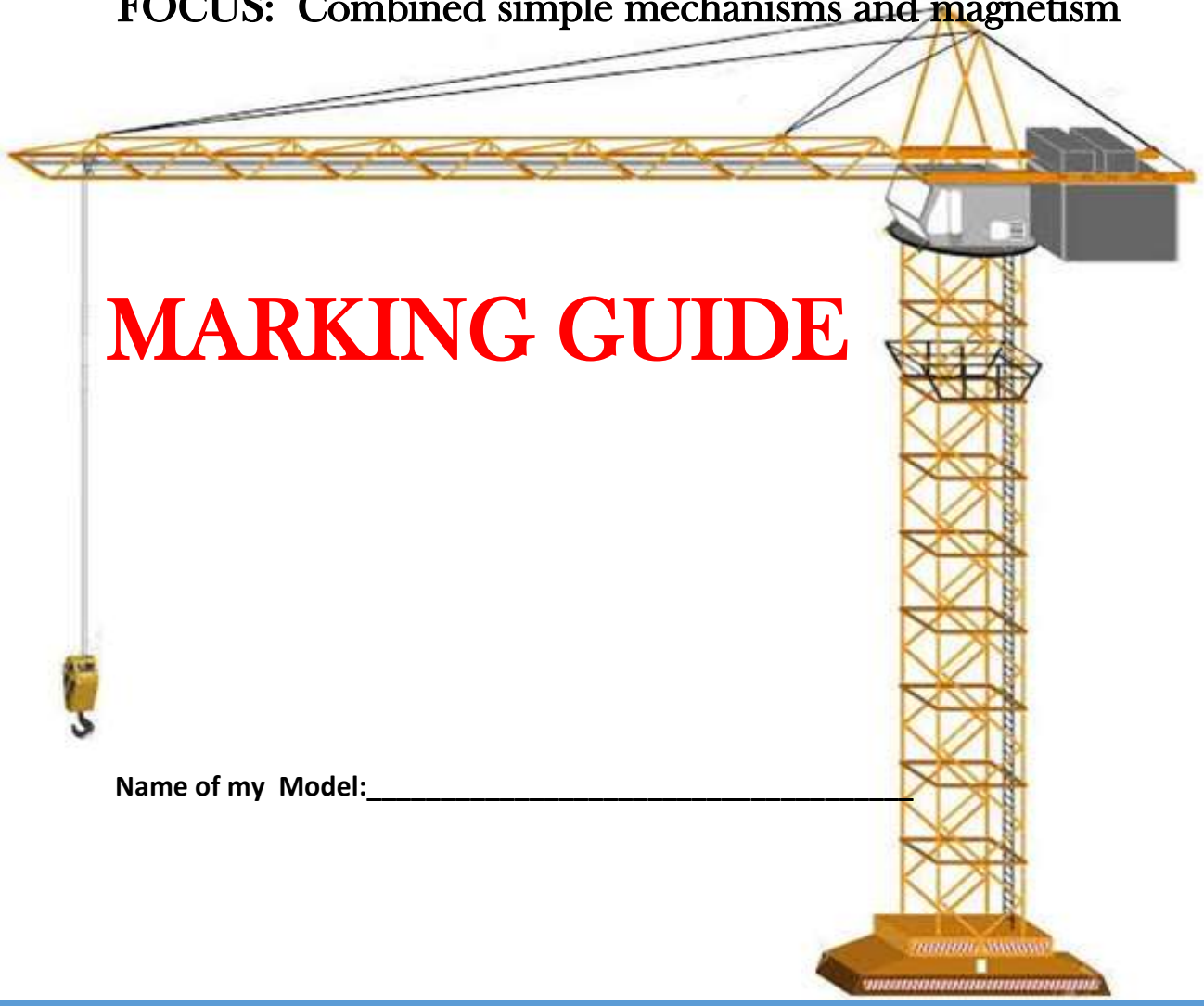
TECHNOLOGY Grade 7 TERM 3

Year: 2025

FOCUS: Combined simple mechanisms and magnetism



MARKING GUIDE

Name of my Model:_____

Investigate		Design		Total
30		**40**		**70 Marks**
Date		Date		

Technology **Grade 7** **Date** _____

Task: INVESTIGATION **Term 3** **Marks 30**

Investigate cranes

1. For what purpose are cranes used for? [2]

Cranes are designed for lifting and lowering heavy loads and for moving them horizontally

2. What makes their frames rigid and strong. [1]

The frames are triangulated

3. What do you think is the function of the counter-weight? [1]

It prevents the crane from falling over ***OR***

It is a heavy mass that opposes the load that is being raised and lowered, so that the crane is balanced and does not fall over

4. Pulley mechanism is noticeable on cranes in **Page 1**. What do you think their function is? [2]

Is used for lifting loads

A pulley is used for transferring rotary motion

Identify cranks and pulleys

5. Work on your own. This task will be assessed.
   Look at the four pictures of cranes below and on the following pages. Each crane has a winch and one or more pulleys.

