



Province of the
EASTERN CAPE
EDUCATION

**SENIOR
PHASE**

GRADE 9

JUNE 2010

TECHNOLOGY

MARKS: 100

TIME: 2 hours

This question paper consists of 10 pages.

INSTRUCTIONS AND INFORMATION

1. Answer all the questions from both Sections A and B.
2. Sketches must be clear, neat and done in pencil.

SECTION A: STRUCTURES**QUESTION 1**

- 1.1 Match the term in COLUMN A with the correct description in COLUMN B. Write down only the letter of the word in COLUMN A and the correct number of the description in COLUMN B next to it e.g. K – 12.

COLUMN A		COLUMN B	
A	Malleability	1	This is the strength needed to pull a material apart by breaking the atoms.
B	Hardness	2	A mixture of two or more metals to improve the properties.
C	Tensile strength	3	This is when a material can be pressed into shape without breaking.
D	Ductility	4	This is when a material will not break when hitting something else.
E	Shearing force	5	This is the strength the material has to resist being squeezed.
F	Conductivity	6	This occurs when two forces are pushing in opposite directions, but are not acting along the same line.
G	Compression	7	This is when a material can be drawn out without breaking.
H	Toughness	8	A less durable, transparent material.
I	An alloy	9	Electricity can easily flow through this material.
J	Perspex	10	This is when one material is hard enough to cut another material.

(10)

- 1.2 Corrosion has a negative effect on the properties of metals and plastics.

1.2.1 Explain what is meant by the term corrosion.

1.2.2 Suggest a suitable material for the manufacturing of a security gate to make it corrosion resistant.

(2)
[12]

QUESTION 2

2.1 Read the following case study and answer the questions that follow:

Suppose that the small village in which your uncle and aunt live is at the foot of the Drakensberg mountains. You only visit them once a year because the road leading to the village crosses a very deep canyon, more than 350 metres deep. The narrow road dangerously winds down the steep and rocky sides of the canyon before it reaches a strong flowing river which washes away the wooden bridge every year.

A rare mineral was discovered just outside the village and the government plans to start mining this mineral as soon as possible. The raw material from the mine has to be transported to the nearest processing plant. This is a problem as the road going down the sides of the canyon is too steep and the wooden bridge crossing the river will not be able to carry the heavy loads that each truck will be carrying. Finances are set aside for developing the village and its infrastructure to support the many employees of the mining complex. The building materials needed for this have to be transported to the village from the nearest town.

Here is a list of some of the infrastructure upgrades that are being planned in and around the village:

- housing for the many mine employees,
- a shopping complex to cater for their needs and wants,
- the mining facility itself,
- municipal services,
- roads and bridges.

2.1.1 What is the first infrastructure upgrade that has to be made in order for this project to continue? (1)

2.1.2 The next step is to list the design specifications and constraints of the bridge which will cross the deep canyon. To find the best design you must answer the following questions:

- (a) What is the purpose of the bridge? (2)
- (b) What are the environmental constraints? (2)
- (c) Is appearance and aesthetics important for this situation? Explain your answer. (2)
- (d) What possible safety features should be considered? (2)
- (e) Name any two of the costs involved in building this bridge? (2)

2.2 Taking your answers in QUESTION 2.1.2 into consideration, choose the most suitable type of bridge for this situation from the list below:

• Cantilever bridge	• Clapper bridge
• Beam bridge	• Arch bridge
• Suspension bridge	• Cable-stayed bridge

(1)

2.3 Make a neat sketch of the bridge that you have chosen and explain the reason for your choice.

(5)

