



# education

---

Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**AGRICULTURAL TECHNOLOGY**

**FEBRUARY/MARCH 2009**

**MEMORANDUM**

**MARKS: 200**

**This memorandum consists of 19 pages.**

**SECTION A**

**QUESTION 1**

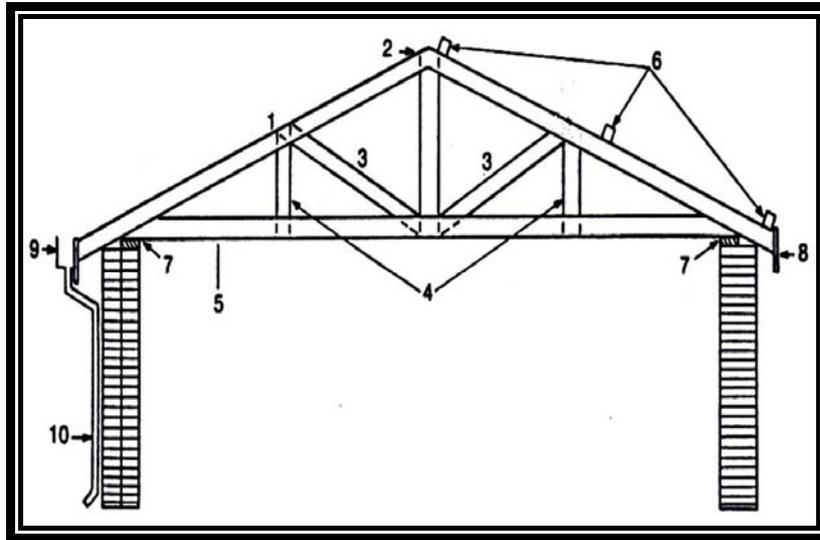
- 1.1 A ✓✓✓
- 1.2 B ✓✓✓
- 1.3 A ✓✓✓
- 1.4 C ✓✓✓
- 1.5 B ✓✓✓
- 1.6 B ✓✓✓
- 1.7 A ✓✓✓
- 1.8 B ✓✓✓
- 1.9 A ✓✓✓
- 1.10 C ✓✓✓
- 1.11 A ✓✓✓
- 1.12 A ✓✓✓
- 1.13 A ✓✓✓
- 1.14 B ✓✓✓
- 1.15 B ✓✓✓

**TOTAL SECTION A: (15 x 3)    45**

**SECTION B****QUESTION 2: MATERIALS AND STRUCTURES**

- 2.1 Tinned or galvanised wires are commonly used on a farm for various purposes.
- 2.1.1 Give a reason for the tinning or galvanising of fence wire.
- To prevent the wires from rusting. (Corrosion) ✓ (1)
- 2.1.2 Describe the *galvanising process of wire*.
- Wires are cleaned with hydrochloric acid, ✓ then treated with zinc-chloride and dipped into molten zinc. ✓ (2)
- 2.1.3 Name TWO important procedures that must be followed before galvanised roof plates are painted.
- Clean with hydrochloric acid. ✓
  - Paint a prescribed undercoat. ✓ (2)
- 2.1.4 Security fences can be made from various types of wire. Name THREE of these types of wire.
- Bonnox ✓
  - Jackal proof netting ✓
  - Wire mesh ✓
  - Chicken mesh (Any 3) (3)
- 2.2 Adhesives play an important role in everyday repair jobs on the farm.
- 2.2.1 Name the TWO most important aspects to be considered by the choice of an adhesive.
- The type of material to be joined. ✓
  - The conditions under which this joint will be used. ✓ (2)
- 2.2.2 Describe the difference between *cohesion* and *adhesion* when applying adhesives.
- *Cohesion*  
Inherent strength of the adhesive/Force between molecules of the same kind ✓
  - *Adhesion*  
Ability of the molecules of an adhesive to cling to the molecules of other types of substances. ✓ (2)

- 2.3 Roof trusses are made from pine wood, and are used for the erection of various types of roofs on the farm.



- 2.3.1 Name the parts of the roof truss numbered 2, 3 and 5 in the sketch above.

- (2) Knock ✓
- (3) Struts ✓
- (5) Beam ✓

(3)

- 2.3.2 Briefly explain why triangular shapes are used in the design and construction of roof trusses.

- Triangles are very strong because of their triangular design. ✓
- It strengthens the construction so that the struts can carry the weight of the roof. ✓

(2)

- 2.3.3 Give TWO reasons for the use of pinewood for the manufacturing of roof trusses.

