Province of the
EASTERN CAPE
EDUCATION
CHRIS HANI EAST

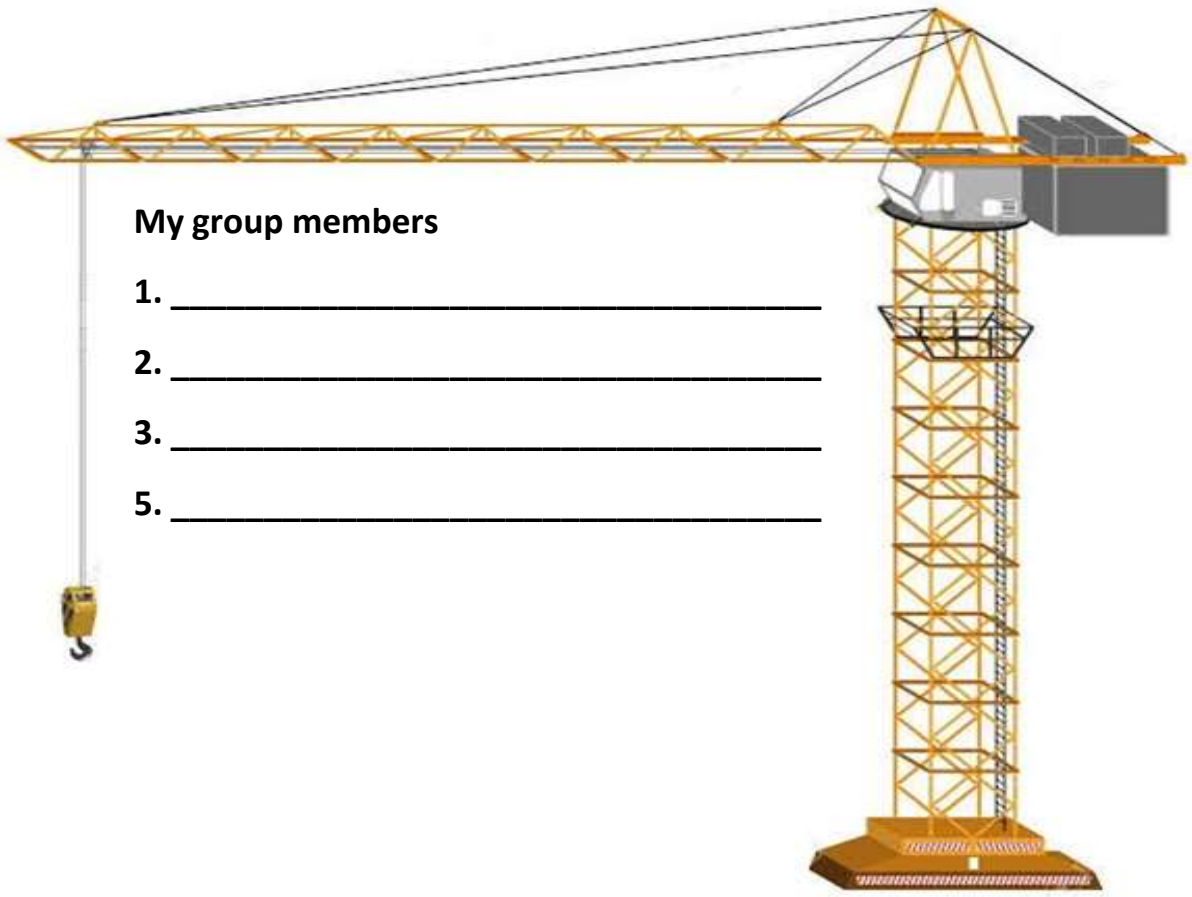
TECHNOLOGY

FOCUS: Combined simple mechanisms and magnetism

Grade: 7 Term 3 PAT 2025

Marks: 70

Name of learner: _____

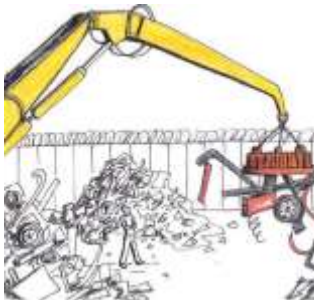


My group members

1. _____
2. _____
3. _____
5. _____

	Investigate	Design	Make	TOTAL
MARK	15	20	35	/70
DATE				
MARK OBTAINED				

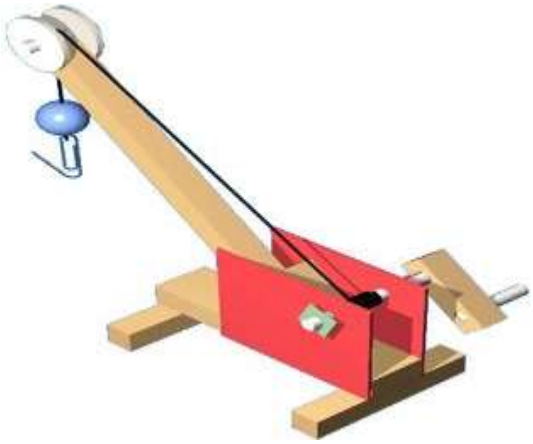
Problem scenario



A scrap metal dealer sorts magnetic and non-magnetic metals into separate piles for recycling. They use a crane with a magnet, but find it difficult to remove the metal pieces from the magnet. They need a magnet that can be switched on and off to help with this. Your Grade 7 class has been asked to design and make a model of a crane

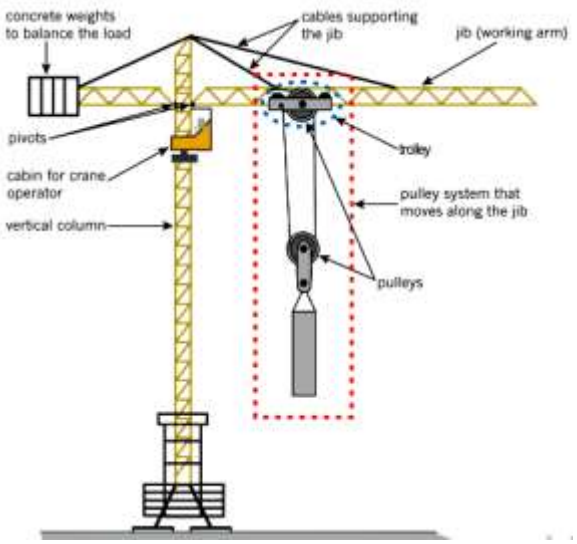
