Province of the EASTERN CAPE EDUCATION

TECHNOLOGY PAT PORTFOLIO

SENIOR PHASE



SCHOOL: VICTORY CHRISTIAN SCHOOL

GRADE: **8**
DATE : ……...

PROJECT TITLE: ……

GROUP NAME: ……

GROUP MEMBERS:

1. …….
2. …….
3. .....
4. …….
5. …….
6. …….

*N.B.: THE GROUP MEMBERS MUST NOT BE MORE THAN **SIX (6**)*

SCENARIO

Platinum, a very valuable metal, has been found on land belonging to a tribe in a rural area. Samples show that the platinum is only 500m below the surface. An international and South African company joint venture company, called Platinum Stars, has decided to invest money in this project. They want to sink a shaft to the 500m point to take a few samples. They will decide on the best mining method.

Your engineering company wants to submit a tender for the construction of the shaft headgear. The headgear must be able to transport miners and equipment 500m underground. It must also be able to lift platinum ore that weighs 10 tons back up to the surface.

INSTRUCTIONS:

- Write legibly and fill each page with necessary information i.e. your Name and Date.
- Draw neatly by using pencil.
- Fill all spaces with relevant answers.
- Ask your teacher if you do not understand as s/he will supervise your progress throughout.
- Dates of completion are indicated at the beginning of each task.
- Complete each task in the set time and submit to your teacher immediately.
- You may attach drawings or extra materials in your PAT as evidence.
- Pack your PAT according to page numbering.

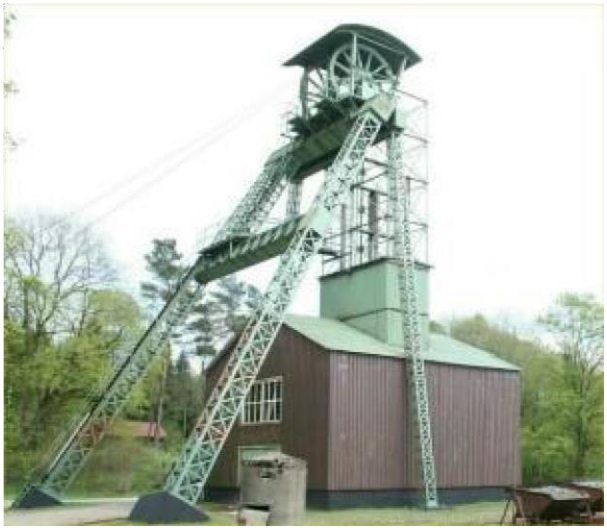
Focus: Investigate, design, make, evaluate and communicate.

Project: Mechanical systems and control (mine shaft head gear)

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COMPONENT	Planned date of completion	Maximum Marks	Learner's Marks
Investigation	Week 5 Date 05 - 08/08/2024	15	
Design	Week 6 & 7 Date 12 – 23/08/2024	20	
Making	Week 8 & 9 Date 26/08/2024 to 06/09/2024	35	
Grand Total		**70**	