- Light in weight ✓
- Strong ✓
- Durable
- Relatively cheap
- Easy to work with

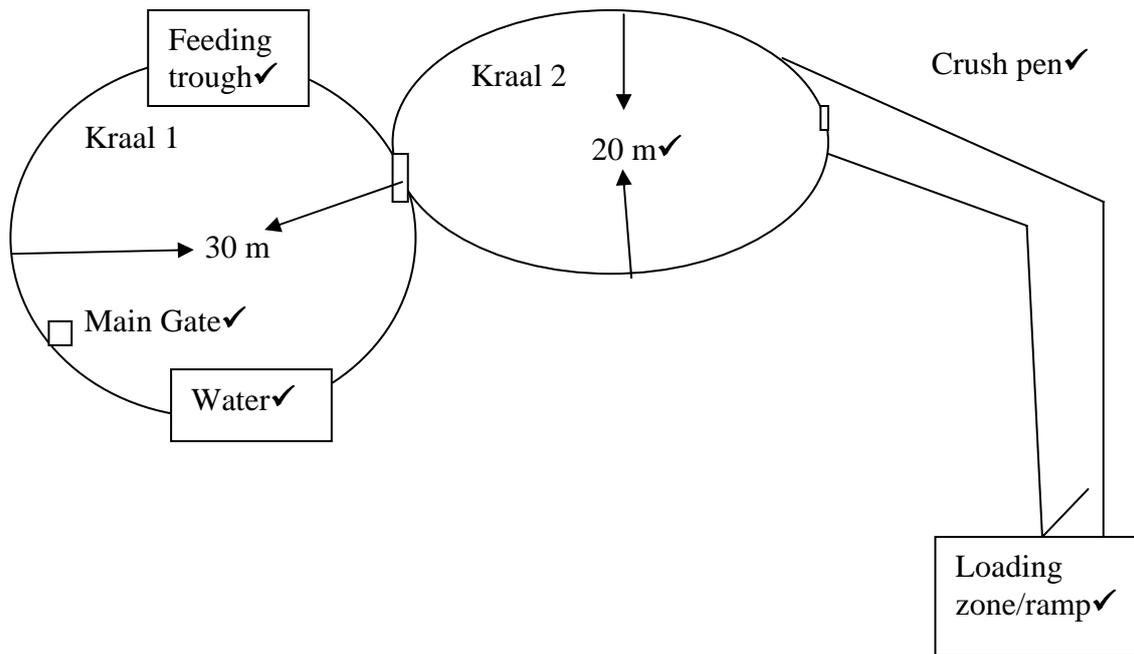
(Any 2)

(2)

- 2.4 Design and sketch an effective handling facility for cattle. The kraal must be used to handle animals when they are inoculated, hot branded, sorted or loaded and must also have a facility to keep the animals for a day or two when necessary. Your freehand drawing must include the following:

- A TOP VIEW that shows the position of the kraal, gates, water points, feeding troughs, crush pen and loading ramp. (6)
- Indicate the scale of the drawing. (1)
- Marks will be allocated for accuracy, scale and neatness. (2)

2.4



Neatness ✓  
Accuracy ✓  
Scale ✓

2.5 The posts of the kraal mentioned in QUESTION 2.4 must be concreted into the ground so that animals cannot push the posts down and escape.

2.5.1 Name the basic materials needed for this concrete mixture and indicate the mixing ratio.

1:2:3 ✓

1 Cement ✓  
2 Sand ✓  
3 Stone ✓

(4)

2.5.2 Why can concrete not be poured during a very cold winter's day when the temperature is below 0 °C?

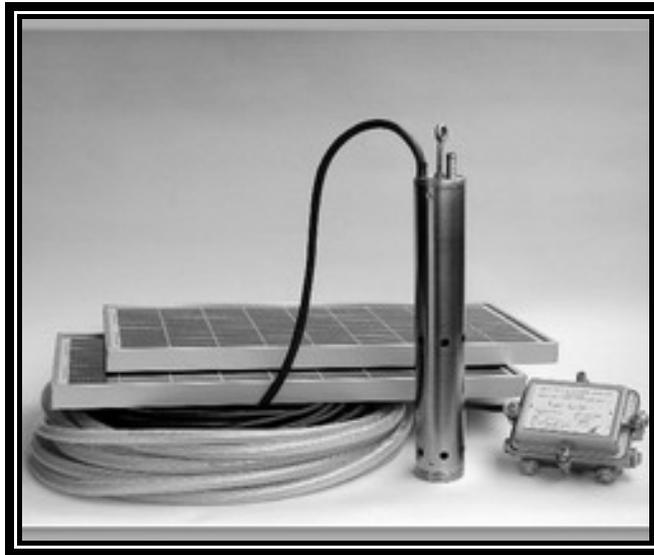
The water inside the concrete mixture will freeze ✓ and expand ✓ causing small cracks and a weakened concrete mixture. ✓

(3)

[35]

**QUESTION 3: ENERGY**

3.1 The diagram below shows a submersible pump, using solar energy.



3.1.1 Name the cells that transform light energy into electrical energy.

Photovoltaic cells ✓

(1)

3.1.2 The solar panels must be installed in such a way that the pump works effectively on a clear sunny day.

Describe the principles that must be remembered when installing these solar panels.