The company wants you to design and build a model crane that:

- should be a simple frame structure,
- should be made **strong, stiff** and reinforced **through triangulation**,
- **has an arm** that rotates around a pivot at the bottom, so that the top end of the arm can be raised and lowered,
- uses a **crank, a cable, and pulleys to lift and lower the arm, and**
- is made from any materials. Some can be bought, while others can be simple materials, such as **paper dowels** or elephant grass.



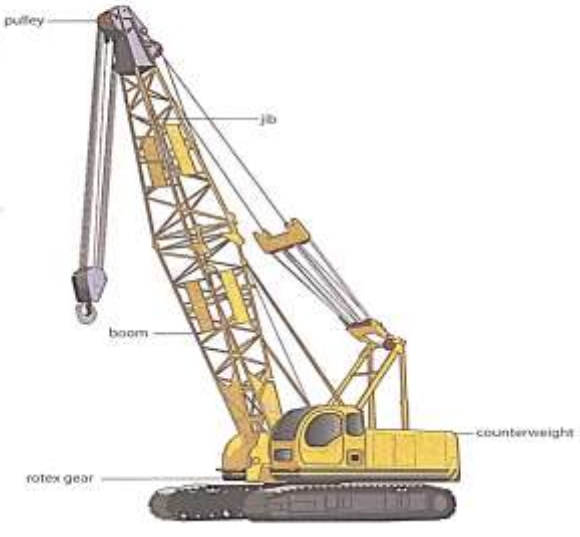
The crane should have an **electromagnet attached to its arm**. The electromagnet:

- should have a soft iron core made from a bundle of short lengths of iron wire,
- must **have a switch** so that it can be switched on and off, and
- must be strong enough to pick up several steel paperclips, nails or coins.



