



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL TECHNOLOGY

MARKING GUIDELINES

NOVEMBER 2025

MARKS: 200

These marking guidelines consist of 14 pages.

SECTION A**QUESTION 1**

1.1	1.1.1	D✓✓	(2)
	1.1.2	B✓✓	(2)
	1.1.3	A/C✓✓	(2)
	1.1.4	B✓✓	(2)
	1.1.5	C✓✓	(2)
	1.1.6	A✓✓	(2)
	1.1.7	A✓✓	(2)
	1.1.8	B✓✓	(2)
	1.1.9	B✓✓	(2)
	1.1.10	A✓✓	(2)
			(20)
1.2	1.2.1	Non-return valve/One-way valve✓✓	(2)
	1.2.2	Galvanised steel/Zinc/Paint✓✓	(2)
	1.2.3	One/Single-phase✓✓	(2)
	1.2.4	Global Positioning System (GPS)✓✓	(2)
	1.2.5	Generator✓✓	(2)
			(10)
1.3	1.3.1	F✓✓	(2)
	1.3.2	A✓✓	(2)
	1.3.3	I✓✓	(2)
	1.3.4	B✓✓	(2)
	1.3.5	D✓✓	(2)
			(10)
TOTAL SECTION A:			40

SECTION B**QUESTION 2: MATERIALS AND STRUCTURES****2.1 2.1.1 The three alloy elements and ONE influence of each.****Chromium✓**

- Increases resistance against corrosion✓
- Promotes the hardening of steel✓
- Improves strength✓
- Improves resistance to the formation of scale✓
- Improves tensile strength✓
- Decreases magnetism✓
- Most chromium steels can be welded✓

(Any 1)

Manganese✓

- It combats corrosion✓
- Gives steel a coarser structure✓
- Changes the band structure, at the same time causing a reduction in striking strength✓
- Increases tensile strength✓
- Reduces the critical cooling tempo and by doing so improves hardening✓
- Increases resistance against wear✓
- It reduces magnetism✓

(Any 1)

Nickel✓

- It improves the toughness and the hardening ability✓
- One of nickel's greatest advantages is that it gives steel a fair amount of toughness at low temperatures✓
- Used with chromium, nickel helps to increase the hardening ability✓
- Steel which is alloyed with chromium and nickel is resistant to air, water and many chemical acids and alkali✓

(Any 1)

(6)

2.1.2 Preferred welding machine when welding stainless steel and motivation.

TIG✓- The high current✓ in MIG welding will cause the metal to melt away.✓ / no cleaning necessary✓ More precise✓ Less splatter✓ Better for thinner metal ✓

Or

MIG ✓

MIG the wire✓ and gas✓ must be changed / no cleaning necessary. Less skill needed to use✓

(3)

2.2 Precautionary measures to prevent cracks and brittleness.

Pre-heating✓ ,Clean.✓

(2)

2.3 Adhesion as a *property* of an adhesive.

Ability of the molecules of an adhesive to cling✓ to the molecules of other substances.✓

(2)

2.4 Discussion of FOUR physical hazards on the human body when working with fibre-glass and the precautionary measures that must be taken to prevent the hazard.

- Catalyst mixed with accelerator can cause an explosion.✓ Catalyst and accelerator should always be stored separately✓
- Resin, catalyst and accelerator on the skin can cause skin irritation✓ Remove it immediately from the skin or wear gloves✓
- Acetone can cause lung diseases.✓ Use acetone in well-ventilated room and or wear a respirator✓
- Glass fibre matting has small pieces of fibre that can penetrate the skin or lungs.✓ Use overall, gloves and or a respirator✓
- Glass fibre particles can cause lung cancer.✓ Do not breathe it in✓
- Glass fibre particles can lead to blindness.✓ Do not let it get into your eyes. Wear a face shield or goggles✓

(Any 4)

(8)

2.5 How to improve the earth efficiency of an electric fence?

- Add more earth spikes✓
- Keep soil moist at the spikes✓
- Run the earth wire parallel to the fence line and connect it to the earth spikes at regular intervals✓
- Replace earth spikes with earth plate✓