- Install the panels in such a way that the panels face into the sun during day time utilising as much sun energy as possible. ✓
- Install in such a way that animals/people cannot damage the panels ✓.
- Do not install near trees or any other objects that can cast a shadow over the panels. ✓
- Install not too far from pump installation, to minimise voltage drop. ✓
- Bury or cover the electrical wires that lead from the panels to the pump. ✓

(5)

3.1.3 Compare, in table form, the advantages of solar energy coal over generated electricity that can be purchased from the national supplier.

<u>SOLAR ENERGY</u>	<u>NATIONAL SUPPLIER</u>
(a) Green energy/No pollution ✓	(a) Smoke/Air pollution ✓
(b) Unlimited energy source ✓	(b) Limited coal supplies ✓
(c) No load shedding/ scheduling ✓ (✓)	(c) Load shedding because of over demand
(d) No supply interruptions ✓	(d) Overloading cause interruptions ✓
* Cheap energy source	* Expensive energy source
(Any four)	(Any four)

(8)

3.1.4 One of the disadvantages of the use of alternative energy sources is that it cannot function when the energy source is not available.

Discuss this problem and provide a possible solution.

- Energy sources like wind and sun are sometimes not available. ✓
- Use a battery system that can be used to store the energy when the source is available. ✓

(2)

3.2 Briefly explain the term *Bio fuel*, and give TWO examples.

Fuel that is made from plants or plant parts ✓ such as maize, ✓ sunflower ✓ and sugar cane.

(3)

3.3 What type of current is generated by a wind generator?

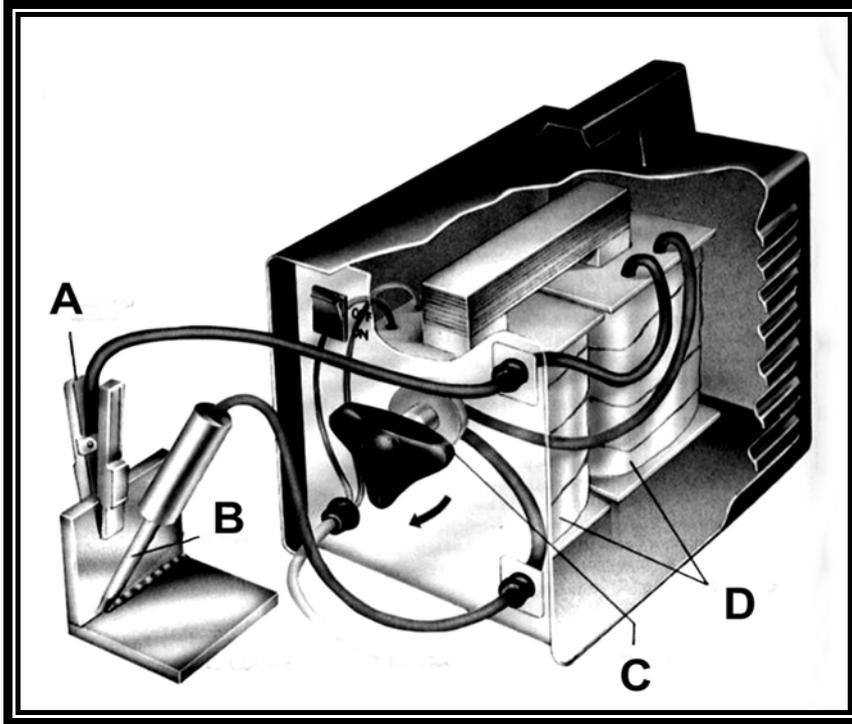
Direct current ✓

(1)

**[20]**

**QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES**

4.1 Study the sketch below which shows a machine that is used to build metal structures and repair equipment on the farm. Answer the questions that follow:



4.1.1 Name this type of machine. (1)

Arc -welding machine. ✓

4.1.2 What is the function of the part labelled D?

Transforms the low voltage alternating current into high voltage direct current ✓ (1)

4.1.3 Briefly describe the process of striking an arc.

- Make sure the earth cable clamp **A**, makes thorough contact with the welding table/work piece. ✓
- Put an electrode with the correct diameter that corresponds with the thickness of the work piece in the electrode holder **B**. ✓
- Adjust the amperage of the welding machine according to the table on knob **D**. ✓
- Protect your eyes with a welding helmet. ✓
- Start the weld by making a scratching movement with the welding rod. ✓
- Make a zigzag movement with the electrode. ✓
- Bend the electrode back and lift it up, when the electrode gets stuck.
- Finish the weld and remove the slag with a chipping hammer.