2.4 Give a brief description of the differences between a cable-stayed bridge and a suspension bridge.

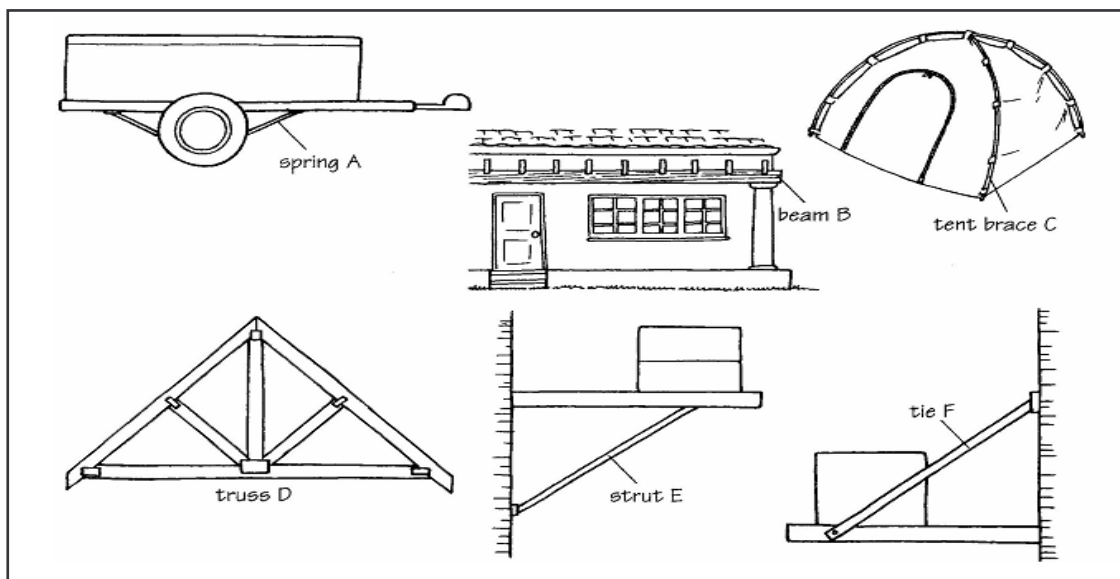
(4)

[21]

QUESTION 3

3.1 The way a structure resists the forces acting on it depends on the material from which it is made. STIFFNESS and FLEXIBILITY are two different properties that materials can have.

Look carefully at the labelled component of each structure shown in the illustrations below and answer the questions that follow:



3.1.1 Are the forces in components E and F tensile or compressive?

(2)

3.1.2 Decide whether each labelled component needs to be stiff or flexible in order to resist the forces that act on them. Record your answers in a table.

(6)

[8]

QUESTION 4

4.1 When analysing the effects of different loads on structures, we must know the loads are static/dynamic loads or even/uneven loads.

4.1.1 Study the sketch and identify whether the forces mentioned below are static or dynamic loads:



- (a) The force that the thatch roof exerts on the walls.
- (b) The force of the wind blowing against the roof.
- (c) The force the woman exerts on the ladder and the wall. (3)

4.2 Explain the difference between even and uneven loads and illustrate your explanation by using simple drawings. (6)
[9]

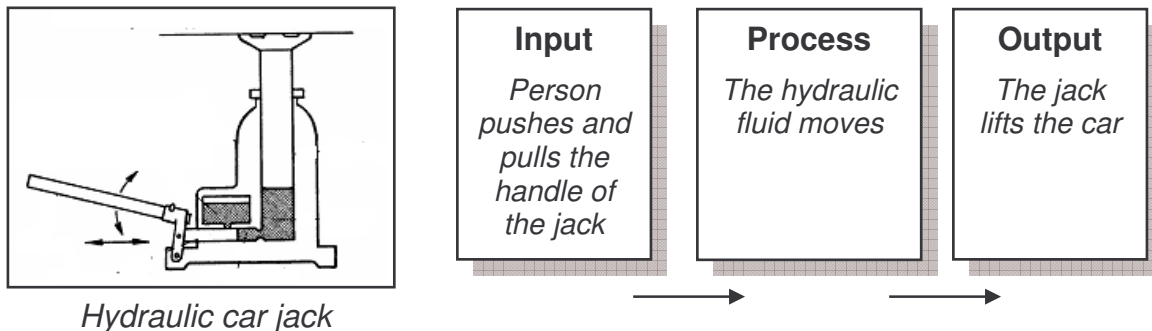
TOTAL SECTION A: 50

SECTION B: SYSTEMS AND CONTROL (Mechanical)