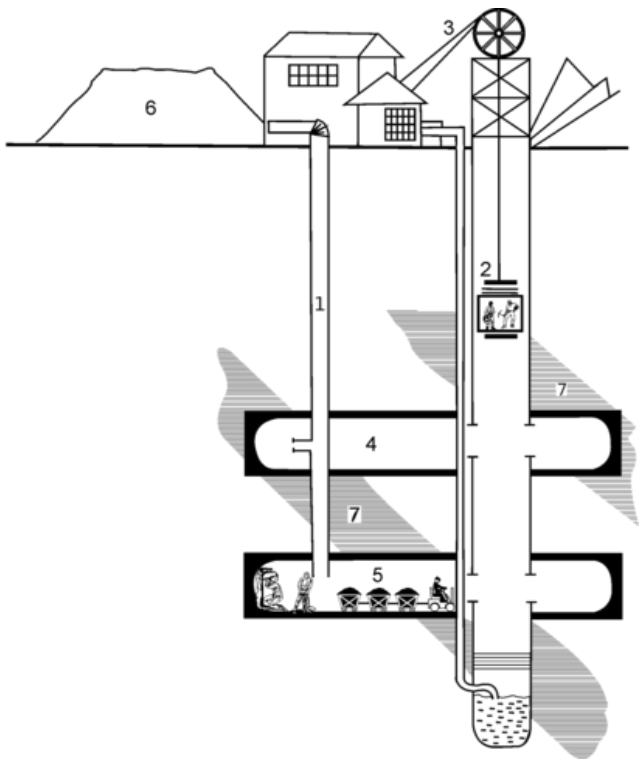
PROBLEM STATEMENT / SCENARIO/ CONTEXT



Platinum, a very valuable metal, has been found on land belonging to a tribe in a rural area. Samples show that the platinum is only 500m below the surface. An international and South African company joint venture company, called Platinum Stars, has decided to invest money in this project. They want to sink a shaft to the 500m point to take a few samples. They will decide on the best mining method.

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1. INVESTIGATE SKILLS (INDIVIDUAL ACTIVITY)

1.1 Mine shaft headgear, head frame and winch

Use the above picture to answer the following questions below:

1.1.1 Give the function of the headgear. (2)

_____

_____

1.1.2 What happens in the winding house of a mine? (1)

_____

_____

1.1.3 Explain what a sheave wheel is and its function? (2)

_____

_____

1.1.4 Briefly explain the function of a head frame. (2)

_____

_____

1.1.5 Why do the legs on a head frame always slope towards the winch? (2)

_____

_____

1.1.6 What are the two parts of lift that go down a mine called? (2)

_____

_____

1.1.7 Give the functions of the two parts you listed in question 1.1.6 (2)

_____

_____

1.1.8 Give any visible difference between the two mine winches shown in the figures appeared on the next page. (2)

Figures 1.1.8 A and 1.1.8B?

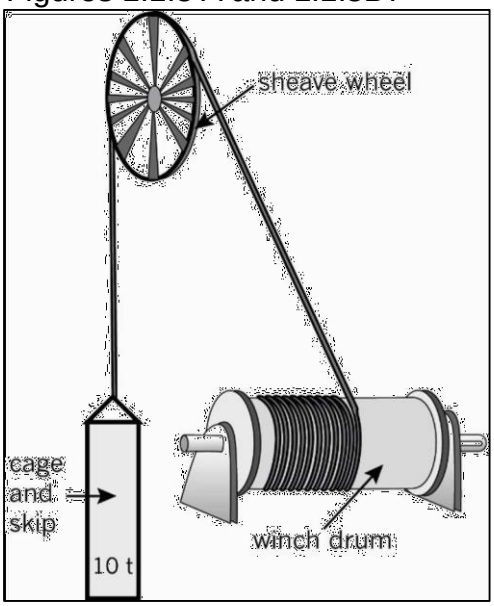


Figure 1.1.8 A

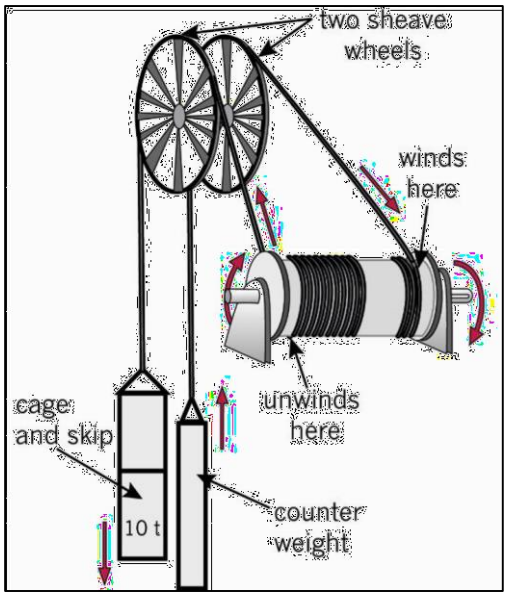


Figure 1.1.8 B

(2)

[15]

2. DESIGN SKILLS (INDIVIDUAL ACTIVITY)

2.1 Design brief with specifications and constraints.

2.1.1. Write the design brief: (4)

_____

_____

_____

2.1.2. List any 2 specifications: (2)

_____

_____

_____

2.1.3. List any 2 constraints. (2)

_____

_____

2.2 Use the space below to sketch two initial ideas in 3D to meet the requirements given in the scenario. Your generated freehand designs must include types of lines and mechanisms. **(6)**