5.1. Look at where the **Cranks** are placed. Mark each winch with the letter **C**.

5.2. Look at where the **pulleys** are placed. Mark each pulley with the letter **P**. [8]

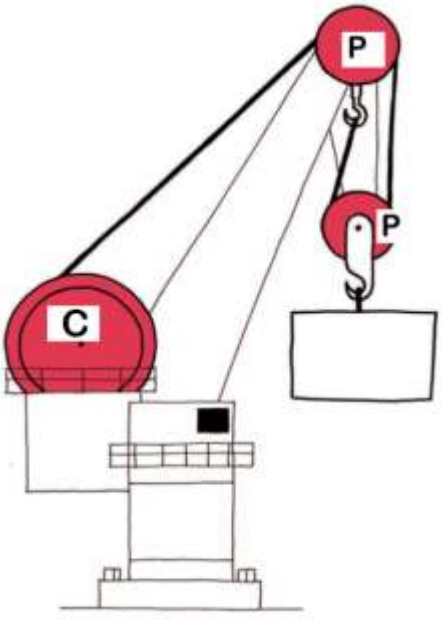


Figure 1: Crane in a harbour

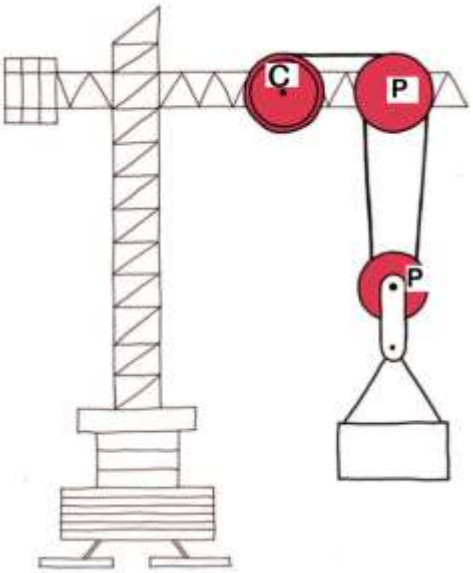


Figure 2: Tall builder's crane

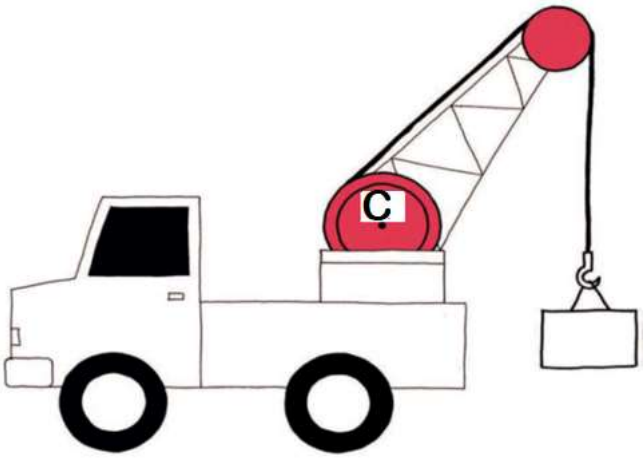


Figure 3: Crane on a truck

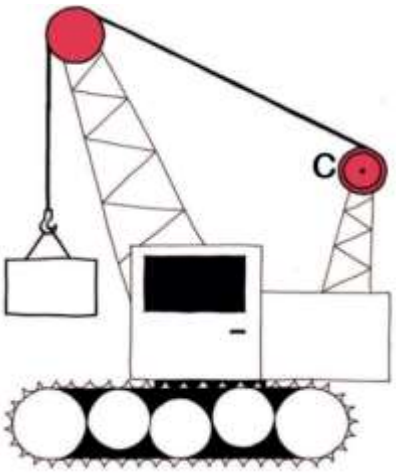


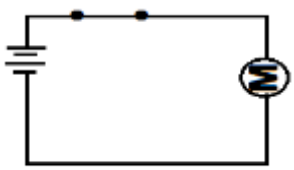
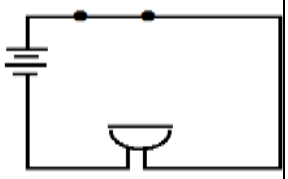
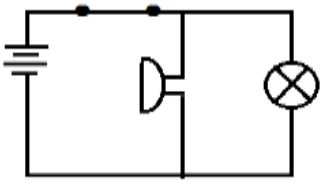
Figure 4: Crane on caterpillar tractor

