENGINEERING SCHOLARSHIPS

Moon Dust Collector

For Section B of this exam I found this question rather intriguing as 'astronautical technologies have to be simple enough to be robust and survive but complex enough to complete it's given task effectively.

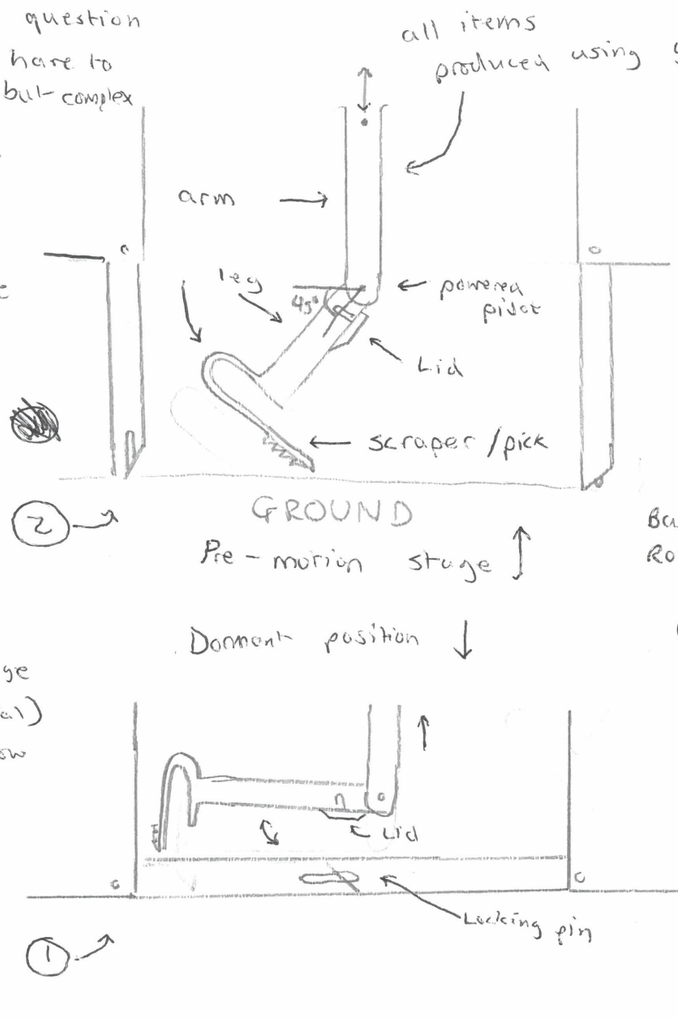
For my design I employed a concept that involved the repository into which the sample is created is built into the collection tool.

The Algorithm



Essentially the contraption open the doors through powered motors and then lower the arm (the appendage of the design that controls height) Then the leg (The rotating appendage to both digs and collects material) is then swung down to check how far the ground is.

Once that has happened the collector initiates it's digging phase.



The Digging Phase

The digging phase involves the leg of the contraption repeatedly swinging back and forth into the ground with force provided from the motor on the pivot.

This serves to dislodge any of the below moon dust and rock before it begins collection.

Collection phase

With the material now dislodged the contraption makes one final swing, being lowered slightly to ensure it collects a full sample. The arm then completes this swing being 180° from it's previous dormant position and a lid is moved across with hydraulics,

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Section A	Function and creativity of the 3 concepts	/30
	Technical knowledge & Reasoning	/15
	Total for Section A	**/45**
Section B	Functionality of Proposal	**/30**
	Materials, components and construction	**/15**
	Total for Section B	**/45**
	Communication	**/10**
	Total	**/100**

Name:

School:

Section A or B: B

Question Number: 4

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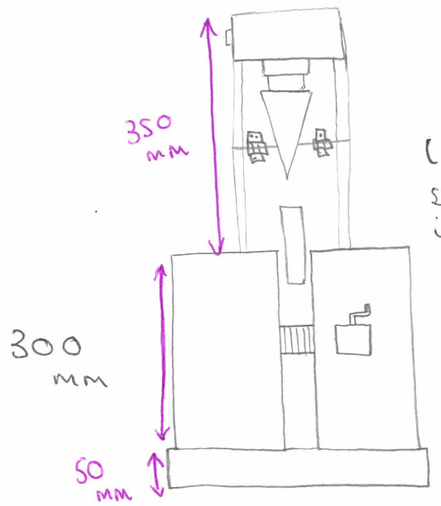
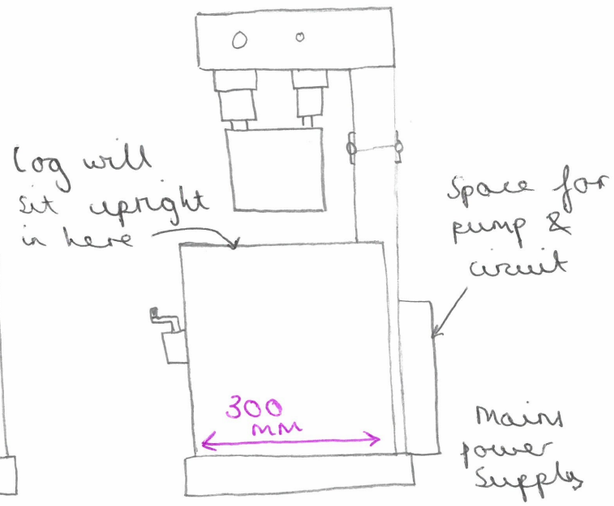
ARKWRIGHT ENGINEERING SCHOLARSHIPS

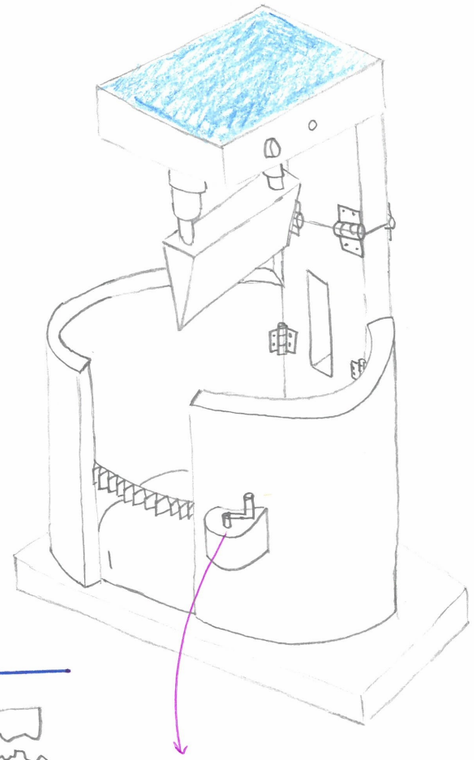
Question 5 :

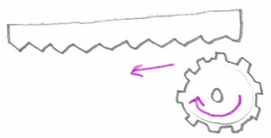
Mechanical log splitter





The main shaft is hinged to allow it to fold inwards for more compact storage



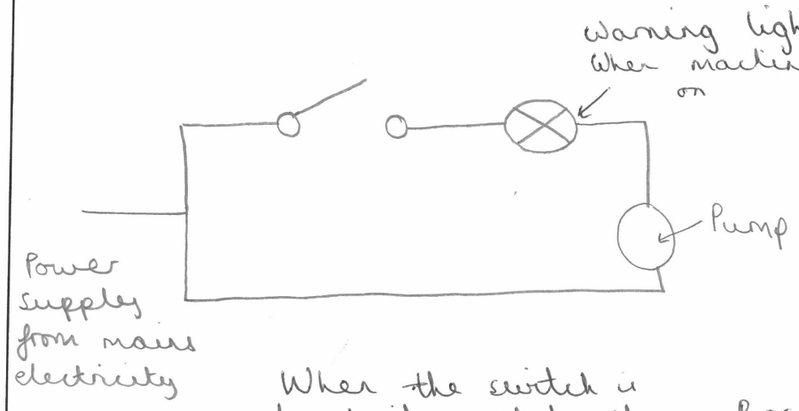


Turning this gear moves it along the pinion - allows it to clamp the log in place

