basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

AGRICULTURAL TECHNOLOGY

2021

MARKING GUIDELINES

MARKS: 200

This marking guideline consists of 13 pages.

SECTION A

QUESTION 1

1.1	1.1.1	C✓✓	(2)
	1.1.2	D✓✓	(2)
	1.1.3	C✓✓	(2)
	1.1.4	A✓✓	(2)
	1.1.5	B✓✓	(2)
	1.1.6	D✓✓	(2)
	1.1.7	B✓✓	(2)
	1.1.8	D✓✓	(2)
	1.1.9	B✓✓	(2)
	1.1.10	C✓✓	(2)
			[20]
1.2	1.2.1	Stress/Depression/anxiety✓✓	(2)
	1.2.2	Gearbox/Gears/Transmission✓✓	(2)
	1.2.3	Magnetism/decrease rusting✓✓	(2)
	1.2.4	Explosion/Fire✓✓	(2)
	1.2.5	Simultaneously/together/All at once✓✓	(2)
			[10]
1.3	1.3.1	F✓✓	(2)
	1.3.2	A✓✓	(2)
	1.3.3	C✓✓	(2)
	1.3.4	D✓✓	(2)
	1.3.5	B✓✓	(2)
		(5 x 2)	**[10]**

TOTAL SECTION A: 40

SECTION B

QUESTION 2: MATERIALS AND STRUCTURES

2.1 2.1.1 A metal that will be used to supply warm water.

Copper.✓ (1)

2.1.2 The reason why Copper will be the best suited for warm water pipes.

No corrosion/rust.✓ (1)

2.1.3 The joining method that will be used to permanently join two Copper pipes.

Soldering.✓ (1)

2.1.4 The material that will be best to transport milk in a dairy system.

Stainless steel.✓ (1)

2.1.5 A reason why stainless steel will be the best metal.

The steel is resistant to air, water and many chemicals used for cleaning/Corrosion resistant/Hygienic/does not contaminate food.✓ (1)

2.1.6 A method used to permanently join stainless steel.

Welding/TIG welding.✓ (1)

2.1.7 The best metal used for the manufacturing of a farm gate.

Mild steel.✓ (1)

2.1.8 The substance that can corrode copper.

Acids/Ammonium/Heavy metal salts/Sulphur.✓ (1)

2.1.9 A metal that is commonly used in the food industry for food storing purposes.

Aluminum.✓ (1)

2.2 THREE preparation procedures to ensure a sufficient PVC pipe welding joint.

- Make sure the joint is clean.✓
- Make sure the joint is dry.✓
- Sand both the joint with sandpaper.✓ (3)

2.3 2.3.1 Description of the earth leakage system of the electrical fence.

- There must be an earth spike to the ground to complete the circuit between the ground and the fence.✓
- The animal or person will complete the circuit and get shocked.✓
- Plant material will influence the circuit and must be removed.✓
- Inspect the fence, isolators and connections frequently to prevent short circuit.✓
- Run an earth return line parallel to the fence line on long distance fences.✓
- Connect with earth spikes on a regular basis to improve the efficiency.✓ (6)

2.3.2 The type of wire that may never be used to erect an electric fence.

- Razor wire.✓
- Barbed wire.✓ (Any 1) (1)

2.3.3 TWO daily activities that the farmer must perform to properly maintain an electric fence.

- Clean plants that is touching the fence.✓
- Look for damaged or broken wires, isolators or loose connections and repair.✓ (2)

2.4 Recommendations for the use of Vesconite when manufacturing bushes.

- Easy to install or to remove.✓
- Does not corrode and is non-conductive.✓
- Will not wear shafts.✓
- Resistant to a wide range of chemicals.✓
- Cheap to manufacture.✓ (5)

2.5 ONE electrical property of Teflon and a reason for the answer.

- It has a high di-electric capacity.✓
- **Reason**: Electricity don't have an influence on this material.✓ (2)