(Any 6) (6)

- 4.1.4 Name TWO types of metal that can effectively be welded with this type of welder.
- Mild steel ✓
  - Cast iron ✓
- (2)
- 4.1.5 What is the welding joint on the project in the sketch called?
- Corner joint ✓
- (1)
- 4.1.6 After examining this completed welding joint, it is found that there are small holes in the joint.
- (a) What is this welding defect called? (1)
- (b) Explain the reason for this welding defect. (3)
- (a) Gas holes ✓
- (b) Dirty metal ✓  
Base metal is melted too fast ✓  
Welding metal is cooled down too quickly ✓
- 4.2 Welding downward in a vertical position, may sometimes prove to be a problem, because the molten metal of the puddle will tend to run down.
- 4.2.1 Describe the correct welding procedure of vertical welding in the downwards direction with an arc-welding machine.
- Special electrode is used for vertical welding, that makes the process easier as it 'freezes' more quickly. ✓
  - Amperage can be reduced slightly from the normal down hand setting. ✓
  - Tip of the electrode must be pointed upwards, so that the electrode forms an angle of up to 30° with the horizontal plane. ✓
  - Arc must be kept short and the speed must be just sufficient to prevent the molten metal from the puddle to run down. ✓
  - When welding down very little lateral movements of the electrode must be made. ✓
- (5)
- 4.2.2 What is the purpose of the slag that is formed on the welding run?
- Protects the molten metal against air pollution. ✓
  - Prevents the weld from cooling too fast. ✓
  - Brings about an even weld. ✓
- (3)
- 4.3 List the effects on the welding process if the welding-rod coating is absent. (5)
- Current cannot be stabilized. ✓
  - Impurities on the surface of the metal cannot be melted away. ✓
  - Slag cannot be formed. ✓
  - Melting time is retarded. ✓
  - An even weld is not possible. ✓
  - A protecting arc cannot be obtained.
- (Any 5)

4.4 Name TWO effects of poor storage conditions on welding electrodes.

- Rusting of electrode. ✓
- Damage to the electrode coating. ✓
- Electrodes may become damp.

(Any 2) (2)

4.5 Choose a word from COLUMN B that matches a description in COLUMN A. Write only the letter (A – G) next to the question number (4.5.1 – 4.5.5) in the ANSWER BOOK.

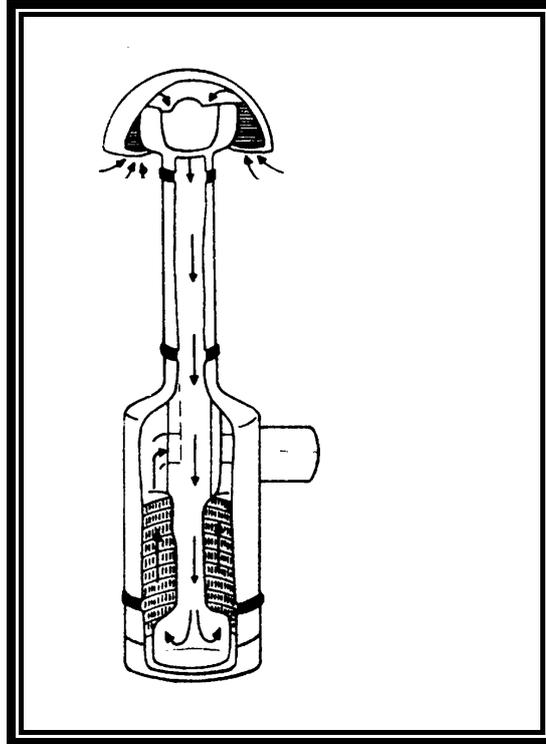
COLUMN A	COLUMN B
4.5.1 Small welds at the ends of two pieces of metal	A welding bead.
4.5.2 Puddle of melted metal	B MIG welding
4.5.3 Covers the welding rod	C flux.
4.5.4 Acetylene equipment	D tag weld
4.5.5 Argon, helium and carbon dioxide	E righthand thread.
	F black
	G maroon

- 4.5.1 D – Tag weld ✓  
 4.5.2 A – Welding bead ✓  
 4.5.3 C – Flux ✓  
 4.5.4 G – Maroon ✓  
 4.5.5 B – MIG welding ✓

(5)  
[35]

**QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT**

- 5.1 The illustration below shows an oil bath air cleaner that is being used on a tractor. Engines cannot perform properly without an air cleaner.