The simple crane shown below is made of these different parts:

1. a base with a **counterweight** that prevents the crane from falling over
2. a rotex gear, which allows the crane to pivot and move from side to side
3. a **boom** which is moveable arm
4. a **jib** which is a strut that supports a fixed pulley
5. a pulley.



A diagram of a simple crane

Technology **Grade 7** **Date** _____
Task: INVESTIGATION **Term 3** **Marks 30**

Investigate cranes

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

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

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

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

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 with crank 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]

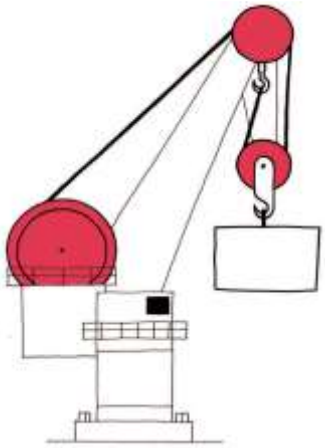


Figure 3: Crane in a harbour

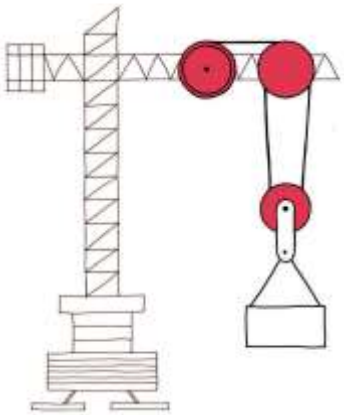


Figure 4: Tall builder's crane

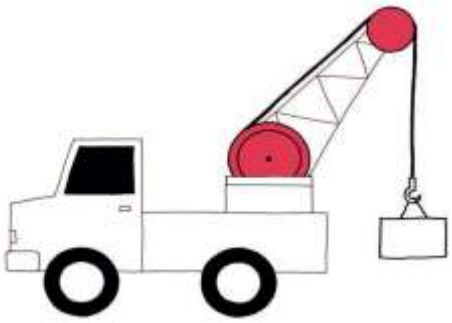


Figure 5: Crane on a truck

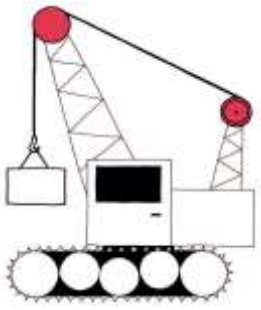
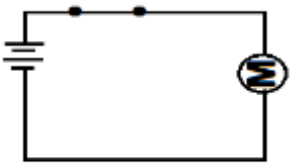
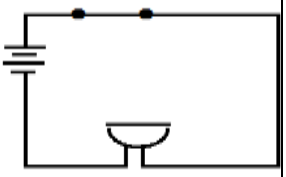
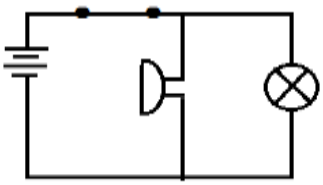