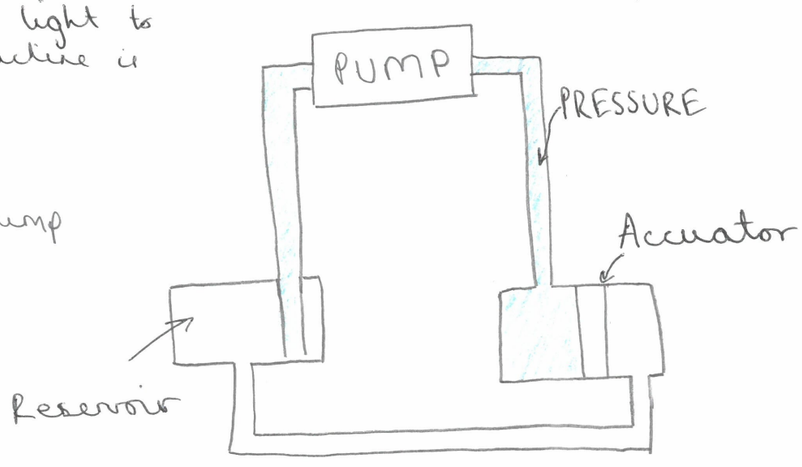
- This design features a hydraulic log splitter
- The hydraulic pump pushes a wedge through the log, forcing it to split in half
- The main shaft fits logs upto 300 mm in length & diameter - the side pieces can then be tightened to secure the log in place

- The wedge will be made from (sand casted) High carbon steel to prevent it from going blunt
- The rest of the machine will use mild steel - due to its strength, the weight will also help with stability

Circuitry and hydraulic system:



When the switch is closed it completes the circuit, providing power to the pump



- This pressure drives the wedge through the log
- The hydraulic system eliminates the need for an axe

Name:	School:	Section A or B: B	Question Number:

This is a good, clear response to this question. The applicant has considered the power needed to split a log, so has included hydraulics, along with details of how the hydraulic system would work. The applicant has also provided details about how the log can be held in the machine but has not realised that this would work against the movement needed for the log to actually split. Folding for the purposes of storage has been considered, which is good. It is not clear why the top of the device has been coloured blue, nor has it been labelled, which leaves the marker guessing … Is it the reservoir for the hydraulic oil?

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Automatic food dispenser

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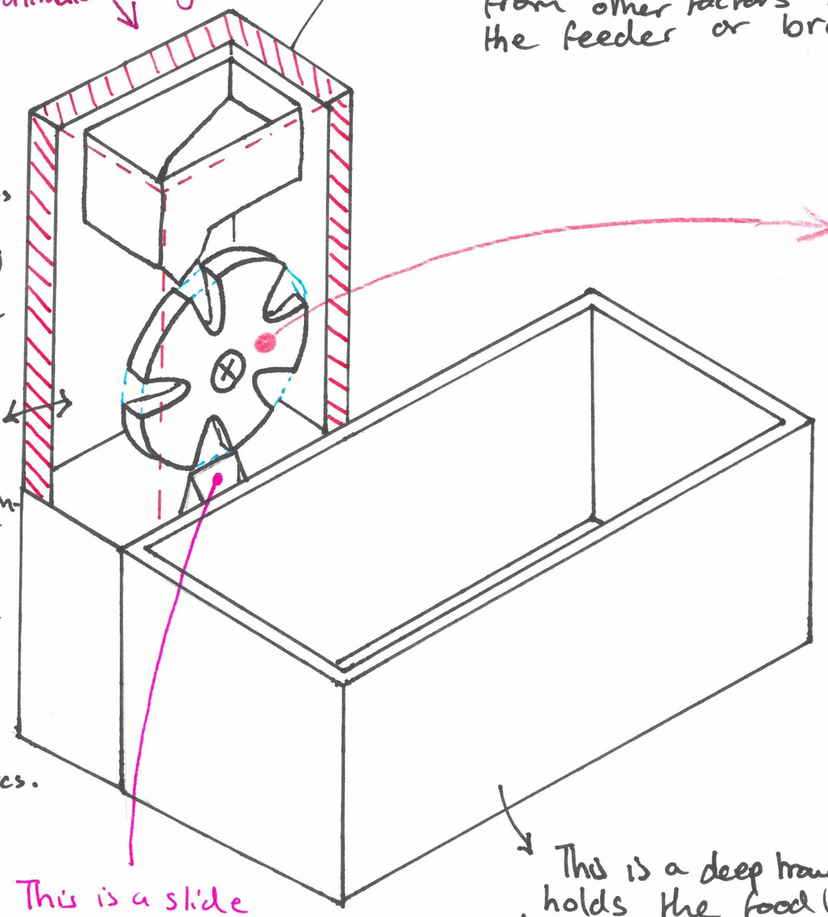
A lid will cover the whole dispenser case. This will make it water tight and prevent things such as animals getting to the food.