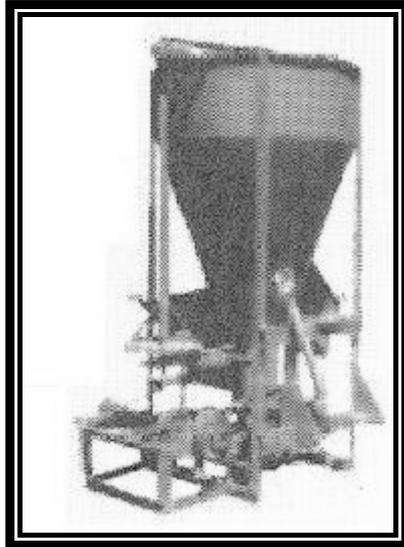
- 5.1.1 Name TWO qualities of a good air cleaner.

- Removes all impurities from the air. ✓
- Have sufficient capacity so that intervals between cleaning are of reasonable length. ✓
- Let enough air through for engine to work effectively. (Any 2) (2)

- 5.1.2 In order to work efficiently, several hints must be kept in mind regarding the air filter of a tractor. Name FOUR of these hints.

- It is a safety mechanism that must keep all the dust out of the engine. ✓
- The surface area of the paper element air cleaner must be large enough to purify the volume of air sucked into the engine. ✓
- Two types of air cleaners must be used simultaneously on the tractor. ✓
- All air pipes must be air tight. ✓
- No exhaust gases must enter the air cleaner. (Any 4) (4)

5.2 A hammer mill is one of the necessities on a farm. It helps a farmer to mill his own feed and saves money in the process.



5.2.1 Name FOUR points that must be taken into account when a hammer mill is being installed.

- It must be installed in such a way that it can be handled with ease. ✓
- It must be placed in a well ventilated area. ✓
- Fodder must be offloaded next to the hopper. ✓
- Hammer mill should be placed near the feed mixer/silo to reduce labour. ✓

(4)

5.2.2 Maintenance is very important to prolong the lifespan of a hammer mill. Name FOUR factors that must be kept in mind when maintenance is carried out on a hammer mill.

- Regular lubrication. ✓
- Hammers should be replaced with the correct type. ✓
- Hammer mill must be correctly mounted. ✓
- Power take-off shaft coupling must be done correctly. ✓
- Clean after each job.
- Sieves and screens must be inspected on a regular basis. (Any 4)

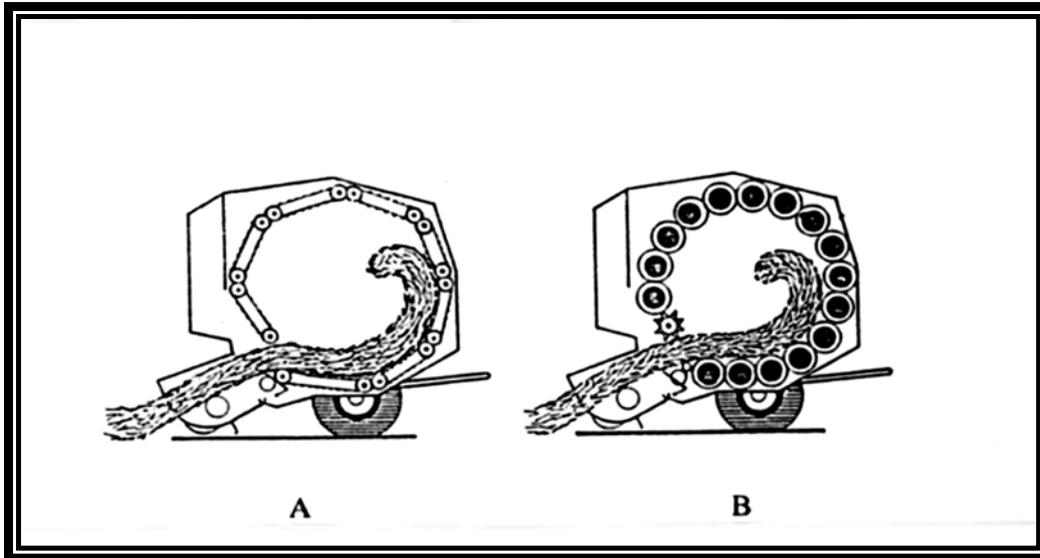
(4)

5.2.3 Name FOUR points that have to be considered when the hammer mill is attached to the power take off shaft of the tractor.