(3)

2.6 ONE word for each of the following.

- | | | |
|-------|---------------------|-----|
| 2.6.1 | Sparking✓ | (1) |
| 2.6.2 | 10 kVA✓ | (1) |
| 2.6.3 | Earth spike✓ | (1) |
| 2.6.4 | Lightning arrestor✓ | (1) |
| 2.6.5 | Energiser✓ | (1) |
| 2.6.6 | Insulator ✓ | (1) |

2.7 Components of an electric fence.

- | | | |
|-------|---|-----|
| 2.7.1 | Main post✓ | (1) |
| 2.7.2 | Isolator✓/ Insulator✓ | (1) |
| 2.7.3 | Energiser✓ | (1) |
| 2.7.4 | Earth spike✓ | (1) |
| 2.7.5 | Electric fence/Electrical wire/Live wire✓ | (1) |

[35]

QUESTION 3: ENERGY**3.1 Description of the function of the wind turbine parts:****3.1.1 (a) Propeller blades**

The blades are shaped like aeroplane wings to catch the wind and turn a large rotor.✓ (1)

(b) Tower

Allows the head and blades to be connected and kept at the right height to be able to catch wind.✓ (1)

(c) Gearbox

To regulate the speed of the generator.✓ (1)

(d) Generator

The generator converts mechanical energy into electrical energy.✓ (1)

3.1.2 Description of how a wind turbine generates electricity.

- Wind power works by converting the kinetic energy present in wind first into mechanical energy and then into electrical energy✓
- Wind turns a turbine's blades, which are shaped to catch the wind✓
- This turning motion is then transferred by gears to the turbine's rotor, causing the turbine to generate electricity✓ (3)

3.2 3.2.1 FIVE advantages of geothermal energy.

- A geothermal system does not create any pollution✓
- The cost of the land to build a geothermal power plant on is usually less expensive. (affordable)✓
- Geothermal plants take up very little room, so you do not need to purchase a larger area of land✓
- Geothermal energy is very clean, you may receive tax cuts, and/or no environmental bills or quotas to comply with the countries carbon emission scheme (if they have one)✓
- No fuel is used to generate the power✓
- The overall financial aspect of these plants is outstanding; you only need to provide power to the water pumps, which can be generated by the power plant itself anyway✓
- Renewable✓
- Lasts long✓ (Any 5) (5)

3.2.2 ONE instance where the use of geothermal energy can cause pollution.

Harmful gases that escape from deep within the earth.✓ (1)

3.2.3 Consequence if pumping too much cold water into the geothermal heat source.

It will result in the rocks cooling down/ crack too much thermal heat source to be cooled down.✓ (1)

3.3 3.3.1 Ethanol is made of.

- Starch✓
- Sugar crops✓
- Maize✓
- Sorghum✓
- Potatoes✓
- Wheat✓
- Sugar cane✓
- Maize stubble✓
- Fruit or vegetable waste✓ (Any 2) (2)

3.3.2 The process in A and B when making ethanol.

- A- Fermenting✓
- B- Distilling✓ (2)

3.4 TWO plants that can be used to manufacture bio-diesel.

- Soya✓
 - Canola✓
 - Sunflower seeds✓
 - Algae✓ (Any 2) (2)
- [20]**

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1 4.1.1 The type of metal that the cutting nozzle is manufactured from.

Copper/Brass alloy✓

(1)

4.1.2 **FOUR** suggestions to ensure high quality welding joints when oxy-acetylene welding is done in the OVERHEAD welding position.