Figure 6: Crane on caterpillar tractor

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

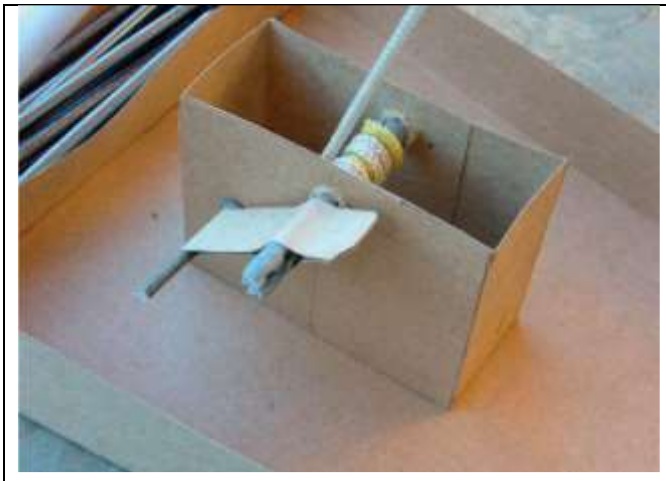
Electrical circuits and magnetism

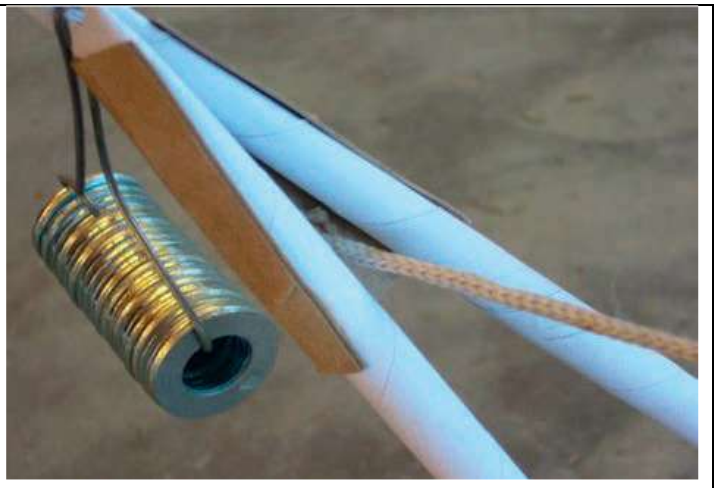
6. What energy conversions (**light**, **movement**, **sound** or **magnetism**) will the following circuits produce? Write your answer below each circuit. [4]

			
A.	B.	C.	D

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?	

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

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

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

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

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]

2. SPECIFICATIONS

2.1. Name of product; _____ [1]

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

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

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

2.6. Size [4]

2.6.1. Boom	Length			
2.6.2. Base	Length		Breadth	
2.6.3. Crane height				

3. Draw a circuit diagram for the electromagnet (with a light to show)

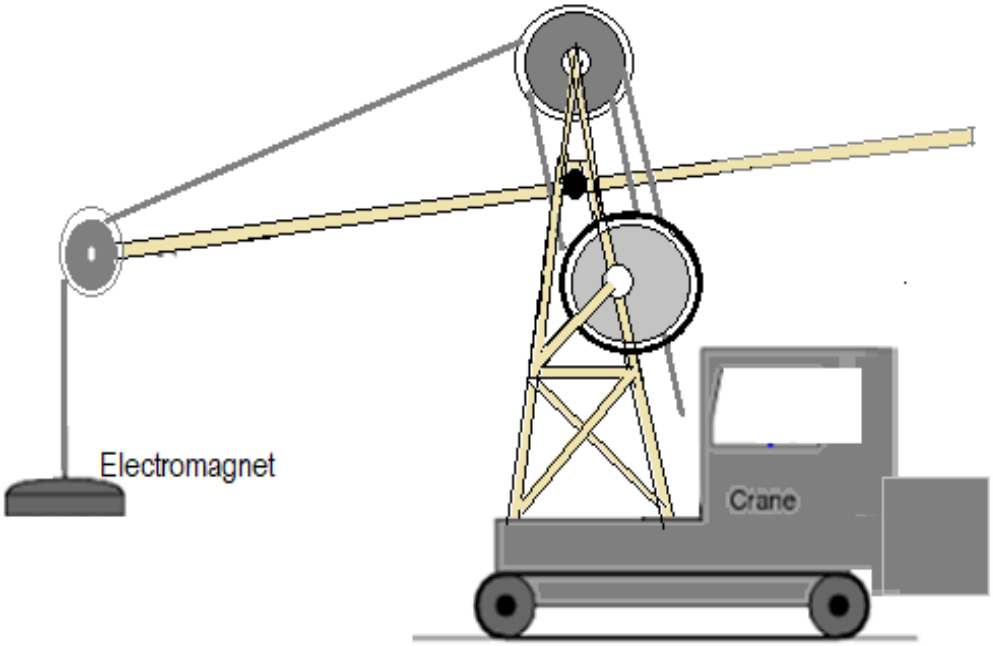
Relevance 1 Mark	Components 2 Marks	Connection 2 Marks	Neatness 1 Mark	TOTAL =[6]