- Check that the anchor bolts of the stationary machine are tight. ✓
- Check that the universal joints are well lubricated. ✓
- Ensure that the driving shaft is as straight as possible. ✓
- Check that the driving shaft guard is present and without cracks. ✓

(4)

5.3 Study the two sectional views of Welger type balers with different roll mechanisms below.



5.3.1 What is the difference between baler A and baler B?

- Baler A has belts/chains ✓
- Baler B has rollers ✓

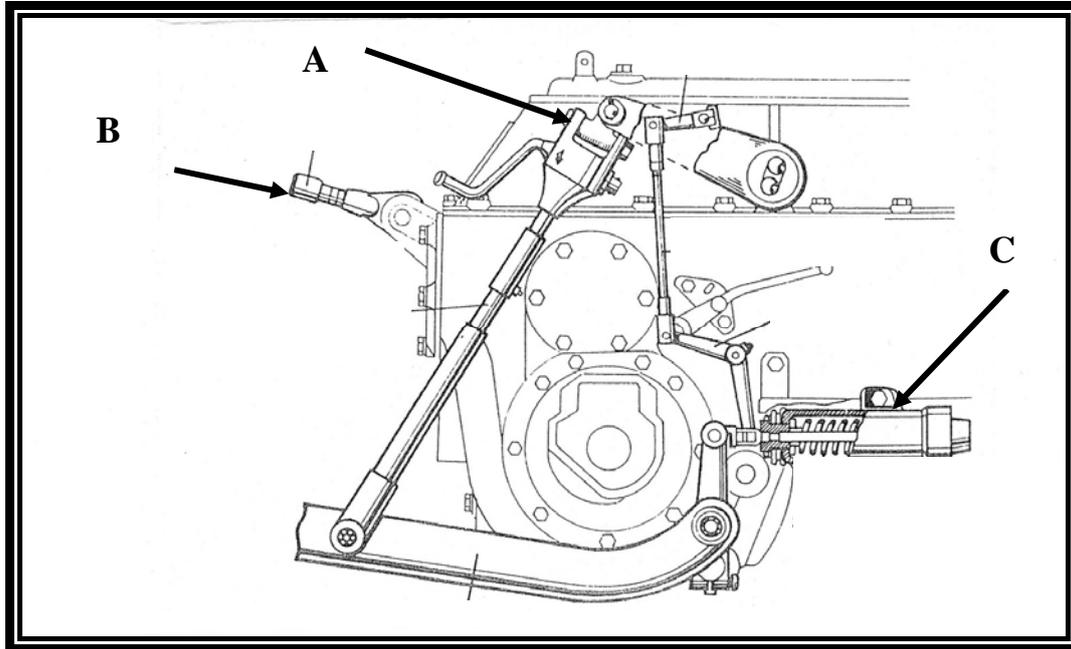
(2)

5.3.2 Describe the process of bale binding in the round baler.

- As soon as a bale reaches maximum size, rope is released to bind it and forward motion is stopped. ✓
- The bale keeps rotating and a special arm, which operates mechanically, moves forward over the bale putting the rope around it. ✓
- This movement results in the rope being wound around the entire circumference of the bale. ✓

(3)

- 5.4 The system below is an integral link between the implement and the tractor, and its working and function must be clearly understood by the persons who operate and service the tractor.



- 5.4.1 Describe the function of the component labelled A.

To adjust the cross angle of the implement in relation to the tractor.✓ (1)

- 5.4.2 Arrow B shows where the top link is connected. What is the function of the top link?

Keeps the back of the implement in the soil when ploughing. Lift the back of the implement when it is lifted up✓ (1)

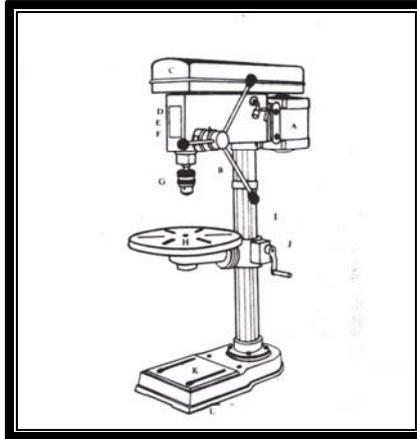
- 5.4.3 Name the device labelled C, and briefly describe its function.