Design Idea 1 (INDIVIDUAL ACTIVITY)

Assessment criteria of freehand designs

Assessment Criteria	**Mark allocation**	**Learner's mark**
Mine shaft headgear drawn in free hand	**1**	
Mechanisms included (Gears and Pulleys	**2**	
Line types(Feint; bold and hidden details)	**3**	
TOTAL	**6**	

Design Idea 2 (INDIVIDUAL ACTIVITY)

[6]

Assessment criteria of freehand designs

Assessment Criteria	**Mark allocation**	**Learner's mark**
Mine shaft headgear drawn in free hand	**1**	
Mechanisms included (Gears and Pulleys	**2**	
Line types(Feint; bold and hidden details)	**3**	
TOTAL	**6**	

[TOTAL: 20]

3. MAKING SKILLS [INDIVIDUAL (3.1 – 3.3) AND GROUP (3.4) ACTIVITIES)

3.1 Draw a 2D working drawing of the head gear with dimensions and line types using the following scale: 1cm = 10mm

(6)

Assessment Criteria	**Mark allocation**	**Learner's mark**
Correctness of the drawing	**2**	
Drawing to scale	**1**	
Dimensioning	**1**	
Line types	**1**	
Neatness	**1**	
TOTAL	**6**	

3.2 Give the realistic budget detailing expected costs of the construction of a real mine shaft headgear; detailing prices of materials and labour costs of the range of workers who will be involved in designing and building such a device. (**INDIVIDUAL ACTIVITY**)

Cost of steel for the head frame

Item	**Cost per unit**	**Quantity needed**	**Cost estimated**
Steel column	R500 per meter		
Steel for cross braces	R20 per meter		

Sub- total: Costs for steel frame R_____

Cost of lift components

Item	**Cost per unit**	**Quantity needed**	**Cost estimated**
Sheave wheels	R150 000		
Winch and motor	R1 200 000		
Cable	R100 per meter		
Cage and skip	R350 000		

Sub- total: Cost of lift components R_____

Labour costs

Item	**Cost per unit**	**Quantity needed**	**Cost estimated**
Project manager	R30 000 per month		
Engineers	R30 000 per month		
Artisans	R25 000 per month		
Semi-skilled workers	R20 000 per month		
Unskilled workers	R12 000 per month		

Sub-total: Labour costs **R**_____

TOTAL PROJECT COST **R**_____

Assessment Criteria	Mark Allocation	Learner's mark
Good estimates of materials quantities	**1**	
Correct calculation of labour quantities	**1**	
Calculations of cost estimate per item	**2**	
Calculation of subtotal and total project cost	**1**	
TOTAL	**5**	

(5)

3.3 Flow Diagram (Maximum 6 Steps) BLOCKS

-
-
-
-
- **(6)**
-

3.4 Building of the Model (Group Activity) (18)

Assessment criteria	1 Mark	2 Marks	3 Marks	Learner's Mark
Winch and cage included	Winding drum doesn't lift heavy load using crank handle	Winding drum can lift heavy with difficulty load using crank handle	Winding drum can lift heavy load using crank handle without tilting back	
Sheave wheel included	Sheave wheel doesn't turn at all on its axle or shaft	Sheave wheel turns with difficulty on its axle or shaft	Sheave wheel turns easily on its axle or shaft	
Side frames reinforced	No cross bracings been added at all	Cross bracings not fully added to strengthen the lower half of the frame	Cross bracings fully added to strengthen the lower half of the frame	
Components correctly joined	Components not being correctly joint	Able to join components but not stiff.	Able to join components correctly and carefully	
Strength of the model	Product is already broken due to incorrect joining of components	Product is fragile and in danger of breaking with handling	Product is extremely strong and appears long-lasting	
Mine shaft head gear working	Product is non-functional and not safe to be used	Product is simply conceived and made but lacks functionality	Product is well conceived and made, functional, safe, interesting and innovating	
Total				