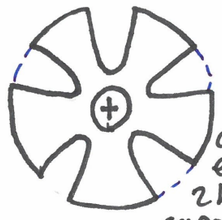
The main structure of this automatic sheep feeder is made from stainless steel. This allows it to be outside without being corroded by water. Stainless steel being strong, it should also be able to withstand erosion from other factors that could erode the feeder or break it.

This cross-sectional drawing shows the inside of the casing that holds the electronic system and automatic feeder. It shows the casing is made of stainless steel that has been made into a water tight case. This prevents water getting to the food and electronics.



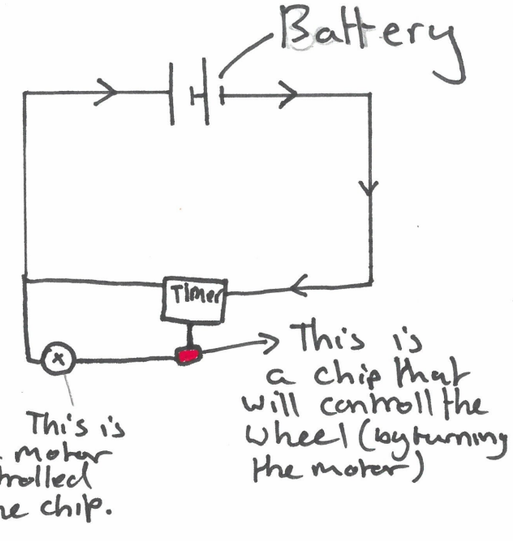
This is a slide that directs the food into the feeding trough.

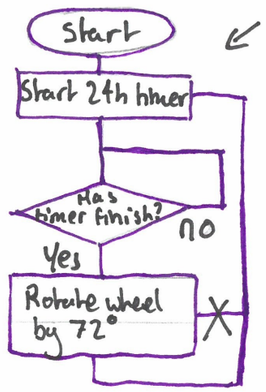
This is the main feeder. It dispenses 2kg of food every 24 hours. It can be filled with 10kg at a time and will be loaded every 24 hours with 2kg of food in a capsule by the funnel. When it has been 24 hours, it will rotate by 72° and this will cause one of the capsules to drop its load of food down the funnel at the bottom and into the trough.



The blue around the food Dispenser represents a seal created by a cylinder of stainless steel that encloses the feeder. It leaves two holes though. One for filling capsules with food and one for applying the capsule into the food trough.

This is a deep trough that holds the food after it has been dispensed. It being deep, allows for it to potentially be pre-stocked with food for the sheep to eat.





This is a simple flow chart that shows how the chip and timer controll the motor that controlls the wheel and dispenses food.

Name:	School:	Section A or B

This answer is clearly communicated, and the method of pellet delivery is clever and simple. However, the scale of the device is not thought through: if the top storage container for the machine is designed to hold 100kg of pellets then the size of the trough would be too big for sheep to feed from! Many other applicants who answered this question failed to consider scale.

It is a shame that the applicant did not provide details of the whole of the workings of the machine: i.e., how is the central wheel mounted? How is it rotated exactly 72 degrees by the motor? How is the motor connected to the central wheel? Why isn't the wind turbine included in the circuit diagram?