Sensitivity element.✓ The function is to activate the hydraulic system when the forces on the plough change.✓ (2)

- 5.4.4 Name FOUR advantages of the use of transmission oil in a tractor's hydraulic system.

- Not compressible✓
- Good lubrication qualities✓
- Remains liquid over a large temperature range✓
- Not volatile✓
- Relatively cheap
- Easily conductible in pipes
- Flows through filters; pipes; oil pumps and cylinders with ease
- Contains detergents that keep parts clean (Any 4) (4)

5.5 The pedestal drilling machine is an important item in the workshop. It facilitates the drilling process.

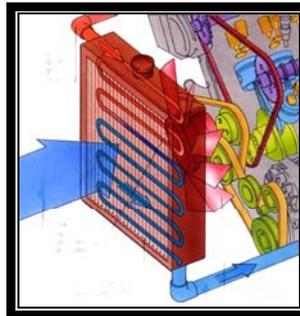


Certain settings must be made before this machine can be used. Name TWO settings that are very important to operate this machine successfully.

- Choose the correct pulley speed.✓
- See that the chuck is properly tightened and that the chuck key is removed.✓
- Drilling table centered.
- Mortise apparatus/drill correctly adjusted and firmly tightened.

(Any 2) (2)

5.6 Before the ploughing, planting or harvesting season starts the farmer must make sure that all his vehicles and machines are in good working order. Defective cooling systems can cause great financial losses.



Blocked radiators can cause engines to overheat. How would you prevent a radiator from becoming blocked? Name TWO methods.

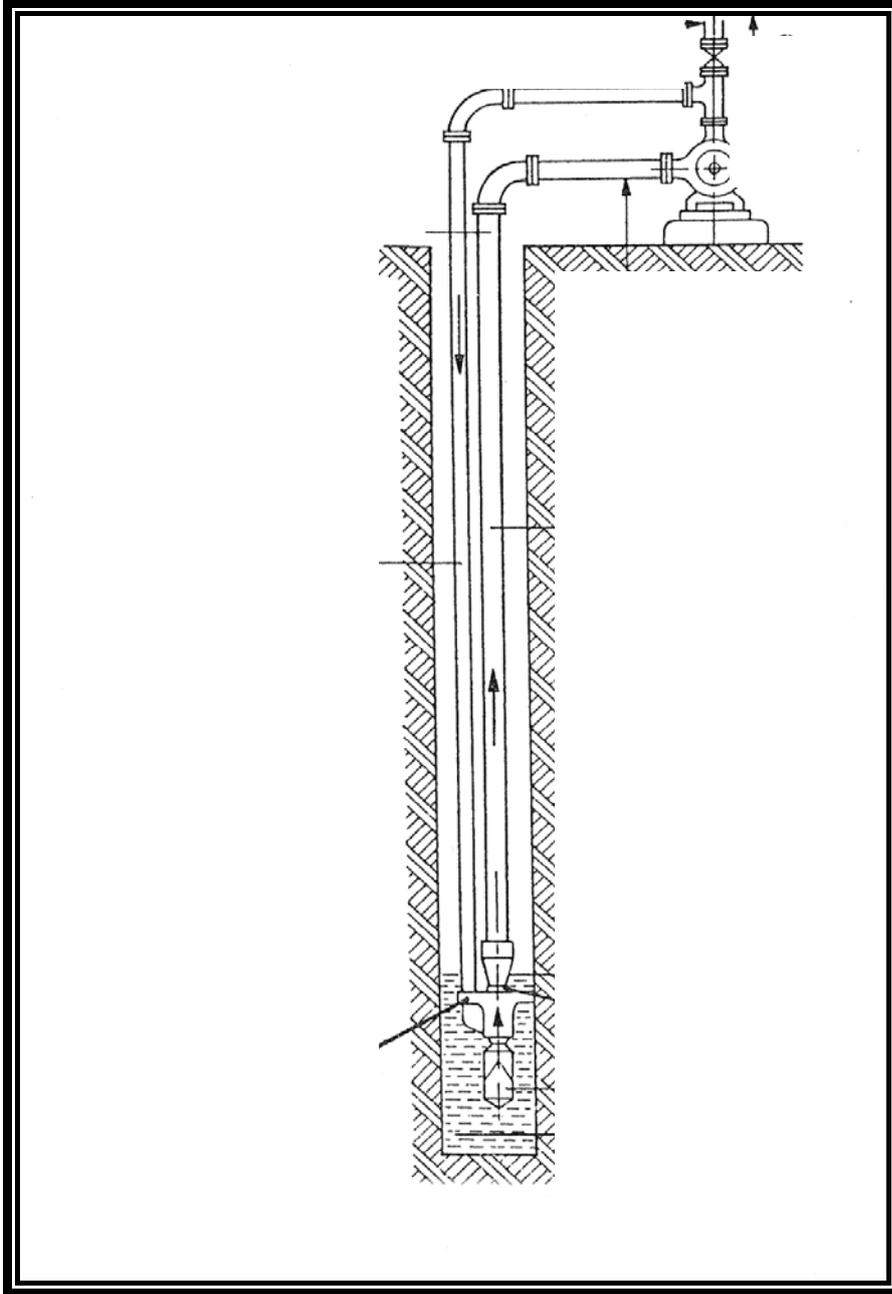
- Add an anti rust agent to the water in the radiator.✓
- Use clean distilled water.✓
- Treat the radiator with a lime dissolving agent