- A reduced melting pool is required, big enough to create the wanted penetration✓
- Reduce the size of the welding flame✓
- Use a slightly thicker welding rod✓
- Increase the force of the welding flame a little bit as this will help to keep the molten metal positioned✓

(4)

4.2 **Welding defect of MIG-welding.**

4.2.1 Porosity✓

(1)

4.2.2 Lack of penetration✓

(1)

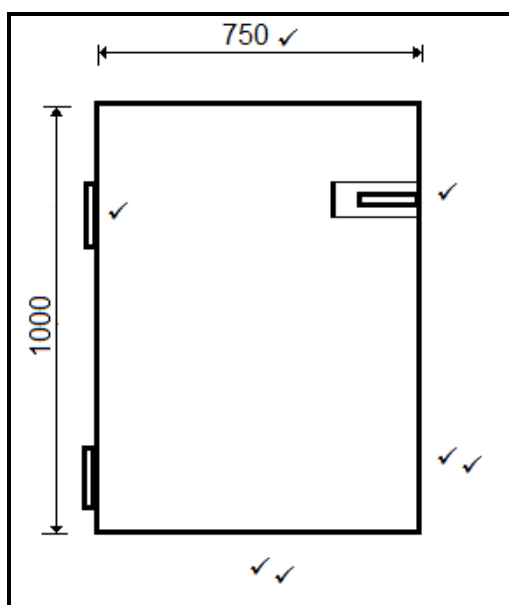
4.2.3 Spatter✓

(1)

4.2.4 Undercutting✓

(1)

4.3 **Freehand sketch of the trough with two hinges and a lock mechanism.**



Marks will be allocated for:

Proportional drawing	(1)
Practical application	(2)
Two Hinges	(1)
Lock mechanism	(1)
Two measurements	(2)
Cutting list of material to be used	(2)

- Accepted tolerance, (1 or 2 marks)
- Angle iron 25 mm x 2 x 1 000 mm.
25 mm x 2 x 750 mm. ✓
- Sheet 3 mm x 1000 x 750 mm. ✓

(9)

- 4.4 4.4.1 **TWO reasons for using the welding helmet when doing plasma cutting.**
- The visor blocks the ultraviolet (UV) rays✓
 - The shield covers the whole face of the operator✓
 - Protects face and eyes against heat✓
 - Protects face and eyes against sparks✓
- (Any 2) (2)
- 4.4.2 **Explanation of using of nitrogen for a plasma cutter**
- Nitrogen produces a higher cutting temperature to cut mild carbon steel and high carbon steel✓at faster cutting tempo/rate.✓to cut non-ferrous metal✓
- (Any 2) (2)
- 4.4.3 **The material that is used to manufacture a standard plasma cutting electrode.**
- Tungsten✓/Copper hafnium ✓
- (1)
- 4.4.4 **FOUR advantages of using a plasma cutting apparatus.**
- Wide range of materials and thickness can be cut✓
 - Easy to use✓
 - Economical to use✓
 - Faster cutting speed✓
 - Cheaper✓
- (4)
- 4.4.5 **FOUR consequences if moisture enters the torch nozzle of a plasma cutter.**
- Moisture entering the torch nozzle can cause internal arcing causing a short circuit✓
 - This arcing will damage the torch✓
 - Person can be electrocuted✓
 - Torch will not cut✓
- (4)
- 4.4.6 **The adjustment on a plasma-cutting machine to cut various metal thicknesses.**
- Adjust the current/gas or air flow control knob/watts✓
- (1)
- 4.5 4.5.1 Air✓
- (1)
- 4.5.2 Argon/Hydrogen✓
- (1)
- 4.5.3 Nitrogen✓
- (1)
- [35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT**5.1 5.1.1 Identification of the part.**

Grease nipple✓ (1)

5.1.2 The working of the part.

This part is connected to a bearing housing and grease is pumped in under moderate to high pressure using a grease gun.✓✓ (2)

**5.2 5.2.1 A - Straight cut gear or spur gear.✓
B - Helical gear.✓**

(2)

5.2.2 Calculate the number of teeth on the driven gear.

Given: Ratio = 1 (drive gear) : 3 (driven gear)
Teeth on drive gear = 60

Number of teeth = 60×3 ✓
Number of teeth = 180✓ teeth✓ (4)

5.3 5.3.1 Safety tips when operating a rotary mower.