3. Design drawings

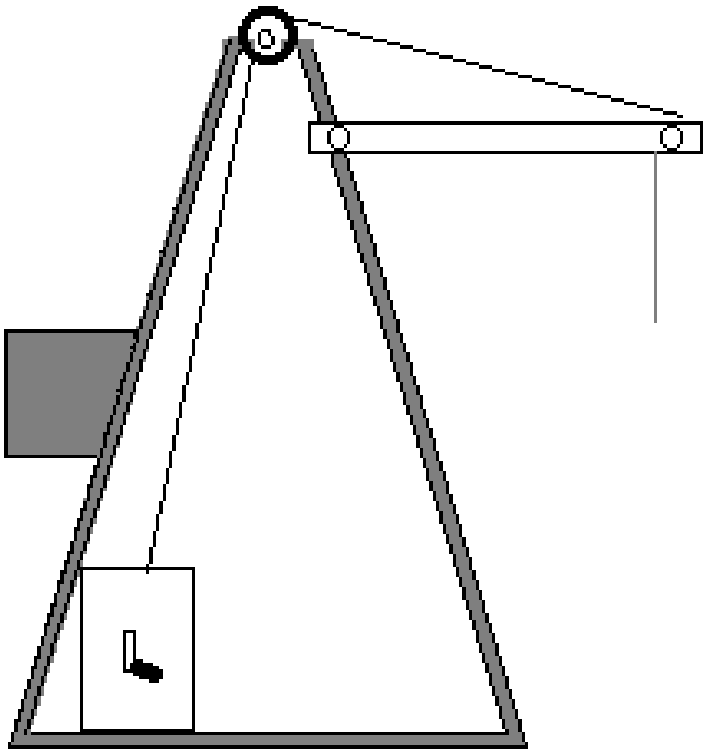
	True-face	3D	VP	Total
First design	1	2	1	4
Second design	1	2	1	4
TOTAL				= 8