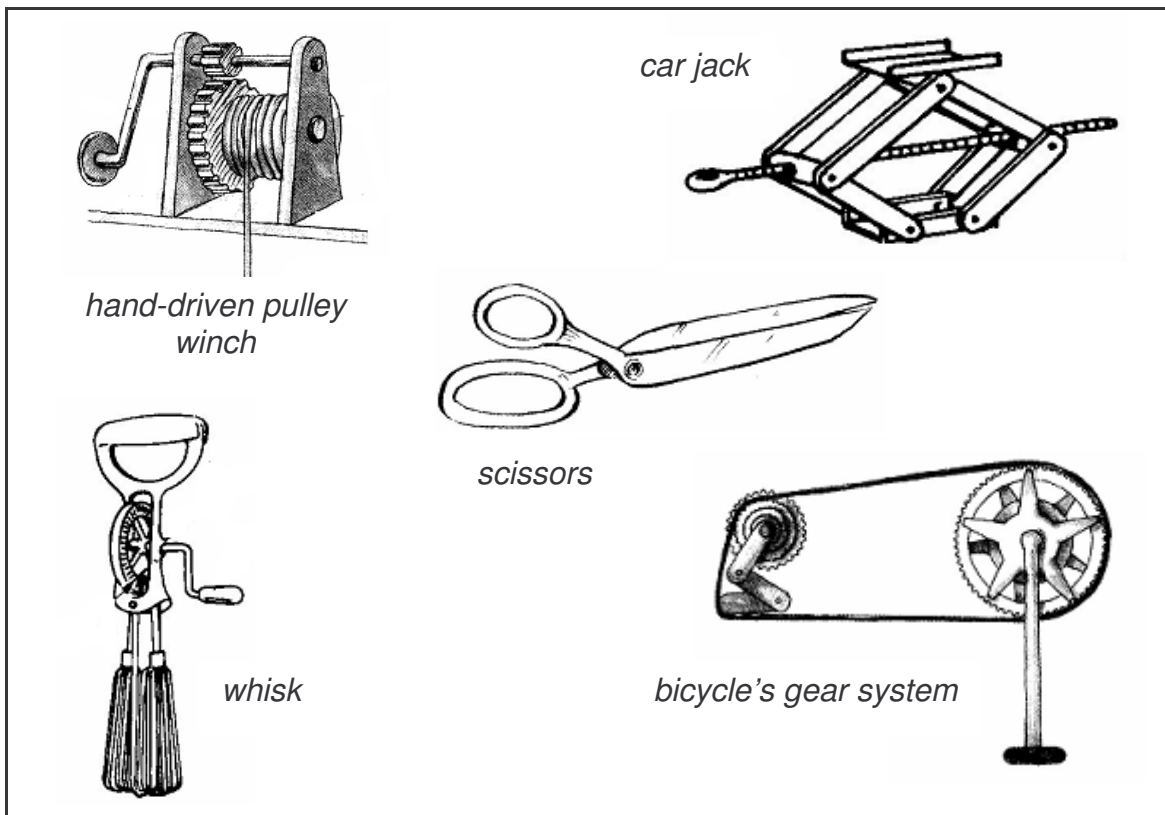
QUESTION 1

- 1.1 All machines, whether basic or complex, consist of simple mechanisms. For a mechanical system to work, there must be an **INPUT** that undergoes a **PROCESS** to produce an **OUTPUT**.

Example:



Study the diagrams and copy and complete the table below:



Name of object	Input	Output

[10]

QUESTION 2

2.1 Answer the following questions:

2.1.1 What is a gear? (1)

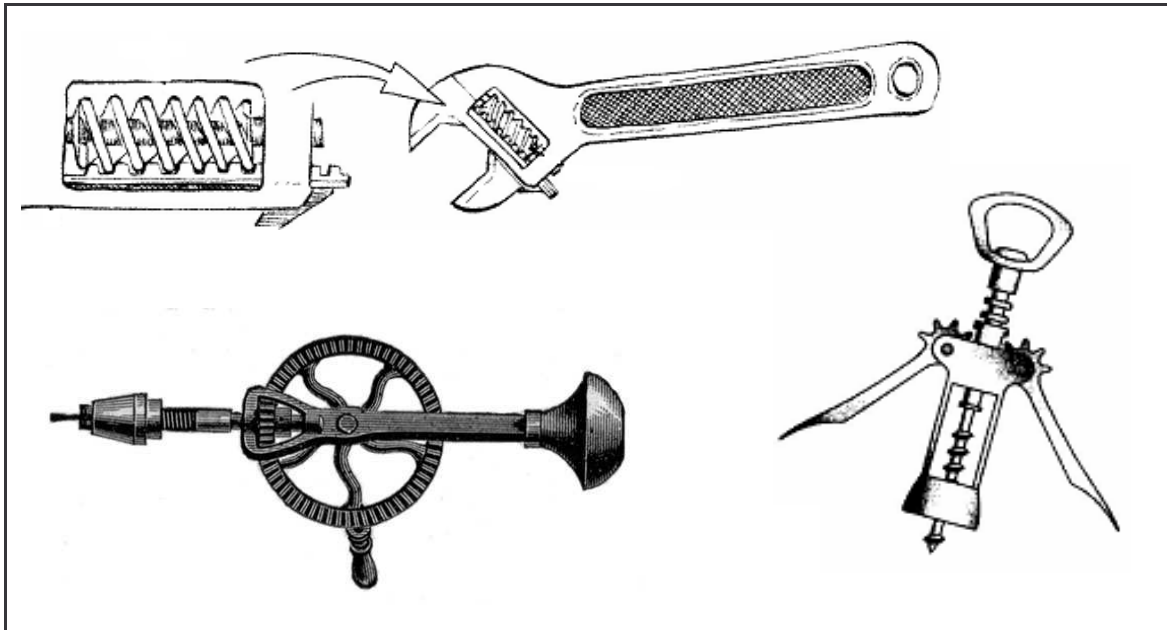
2.1.2 What is the difference between a driver gear and a driven gear? (2)