2.6 FIVE properties of safety screens on a combine harvester.

- Light.✓
- Safeguard the user.✓
- Not vibrate or become loose.✓
- Sturdy/Strong.✓
- Keep out all undesired material.✓ (5)

2.7 TWO reasons for the use of brass instead of copper in the manufacturing of electrical connections.

- Hardness.✓
- Strength.✓
- Machinability.✓
- Wear resistance.✓
- Ductility.✓ (Any 2) (2)

[35]

QUESTION 3: ENERGY

3.1 TWO alternative energy sources that make use of a turbine and a generator to generate electricity.

- Wind.✓
- Geothermal.✓
- Hydro.✓ (Any 2) (2)

3.2 3.2.1 The number of systems that you will need to provide sufficient power to a 6 kw submersible pump.

Two.✓ (1)

3.2.2 Determine whether the panels should be connected in parallel or series and a reason for the answer.

Series.✓ Because a connection in series will increase the kw/power twice.✓ (2)

3.2.3 ONE Reason for the use of silicon in the manufacturing of the solar cells.

- Is a semi conductive material.✓
- Can withstand the temperature of the sun.✓
- Don't conduct heat.✓
- Is water tight/proof.✓ (Any 1) (1)

3.2.4 The layer of the solar panel that carries negative electrons.

The top layer/N-Type layer.✓ (1)

3.2.5 Measure to ensure that there is electricity available during the night.

Use a battery system for the night.✓ (1)

3.2.6 THREE applications of solar panels on a game farm.

- To provide power to: security cameras.✓
- Alarm systems.✓
- Electric gate motors.✓
- Emergency lights.✓
- Electric fencing.✓
- Borehole pumps.✓ (Any 3) (3)

3.3 FOUR advantages of geothermal power station.

- No pollution.✓
- The cost of the land to build a geothermal power plant on is usually less expensive.✓
- Clean energy.✓
- Tax cuts.✓
- No fuel is used to generate electricity.✓
- Low running cost.✓ (Any 4) (4)

3.4 FOUR factors that must be considered when installing a small wind turbine on a farm.

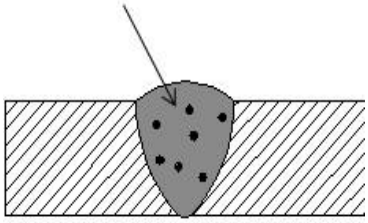
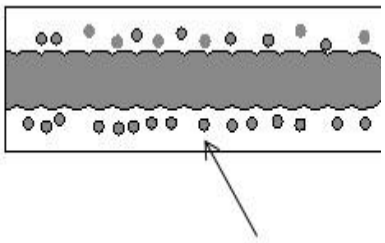
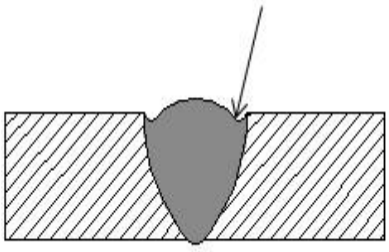
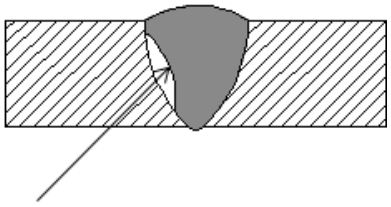
- Must be in an open space/field.✓
- Flat area.✓
- The absence of obstacles like trees/forests/hills/mountains.✓
- The presence of strong and frequent winds.✓
- A location further from a village or residential site.✓
- Location away from suburbs. ✓
- Not harmful to bird life or nature. ✓ (Any 4) (4)

3.5 Process used to manufacture ethanol.

Distillation.✓ (1)
[20]