5.3. Which of the cranes have pulley systems with two or more pulleys? [2]

Figure 1	***Figure 2***

Electrical circuits and magnetism

6. What energy conversions (**light**, **movement**, **sound** or **magnetism**) will the following circuits produce? Write your answer below each circuit. [4]

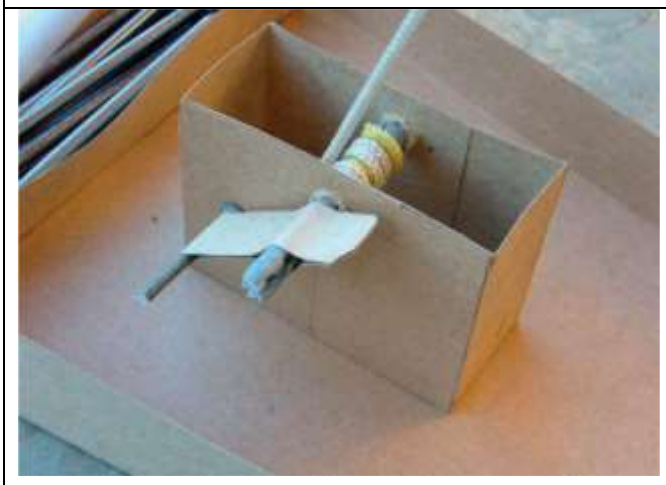
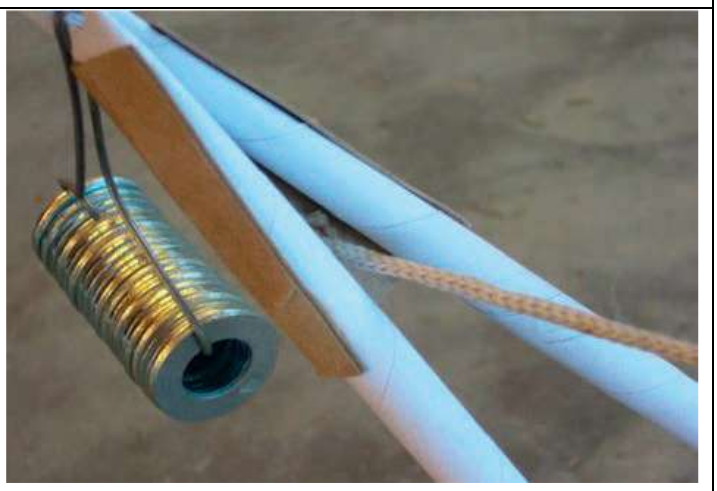
			
A. ***Magnetism***	B. ***Movement***	C. ***Sound***	D ***Sound and light***

Investigating a Crane model

7. Look at the photographs on the next few pages, showing different views of a model crane. Answer the questions after the series of photographs.





7.1. The frame of the model crane in the photographs is built from paper tubes made into triangles [1]

How many triangles were used?	***Three triangles***

7.2. List the materials used to build this model. $^{1}/_{2}$ X6 [3]

- A4 papers (for dowels)	***- Pins***	***- Piece of wire***
- Glue	***- String***	***- Solenoid***
- Cardboard	***- A stick***	

7.3. Identify the materials used for the joints on this model. [2]

Glue	***Pins***

7.4. List the materials used to make the winch. [3]

Piece of were	***Cardboard***	***String***

7.5. What do we call the box of nails at the back of the crane? [1]

Counterweight

Technology **Grade 7** **Date** _____
Task: Designing **Term 3** **Marks 40**

- Write a **design brief** with **specifications** and **constraints** for a crane with electromagnet.