- Read and understand the operator's manual and become familiar with the machine✓
- Remove all debris from lawns before mowing✓
- Use recommended PPE including tight-fitting clothing when operating a lawn mower✓
- Disengage the blade before starting✓
- Keep all guards and safety shields in place✓
- Turn off the motor before cleaning the area under the deck✓
- Keep a running mower away from bystanders and pets✓
- Don't cut wet grass✓
- Correct settings of cutting machine✓ (Any 5) (5)

5.3.2 THREE points when maintenance is done on the rotary cutting machine.

- Lubricate regularly✓
- Sharpen all blades✓
- See that all screens are in working order and in place✓
- Repair damaged or broken parts immediately✓
- Clean✓
- Service✓
- Machine must be off✓ (Any 3) (3)

5.3.3 Description of how the rotary mower is hitched to a tractor.

- Connect the two lifting arms✓
 - Connect the top link✓
 - Connect the two stabilizing chains✓
 - Connected to the PTO shaft✓
 - Connect to hydraulic system ✓
- (4)

5.4 5.4.1 Type of hydraulic cylinder shown in the picture.

Double-action cylinder hydraulic.✓ (1)

5.4.2 Working of the double-action hydraulic cylinder.

- When the control lever is in neutral position, the oil is pumped to the control valve and back to the oil container via the oil filter✓
 - The moment the control lever is shifted to the lift position, the control valve directs the pressurised oil to the piston end of the hydraulic cylinder causing the piston to move to the right, and the implement is lifted✓
 - In order to force the implement into the soil, the operator moves the control lever to the 'lower' position and now the control valve will direct the pressurised oil along the second pipe into the shaft-end of the cylinder (where the shaft is connected to the piston), causing the piston to move to the left✓
 - In this way the operator controls the implement positively in two directions✓
- (4)

5.4.3 THREE advantages of transmission oil.

- 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✓
 - Durable ✓
- (Any 3) (3)

5.4.4 Strongest side of the double action hydraulic cylinder and a motivation.

The side without the shaft /right side/thrust ✓

Motivation.

The side without the shaft is stronger✓ than the side with the shaft because the area that is subjected to the oil pressure in the cylinder is larger than the part of the cylinder, which contains the shaft.✓ (3)

5.5 5.5.1 Material used for manufacturing a clutch disk lining.

- Asbestos✓
- Kevlar✓
- Ceramic✓
- Carbon✓

(Any 1) (1)

5.5.2 TWO properties of the friction material of a good clutch system.

- Should be highly wear resistant✓
- Should be highly temperature resistant✓
- Does not corrode✓
- Does not slip/slide✓

(Any 2) (2)

5.5.3 TWO reasons for equipping a tractor with a clutch.

- Engine drive needs to be disengaged when gears are changed✓
- Drive should be disengaged when the tractor is started✓
- The clutch is disengaged to allow engine speed to increase and then engaged to give greater torque✓
- Allows the operator to stop the tractor, belt pulley or PTO shaft without stopping the engine✓

(Any 2) (2)

5.6 Diagnosis of the THREE mentioned symptoms.**5.6.1 Black exhaust smoke.**

- Diesel mixture too rich✓
- Oil in the combustion chamber/Rings are damaged✓

(Any 1) (1)

5.6.2 Rattling noise coming from engine.

- Damaged/bent valves✓
- Damage on the timing chain/belt✓
- Object in the engine✓

(Any 1) (1)

5.6.3 Engine heats up quickly.

- Radiator blocked/leak✓
- No water in the radiator/cooling system✓
- Cooling fan/fan belt not in working condition✓
- Fan belt not correctly installed✓

(Any 1) (1)

[40]

QUESTION 6: WATER MANAGEMENT**6.1 6.1.1 THREE reasons for the centre-pivot irrigation system considered as a labour-saving system.**

- No labourers needed to shift the pipes/system✓
- One-man operation✓
- Automated watering system/scheduling✓
- Pesticides/fertilisers are applied through the system✓ (Any 3) (3)

6.1.2 Description of effective watering in a centre-pivot irrigation system.

- The size of the nozzles✓ varies from small nearer to the centre and larger to the outside✓
- Distance between adjacent sprinklers✓ decrease to the end of the pivot✓ (4)

6.2 THREE reasons of the use of irrigation software.

- To save water✓
- It is used as part of water scheduling✓
- Time saving✓
- Labour friendly✓
- For a big system, software may be the only way to control the system✓
- Software can be used to control when water is turned on and off, how frequently watering occurs, and how much water is delivered at any given time✓
- On a huge farm or large landscaped estate, managing water needs manually or with a restrictive timer system may not be feasible, making software critically important✓
- Such programs typically include tracking utilities, which keep track of how much water is used, monitor average rainfall, and collect other useful data✓ (Any 3) (3)

6.3 6.3.1 TWO reasons for installing such a system in the farmhouse.