QUESTION 4: SKILLS AND CONSTRUCTION PROCESSES

4.1

	Welding defect	Gee moontlike oorsake
	4.1.1 Porosity.✓	4.1.2 • Blocked nozzle.✓ • Gas flow too low or too high.✓ • Leaking gas lines.✓ • Draught conditions.✓ • Nozzles distance from the work is too great.✓ • Painted, wet or oily plate.✓ • Wet or rusty electrode/wire.✓ (Any 1)
	4.1.3 Spatter.✓	4.1.4 • Voltage too low.✓ • Inadequate inductance✓ • Rusty or dirty plate.✓ (Any 1)
	4.1.5 Undercut.✓	4.1.6 • Welding speed too fast.✓ • Current too high.✓ • Poor technique.✓ (Any 1)
	4.1.7 Lack of fusion.✓	4.1.8 • Amps too low.✓ • Irregular surface.✓ • Wrong torch angle.✓ (Any 1)

(8)

4.2 MIG welding labels for the numbers A–D as indicated.

A – Molten puddle.✓
B – Contact tip.✓
C – Welding wire/Electrode.✓
D – Shielding gas.✓ (4)

4.3 4.3.1 TWO materials that can be cut with oxy-acetylene cutting apparatus.

- Mild steel.✓
- Cast iron.✓
- Stainless steel.✓ (Any 2) (2)

4.3.2 FIVE steps that must be followed to cut a straight line on a 10mm mild steel sheet using an Oxy-acetylene cutting apparatus.

- Attach an guide iron to the metal sheet next to the place where you want to cut/parrallel to your mark.✓
- Select the appropriate nozzle size.✓
- Light the torch and adjust the required flame.✓
- Bring the material up to red-hot.✓
- Oxygen is then fed with the lever on the cutting attachment.✓
- Move the torch at the required speed along a guide.✓
- The oxygen will blow the melted iron from the cutting area to create a clean cutting line.✓ (Any 5) (5)

4.3.3 THREE oxy-acetylene welding tips in the overhead welding position.

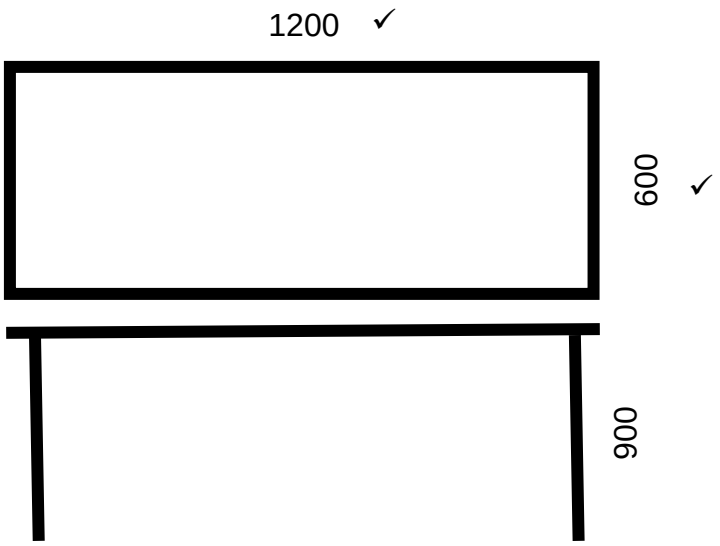
- Reduced melting pool just big enough to create the wanted penetration.✓
- Reducing the size of the flame.✓
- Use a slightly thicker welding rod.✓
- Use the force of the flame to keep the molten metal in position.✓ (Any 3) (3)

4.4 Marks will be allocated for the following:

Design	2✓✓
Correct scale	1✓
Dimensions	2✓✓
Neatness	1✓

Neatness ✓

Design ✓✓



Scale = 1:100 ✓

(6)

4.5 A gas that can be used with a plasma cutter to remove the melted metal.

- Argon.✓
- Nitrogen.✓
- Oxygen.✓
- Compressed air.✓ (Any 1) (1)

4.6 Comparison in table form of the Inverter welding machine to the MIG welding machine

Inverter welder	**MIG welding machine**
• Low initial setup cost.✓	• High initial setup cost.✓
• Compact.✓	• Bulk or large.✓
• Light and easy to handle.✓	• Heavy and difficult to handle.✓
• Slag must be removed after welding.✓	• No slag.✓
• No additional shielding gas cylinder needed.✓	• Need additional cylinder for the shielding gas.✓
• Lower maintenance cost.✓	• High maintenance cost.✓

(Any 6) (6)
[35]

QUESTION 5: TOOLS, IMPLEMENTS AND EQUIPMENT

5.1 5.1.1 Identification of the component in the sketch that serves as a connection between the parts.