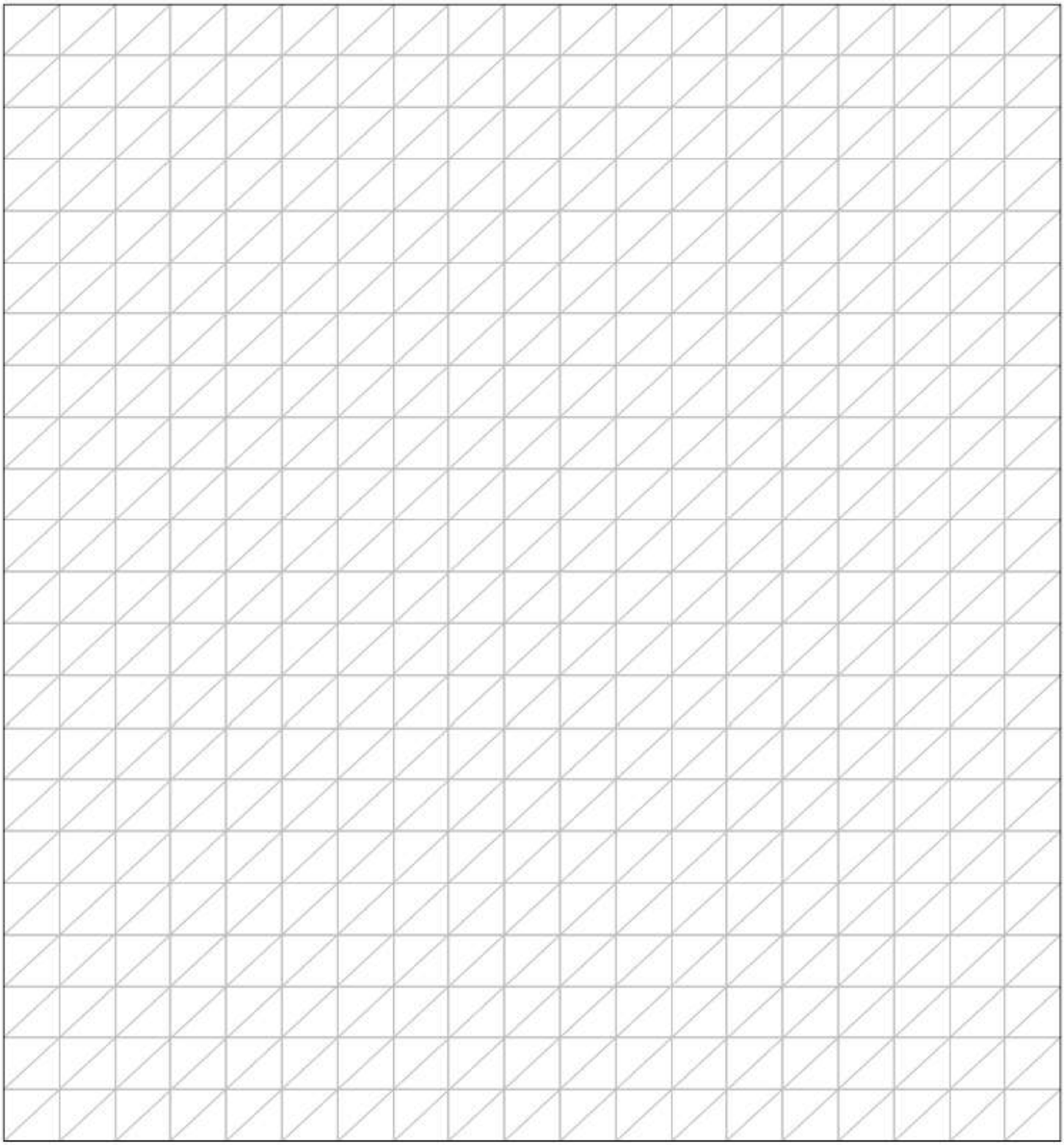
3.1. Convert the 2D solutions below 3D drawings.

First solution



Second solution





Does your drawing have a heading?	*Enhancing*	Use of grid & (3D) Oblique	Did you draw the face of the crane that shows the most detail?	*Dimensions and labelling*	*TOTAL*
1	***1***	***2***	***2***	*4*	***=10***

4. CONSTRAINTS (3)

_____

_____

_____

8

Technology	Date_____
MAKE	35 Marks

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?
1.1. (1)	(2)
1.2. (1)	(2)
1.3. (1)	(2)
1.4. (1)	(2)
1.5. (1)	(2)

2. TOOLS

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

a) _____ b) _____ c) _____

2.2. Some tools can be dangerous if they are used incorrectly. Write down a safety rule for the tools that you will use. (2)

_____

_____

_____

_____

3. WORKING DRAWINGS

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

1) (2Marks)

2) (2Marks)

3)

(2Marks)

a) A flow chart for building a crane with all specified element and an electromagnet. [10]

Step 1

Step 2

Step 3

Step 4

Step 5