- Due to pollution and other contaminants in drinking water supplies, it has become necessary to clean all usable water from harmful microbes, bacteria and chemicals✓
- A water filter removes impurities from the water that has negative effects on plants, animals and humans✓ (2)

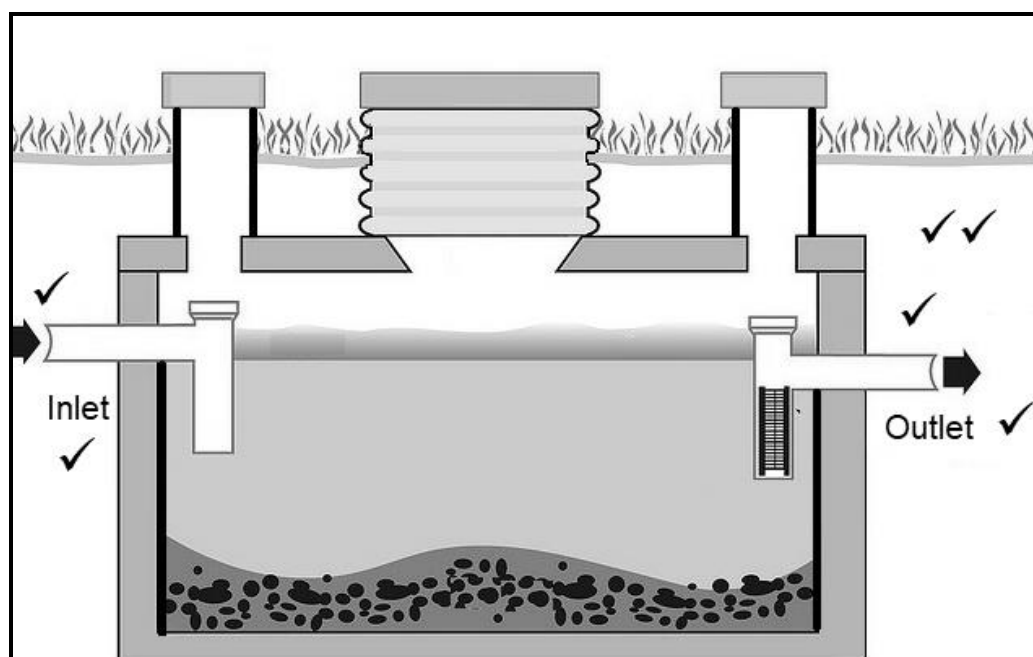
6.3.2 **THREE effective methods that can be used to make brackish water drinkable for humans.**

- Distil process✓
- Reverse osmosis✓
- Boil water and catch the steam✓
- Evaporation✓
- Add sweetener✓
- Electrodialysis ✓

(3)

6.4 Labelled sketch of a septic tank system.

Design	2
Drawing	2
Labels	2



(6)

6.5 **THREE types of home drainage systems.**

- French drain✓
- Channel drain✓
- Downspouts✓
- Slope drain✓
- Drainage ditch/furrow✓

(Any 3)

(3)

6.6 6.6.1 FOUR advantages of variable-rate technology (VRT).

- Cost saving✓
- Time saving✓
- Saving on time using implements and tractors✓
- Labour saving✓
- Ability to precisely control the rate of application✓
- Interaction between implements for precision farming✓
- Detect risks ✓

(Any 4) (4)

6.6.2 TWO other systems that are used for precision farming other than VRT.

- GIS - Geographic Information System✓
- GPS - Global Positioning System✓
- Google earth✓
- Computer systems✓
- Drones✓
- Moisture probes✓

(Any 2) (2)
[30]**TOTAL SECTION B: 160**
GRAND TOTAL: 200