Universal joint.✓ (1)

5.1.2 The substance that is used to lubricate the universal joint.

Grease.✓ (1)

5.1.3 ONE application of the universal joint.

- Drive shaft.✓
- Power take off shaft.✓
- Steering mechanism.✓ (Any 1) (1)

5.1.4 TWO mechanisms installed in the drive system of a four-wheel drive vehicle that allows disconnection of drive to the front wheels and ONE advantage of each device.

- 4 x 4 Gearbox.✓ 4 x 4 can be disengaged when driving on tar roads.✓
- Front wheel hub locking devices.✓ Wear is reduced on the front wheels and front wheel system.✓ (4)

5.2 Type of hydraulic cylinder used to lift or lower the fork of the baling machine.

Double action hydraulic cylinder.✓ (1)

5.3 Function of the lining on the friction plate of a clutch.

- Prevents the pressure plate from slipping.✓
- Heat resistant/Wear resistant.✓ (Any 1) (1)

5.4 TWO advantages of the diff lock as found on a 4x4 tractor.

- Provide increased traction/torque.✓
- Both wheels turn together regardless of traction available to each.✓
- Each wheel applies rotational force independent of the available traction.✓ (Any 2) (2)

5.5 ONE advantage of a bearing without a grease nipple.

- Comes lubricated from manufacturer.✓
- No additional greasing needed.✓
- Sealed bearing.✓ (Any 1) (1)

5.6 5.6.1 Calculation of the pulley ratio of the electrical motor to the pump.

Driven pulley
Drive pulley
450mm✓
150mm✓
= 3✓
Ratio: 3:1✓ (3)

5.6.2 FOUR reasons for using a V-belt instead of a flat belt.

- V-belts do not slip off pulleys.✓
- V-belts draw tighter around a pulley when tension increases.✓
- Lubrication is never necessary.✓
- V-belts are relatively strong, and under normal circumstances do not easily break.✓
- V-belts last longer than flat belts.✓
- Cold, moist conditions, age or use do not cause V-belts to stretch or shrink.✓ (Any 4) (4)

5.6.3 Part that allows relative rotation to the rotor shaft.

Bearing.✓ (1)

5.7 FOUR possible faults in the engine that can cause the presence of oil in the combustion chamber.

- Piston rings are worn.✓
- Cylinder gasket blown.✓
- Crack in cylinder head.✓
- Cylinder sleeves/walls are worn.✓
- Valve stem seals perished/worn.✓ (Any 4) (4)

5.8 Properties of a functional clutch.

- It should engage smoothly and not jam, slip or shudder.✓
- It should be capable of transferring the maximum load of the engine without slip.✓
- When the clutch is disengaged, it should do so completely and not tend to drag.✓
- The clutch should be of such a nature that it could be engaged or disengaged comfortably by hand or foot.✓
- The friction material used on the clutch plate should not only be highly wear and temperature resistant.✓ (5)

5.9 FOUR parts that must be examined on a second hand tractor before you decide to buy it.

- Engine.✓
- Gearbox.✓
- Final drive.✓
- Cooling system.✓
- Fuel system.✓
- Steering mechanism.✓
- Instruments.✓
- Battery.✓ (Any 4) (4)

5.10 Function of the parts of a hammer mill.

5.10.1 The hopper: Facilitates the process of feeding.✓ (1)

5.10.2 Cyclone: Separates the grounded material from the air.✓ (1)

5.11 Reason for the wheels of a front-end loader to be set at its widest position.

To increase stability.✓ (1)