(Any 2) (2)

[35]

**QUESTION 6: WATER MANAGEMENT**

6.1 Most pumps are used to pump water from a source to another place where it is needed.



6.1.1 Identify the pump shown in the figure above.

Jet pump ✓

(1)

6.1.2 Name FOUR advantages of the pump shown above.

- No rods are required. ✓
- Water can be drawn from deep boreholes using the injector. ✓
- Simple construction. ✓
- Almost no maintenance needed. ✓
- It is a high-pressure pump.

(Any 4) (4)  
Please turn over

6.1.3 Describe THREE safety measures when working with electrical pumps and motors.

- Ensure that overload protector/earth leakage protector is functional. ✓
- Electrical connections must be covered or well insulated. ✓
- Earth wires must be connected and in a working order. ✓
- Belts, pulleys and couplings must be safely covered. (Any 3) (3)

6.1.4 Name TWO disadvantages of the rotary pump.

- The pump must be driven from the surface with a shaft. ✓
- Direction of revolution must always be maintained to prevent the shafts from becoming unscrewed. ✓ (2)

6.2 Because of the great demand and scarcity of water in South Africa, the effective use thereof is enforced. Irrigation systems should be designed in such a way that water is applied efficiently for a specific system.



6.2.1 When will sprinkler irrigation be preferred above flood irrigation?

- When the available water is scarce ✓
- Surface gradient (steep) leads to erosion ✓
- Infiltration tempo not constant
- Drainage problems ✓ (Any 3) (3)

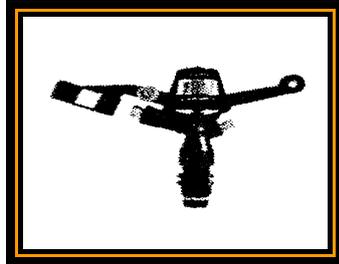
6.2.2 Name FIVE advantages of the irrigation system, referred to in the photo above.

- Minimum labour costs ✓
- Low pump costs ✓
- Low maintenance ✓
- Durable ✓
- High second-hand value. ✓
- Connected to cellphone/computer
- Accurate scheduling can be done
- Fertilisers/herbicides can be applied at the same time
- Labour saving (Any 5) (5)

6.2.3 Identify the system installed at the pump station to prevent blockages of the sprayer nozzles by foreign material.

Sand filters/sieve/Gravel filters/Hydro cyclone filters. ✓ (1)

6.3 Sprinklers form an integral part of irrigation systems.



6.3.1 What is the function of the sprinkler head in the photo?

Even distribution of water over the required area. ✓ (1)

6.3.2 Name TWO effective materials used to manufacture the sprinkler head as indicated in the picture.

- Galvanised metal ✓
  - Brass ✓
  - Plastic ✓
- (Any 2) (2)

6.4 Describe how an open drainage system is used in irrigation fields.

Ditches are dug at regular intervals to a suitable depth ✓ to remove free water from waterlogged soil. ✓ (2)

6.5 Animals cannot survive without the availability of a reliable water source.

6.5.1 Certain requirements are of value when water troughs are installed. Name any FOUR requirements.

- Not be too high. ✓
  - Not be too deep. ✓
  - Not be too wide. ✓
  - Build in such a manner as to prevent the animals to get their feet wet. ✓
  - Easy to clean.
  - Not be able to defecate in the water.
  - Animals should not be able to climb in.
- (Any 4) (4)

6.5.2 Describe the device that can be used in a trough to prevent the water from overflowing. Give a reason for your answer.

- Ball valve. ✓
- The ball closes the valve when the water reaches a certain level and the water stop running. ✓

(2)  
**[30]**

**TOTAL SECTION B: 155**

**GRAND TOTAL: 200**