



**KZN DEPARTMENT OF EDUCATION**  
**EFFINGHAM SECONDARY SCHOOL**  
**TECHNOLOGY MINI PAT TERM 3 2021**



**A STRUCTURE WITH A MECHANISM FOR LIFTING A LOAD**

**GRADE 8**

**Mini pat: a mine needs a lifting system**

The lifting system is used to take miners underground and back up again. It is also used to lift the mined ore to the surface. You are required to investigate and design a model of a lifting mechanism. The figure below will show you exactly what a lifting system is and what the different parts do.



**PART A- INVESTIGATE**

1. What does the headgear of a mine do? 3
2. What happens in the winding house of a mine? 3
3. Explain what a sheave wheel is and what it does. 3
4. What does a head frame do ? 2
5. Why do the legs on a head frame always slope towards the winch? 3

- 6.1. What do you call the two parts of the lift that goes down a mine? 2
- 6.2. What does each part do? 2x2=4
7. Do you think I-beams are a good thing to use for head frame supports? Explain? 1+2=3
8. Where do you see triangulation used on this structure? Explain how triangulation helps make the head frame structure stronger 1+2=3
9. What has been used to stop the head frame from being pulled over by the winch? 1
10. Look at the sheave wheel. Has it been placed in the middle of the upright column? 1
- 10.1. Why do you think it is important to place the sheave wheel in exactly the right place on the head frame? 2

**TOTAL 30 MARKS**

**PART B- DESIGN**

11. Make a 2D sketch of a head frame and sheave wheel with labels 10

**12- Design brief, specifications and constraints for a mine shaft headgear (lifting mechanism) sketch a whole headgear solution that might impress Platinum stars**

**Write a design brief. Using the following questions to assist you:**

- 12.1 What is the opportunity you are tendering for? 2
- 12.2 What do you need to do to tender for this project? 2
- 12.3 Write a design brief.
- What materials you used to create your mine shaft (4)
  - What tools you required to create your mine shaft (4)
  - What difficulties you faced making it (2)
  - What did you enjoy the most about making the project (2) 12
- 12.4 How should the mine winch help the mine workers? 2
- 12.5 What is the headgear for? 2
- 12.6 What does the headgear do? 2
- 12.7 Write down two things that will help to ensure your design is safe? 2
- 12.8 What do you think is important when designing something like a head gear? 2
- 12.9 What should the headgear be able to do for the local people? 2
- 12.10 When designing and making this headgear do you want the most expensive and the best for everything or the cheapest and simplest, or something in between? 2

**TOTAL 40 MARKS**

**OVERALL TOTAL 70 MARKS**