5.12 Servicing procedure when preparing a combine harvester for the harvesting season.

- Lubricate/Grease all moving parts.✓
- Correct tension of belts and chains.✓
- Check that all parts are functioning by operating it slowly.✓
- Replace all worn parts.✓
- Service according to manufacturer's specifications.✓
- Lift up all dust release guards.✓
- Check that no blades are damaged and are sharp.✓ (Any 4) (4)

[40]

QUESTION 6: WATER MANAGEMENT

6.1 FOUR factors to be considered before deciding on a relevant irrigation method.

- Type of crop that must be irrigated.✓
- Determine the amount of water that is available.✓
- Type of irrigation system.✓
- Type of pump.✓
- Determine the water flow (LPM) and pressure requirements.✓
- Size of the field.✓
- Create the first irrigation design.✓ (Any 4) (4)

6.2 Goals of irrigation scheduling.

- To apply adequate water to the root zone of the plant.✓
- Prevent overwatering.✓
- Allow the soil to dry out in between watering.✓
- To allow air to enter the soil.✓ (Any 3) (3)

6.3 TWO structural problems that can influence the sprinkler.

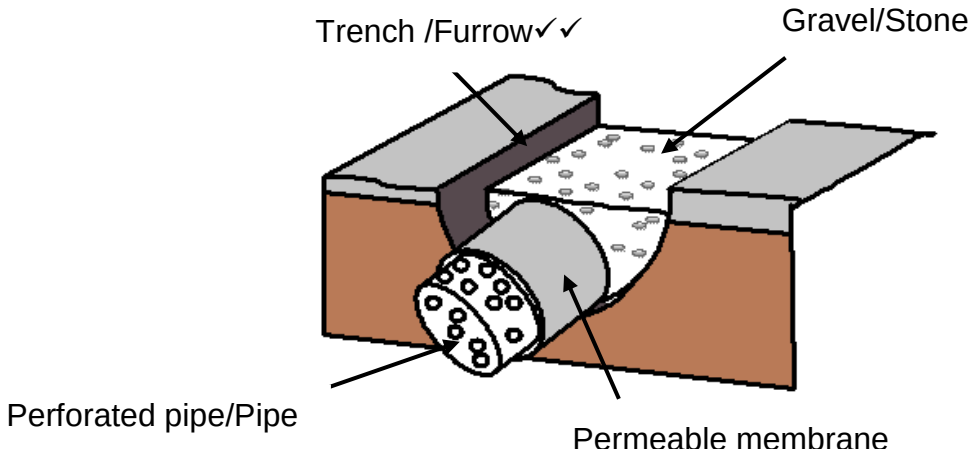
- The springs can lose tension or break.✓
- The nozzles can be blocked.✓
- The water pressure is inadequate.✓ (Any 2) (2)

6.4 A device that a farmer can use to measure the evaporation tempo in a maize field.

Evaporation pan/Class A evaporation pan.✓ (1)

6.5 Labelled drawing of a French water drainage system.
Marks will be allocated for:

Design	1✓
Drawing	1✓
Labels	4✓✓✓✓



(6)

6.6 FIVE items that should never be disposed off in a septic tank.

- Cigarette butts.✓
- Sanitary pads/towels. ✓
- Detergents.✓
- Fats and oils.✓
- Laundry waste.✓
- Plastics. ✓ (Any 5) (5)

6.7 THREE reasons to determine the flow rate in a pipe delivery system.

- For correct calibrating of the sprayers.✓
- For effective scheduling of irrigation.✓
- To prevent the over utilisation of the water source.✓ (3)

6.8 6.8.1 THREE advantages of a centre pivot irrigation system.

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

6.8.2 THREE design principles that are built into the centre pivot irrigation system to ensure uniform distribution of water.

- Distribution pattern of the sprayers.✓
- Nozzle opening diameter must increase proportionally further from the centre to allow for a higher water application.✓
- Spacing between sprayers must decrease proportionally further from the centre.✓ (3)

[30]

TOTAL SECTION B: 160
GRAND TOTAL: 200