1. DESIGN BRIEF [2]

I am going to design and make a model of a electromagnet lifting crane for the scrap metal dealer to sorts magnetic and non-magnetic metals into separate piles for recycling

2. SPECIFICATIONS

2.1. Name of product: ***Electromagnet lifting crane*** [1]

2.3. Who will use it and What is it for? [2]

The scrap metal dealer
It will be used for sorting magnetic and non-magnetic metals into separate piles for recycling

2.4. What must it be able to do? [2]

It must be able; ***-to attract magnetic metals when electromagnet is switched on.*** ***- to lift, raise and lower the load*** ***- to release the load once the switch is off***

2.5. How will it carry out its function? [2]

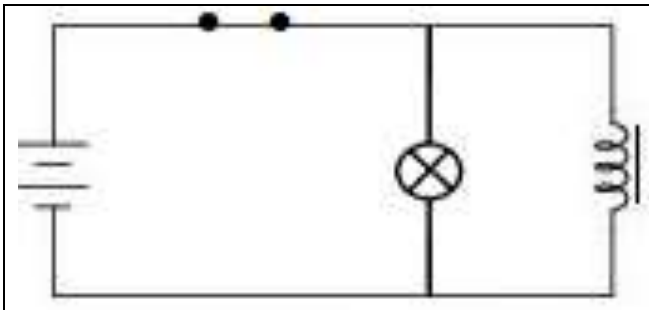
- the crane operator electrical component to attract and releasing ferrous metals • ***Electromagnet will function only when the switch is pressed on and release the magnetic metal once the switch is off.*** •

2.6. Size (***Make a model according to size of your choice)*** [4]

EXAMPLE

2.6.1. Boom	Length: ***350 mm***			
2.6.2. Base	Length	***200 mm***	Breadth	***200 mm***
2.6.3. Crane height	***400mm***			

3. Draw a circuit diagram for the electromagnet (with a light to show how enable the operator to see in the dark hours)



Relevance 1 Mark	Components 2 Marks	Connection 2 Marks	Neatness 1 Mark	TOTAL =[6]

3. Design drawings

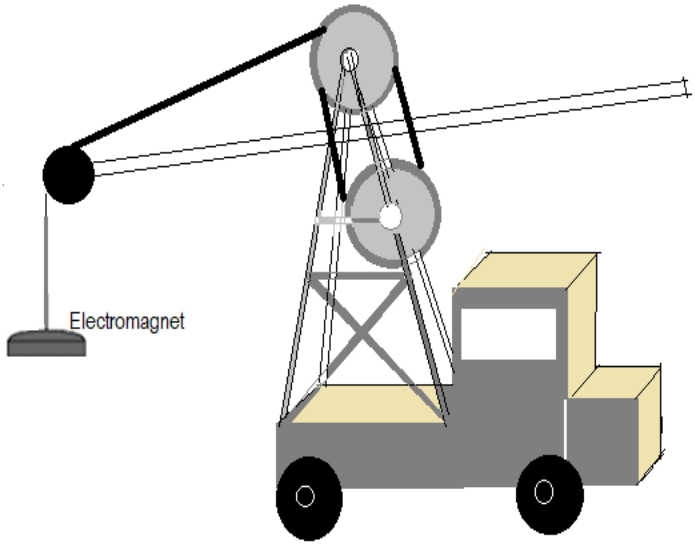
NB: Drawings below are just an example. Learners should be allowed to show their creativity and innovative ideas.

	True-face	3D	VP	Total
First design	**1**	**2**	**1**	**4**
Second design	**1**	**2**	**1**	**4**
TOTAL				**= 8**