2.1.3 "When two gears are meshed, they turn in opposite directions". What is meant by this statement? (2)

2.1.4 Make a neat diagram with labels to help you explain your answer in QUESTION 2.1.3. (4)

2.2 Each of the products shown below has a type of gear mechanism.

Identify the gear mechanism and explain how each mechanism changes the input motion to the output motion. Use the table below:

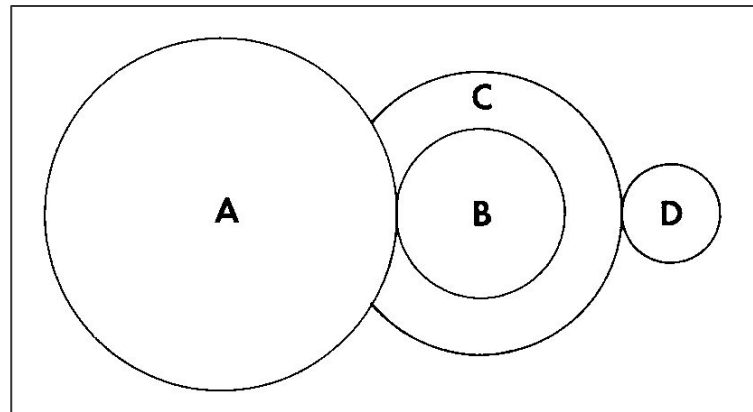


Product	Gear Mechanism	How input motion is changed to output motion
shifting spanner		
hand drill		
corkscrew		

(6)

- 2.3 The illustration shows a compound gear train, consisting of four gears. Look at the diagram and answer the questions that follow.

Gears C and B represent a compound gear as it appears “fixed” together. (*Two gears “fixed” together in this way rotate together and at the same revolutions per minute*)



This table indicates the number of teeth of each gear

Gear A	Gear B	Gear C	Gear D
120 teeth	40 teeth	80 teeth	20 teeth

- 2.3.1 If Gear A rotates in a clockwise direction at 30 revolutions per minute, calculate what is the output in revolutions per minute at D.

(10)

- 2.3.2 What is the direction of rotation at Gear D?

(1)

[26]

QUESTION 3

- 3.1 Which control mechanism can be used in a car’s handbrake system?
- 3.2 Make a neat sketch with labels of the mechanism named in QUESTION 3.1.

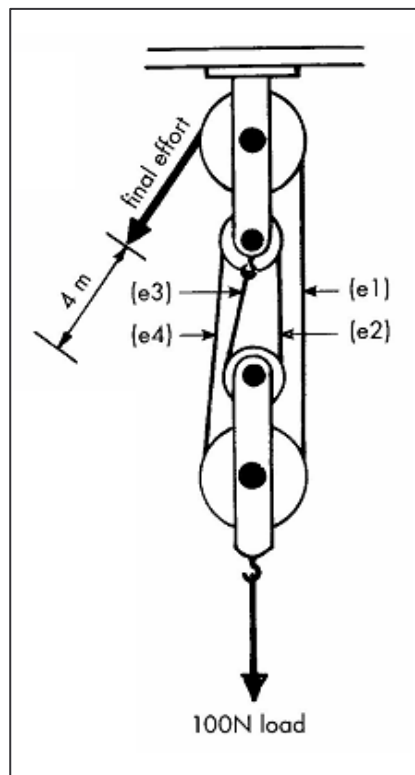
(1)

(3)

[4]

QUESTION 4

- 4.1 What does velocity ratio in a pulley system indicate? (1)
- 4.2 The compound pulley system shown below has four pulleys which support the load by dividing it into four lengths. Each part of the rope equally supports the load. The pulley system is being used to lift a load of 100 N.



Study the diagram above and answer the following questions:

NB. Show the formula with each calculation.

- 4.2.1 Calculate out the mechanical advantage of the pulley system. (3)
- 4.2.2 What effort is required to lift the 100 N load? (3)
- 4.2.3 How far does the load move in comparison to the 4 metre movement of the final effort? (3)

[10]

TOTAL SECTION B: 50

GRAND TOTAL: 100