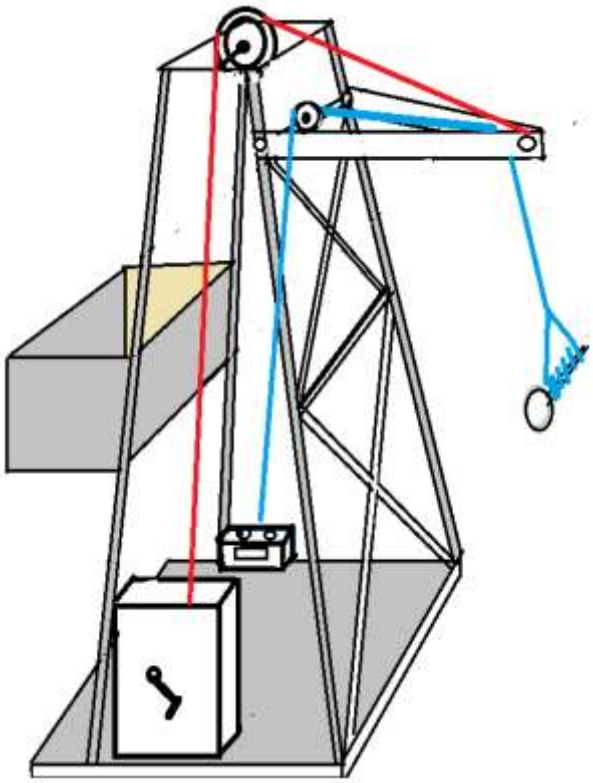
3.1. Sketch two possible designs in 3D

NB: initial drawings are only drawn in freehand

First solution



Second solution



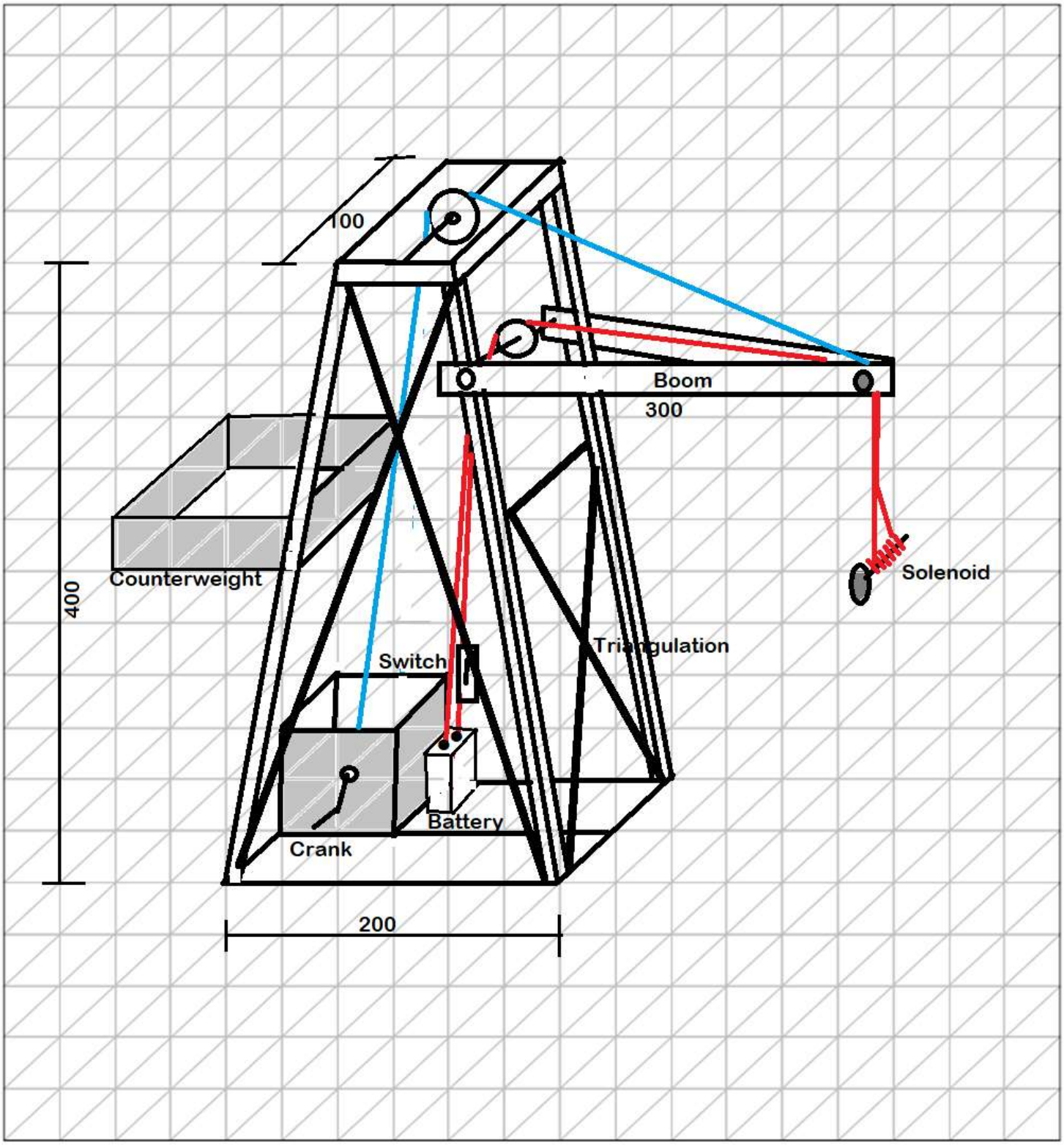
1. Counterweight. ✓
2. Boom. ✓
3. Electrical Circuit (cell & switch). X
4. Solenoid (Electromagnet). X
5. Crank. X

4. CONSTRAINTS

[3]

- *time*
- *material*
- *money for buying some materials*

5. Final design



Does your drawing have a heading?	Did you mark the vanishing point?	Did you draw feint guidelines from the corners of the shape of the crane to the vanishing point?	Did you draw the face of the crane that shows the most detail?	*Dimensions and labelling*	*TOTAL*
1	***1***	***2***	***2***	*4*	***=10***

TECHNOLOGY **PAT** DATE _____
Grade 7 TERM 3
TASK: **MAKING** Marks 35

PLANNING HOW YOU WILL MAKE YOUR MODEL

1. Make list of all the materials you plan to use to build your model. That you will use to build your electrical system. [15]

Materials	What will it be used for?
3 cells	Source of electrical power in the circuit
Isulated wire	To transfer electrical current to other comonents of the circuit
Nail	To wound an insulated wire on it to make solenoid
Buzzer	To convert electrical energy to sound energy
Switch	To control (ON and OFF) of the circuit
6 Syringes	To act as hydraulic sylinders
Tubes	To join syringes as liquid channels
Wood	To make crane frame and parts
Wood glue, screws & nails	For joining parts together
Cardboard	For making the control box
Bolts and nuts	For joining moving parts (linkages) (any 5)

2. TOOLS

2.1. Give any 3 tools that you will use to make your product. (2)

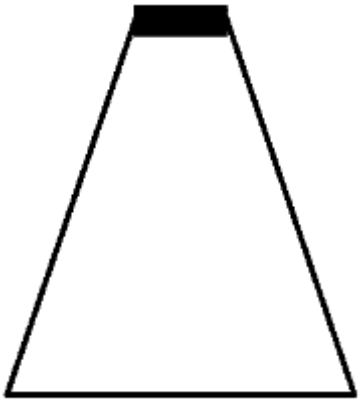
- Pair of scissors
- Screw driver
- Hammer
- Pliers
- Hack saw
- Ruler / tape measure
- Pencil

(any 3)

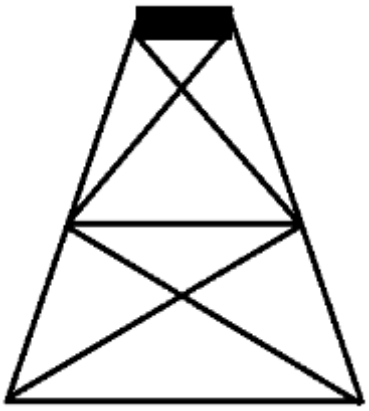
3. Some tools can be dangerous if they are used incorrectly. Write down a safety rule for one of the tools that you will use. [2]

- Use tools in a correct way
- Don't leave tools lying on the floor after use
- Wear safety / protective clothes when working with dangerous objects

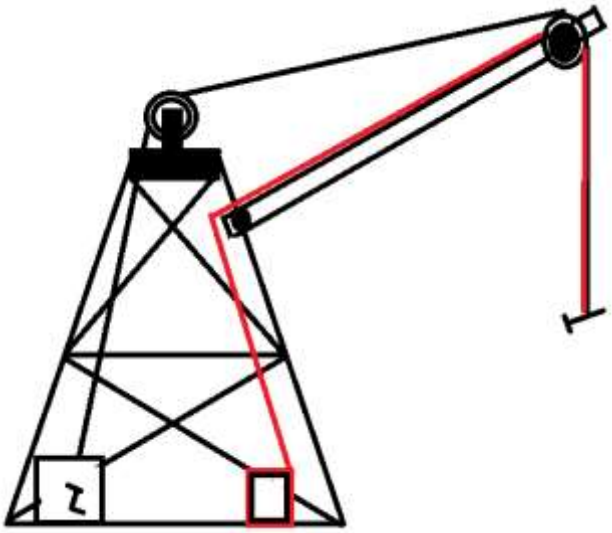
4. Draw the 2D's for side view and the back as **working drawings** for your design.



Side view with broad base and narrow top. (2)



With triangulated frame (2)



with fixed pulley system and electrical circuit (2)

a) FLOW CHART FOR BUILDING A CRANE WITH ALL SPECIFIED ELEMENTS AND AN ELECTROMAGNET [10]

Step 1

Collect all the material and tools needed

Step 2

Build a triangulated frame tower structure with broad base and narrow top.

Step 3

Build a circuit with electromagnet and light circuit and fix it to the boom of the frame tower

Step 4

build a winch with crank and fix a string though pulley wheels

Step 5

Fill the counterweight with marbles or nails and test your crane.